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: **PC184**

DATE VERIFIED: **May 24, 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: PC184

PIN: 4730100073B

Subdivision, Tract, Business or Owner Name (if known): Grace Covenant Presbyterian Church

Property Description: Parcel 2 Mecca Subdivision

Site Address: 1677 Jamestown Road

(For internal use only) **Box** 1 **Drawer:** 1

Agreements: (in file as of scan date) **Y** **Book or Doc#:** 020022837 **Page:**

Comments

COUNTY OF JAMES CITY, VIRGINIA

COPY

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF RUNOFF CONTROL FACILITY

THIS DECLARATION, made this 20th day of September, 2002, between Daniel W. CAPRIO, Susan S. TUTTLE and Richard T. GAY, JR., as TRUSTEES OF GRACE COVENANT PRESBYTERIAN CHURCH, a Virginia religious association, and all successors in interest, hereinafter referred to as the "COVENANTORS (S)," owner(s) of the following property: Parcel II as shown on a plat titled "Plat of Parcels I, II, and III, Property of Mecca Development Corporation" recorded in Plat Book 45, Page No.9; project name, Grace Covenant Presbyterian Church,; and the County of James City, Virginia ("COUNTY.")

WITNESSETH:

We, the COVENANTOR (S), with full authority to execute deeds, mortgages, other covenants, and all rights, titles and interests in the property described above, do hereby covenant with the COUNTY as follows:

1. The COVENATOR (S) shall provide maintenance for the drainage system including any runoff control facilities, conveyance systems and associated easements, hereinafter referred to as the "SYSTEM," located on and serving the above-described property to ensure that the facility that the SYSTEM is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations. The SYSTEM shall not include any elements located within any Virginia Department of Transportation rights-of-way.

2. If necessary, the COVENANTOR (S) shall levy regular or special assessments against all present or subsequent owners of property served by the SYSTEM to ensure that the SYSTEM is properly maintained.

3. The COVENANTOR (S) shall provide and maintain perpetual access from public right-of-ways to the SYSTEM for the COUNTY, its agent and its contractor.

4. The COVENANTOR(S) shall grant the COUNTY, its agent and its contractor a right of entry to the FACILITY for the purpose of inspecting, operating, installing, construction, reconstruction, maintaining or repairing the SYSTEM.

5. If, after reasonable notice by the COUNTY, the COVENANTOR(S) shall fail to maintain the SYSTEM in accordance with approved design standards and with the law and applicable executive regulations, the COUNTY may perform all necessary repair or maintenance work, and the COUNTY may

Instrument # 020022837

Revised 01/02

Recorded on October 3, 2002

asses the COVENANTOR(S) and/or all property served by the SYSTEM for the cost of the work and any applicable penalties.

6. The COVENANTOR(S) shall indemnify and save the COUNTY harmless from any and all claims for damages to persons or property arising from the installation, construction, maintenance, repair, operation or use of the SYSTEM.

7. The COVENANTOR(S) shall promptly notify the COUNTY when the COVENANTOR (S) legally transfers any of the COVENANTOR (S)' responsibilities for the SYSTEM. The COVENANTOR(S)' shall supply the COUNTY with a copy of any document of transfer, executed by both parties.

8. The covenants contained herein shall run with the land and shall bind the COVENANTOR(S) and the COVENANTOR(S)' heirs, executors, administrators, successors and assignees, and shall bind all present and subsequent owners of property served by the SYSTEM.

9. This COVENANT shall be recorded in the County Land Records.

10. Notwithstanding anything to the contrary in this Declaration, pursuant to Section 57-15.1 of the Code of Virginia of 1950, as amended, this Declaration is executed without personal liability of the individuals executing the Declaration on behalf of Grace Covenant Presbyterian Church and shall be the obligation solely of Grace Covenant Presbyterian Church and no other.

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of first above written.

COVENANTORS:

DANIEL W. CAPRIO, SUSAN S. TUTTLE AND RICHARD T. GAY, JR., AS TRUSTEES OF GRACE COVENANT PRESBYTERIAN CHURCH, a Virginia religious association

By: _____ (SEAL)
Trustee

By: _____ (SEAL)
Trustee

By: _____ (SEAL)
Trustee

STATE OF VIRGINIA,

COUNTY OF JAMES CITY, to wit:

The foregoing instrument was duly acknowledged before me this 27th day of September, 2002 by Daniel W. Caprio, Susan S. Tuttle and Richard T. Gay, Jr., as Trustees of Grace Presbyterian Church, a Virginia religious association.

Notary Public

My commission expires: 9/30/2004

Approved as to form:

Asst. County Attorney

This Declaration of Covenants prepared by:

Charles. J. Bodnar, P.E.
(Print Name)

Associate, LandMark Design Group, Inc.
(Title)

4029 Ironbound Road, Suite 100
(Address)

Williamsburg, VA 23188
(City) (State) (Zip)

James City County Environmental Division Stormwater Management/BMP Record Drawing and Construction Certification Review Tracking Form

Project Name: Grace Covenant Presbyterian Church
County Plan No.: SP-066-02
Stormwater Management Facility: BIORETENTION BASIN
BMP Phase #: ☐ I ☐ II ☐ III

- ☐ Information Package Received. Date/By: 12/4/07
- ☐ Completeness Check:
  - X Record Drawing — Date/By: 12/04/07 Peter Farrell
  - ☐ Construction Certification — Date/By:
  - X RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001Only)
  - X Insp/Maint Agreement # / Date: #020022837 10/3/02
  - X BMP Maintenance Plan Location: Page R-2 on Record Drawing
  - ☐ Other:
- ☐ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review
  - X Yes ☐ No Location:
- X Assign **County BMP ID Code #**: Code: PC-184
- X Preliminary Input/Log into Division's "As-Built Tracking Log"
- X Add Location to GIS Map. Obtain basic site information (GPIN, Owner, Address, etc.)
- X Preliminary Log into Access Database (BMP ID #, Plan No., GPIN, Project Name, etc.)
- X Active Project File Review (correspondence, H&H, design computations, etc.).
- X Initial As-Built File setup (File label, folder, copy plan/details/design information, etc.).
- X Inspector Check of RD/CC (forward to Inspector using transmittal for cursory review).
- X Pre-Inspection Drawing Review of Approved Plan (Quick look prior to Field Inspection).
- X Final Inspection (FI) Performed Date: 8/26/08
- X Record Drawing (RD) Review Date: 8/26/08
- X Construction Certification (CC) Review Date: 8/26/08
- X Actions:
  - ☐ No comments.
  - X Comments. Letter Forwarded. Date: 12/11/2007
  - X Record Drawing (RD)
  - X Construction Certification (CC)
  - X Construction-Related (CR)
  - X Site Issues (SI)
  - ☐ Other :
- ☐ Second Submission:
- ☐ Reinspection (if necessary):
- X Acceptable for SWM Purposes (RD/CC/CR/Other). Ok to proceed with bond release.
- X Complete "Surety Request Form".
- ☐ Check/Clean active file of any remaining material and finish "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.
- ☐ Obtain Digital Photographs of BMP and save into County BMP Inventory.
- ☐ Request mylar/reproducible from As-Built plan preparer.
- X Complete "As-built Tracking Log".
- ☐ Last check of BMP Access Database (County BMP Inventory).
- ☐ Add BMP to JCC Hydrology & Hydraulic database (optional).
- ☐ Add BMP to Municipal BMP list (if a County-owned facility)
- ☐ Add BMP to PRIDE BMP ratings database.

Final Sign-Off

Inspector: _____ Date: _____

Chief Engineer: _____ Date: _____

*** See separate checklist, if needed.

CTHUDSON@ET

James City County, Virginia
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: Grace Covenant Presbyterian Church
Structure/BMP Name: BMP #1
Project Location: 1677 Jamestown Road
BMP Location: South East corner of property
County Plan No.: Amendment to SP - 066 - 02

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

Tax Map/Parcel No.: 4730100073B
BMP ID Code (if known): P0194
Zoning District: LB
Land Use: Church
Site Area (sf or acres): 7.3 Acres

Brief Description of Stormwater Management/BMP Facility: Re-Grading of existing Detention Pond

Nearest Visible Landmark to SWM/BMP Facility: Intersection of Jamestown Road and Lakewood Dr.

Nearest Vertical Ground Control (if known):
X JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☐ Arbitrary ☐ Other
Station Number or Name: Station #318
Datum or Reference Elevation: 46.46
Control Description: JCC Geodetic Control Monument 318
Control Location from Subject Facility: At intersection of Jamestown Road and Ironbound Road

Section 2 - Stormwater Management / BMP Facility Construction Information:

PreConstruction Meeting Held for Construction of SWM/BMP Facility: ☐ Yes ☐ No X Unknown
Approx. Construction Start Date for SWM/BMP Facility: January 2003
Facility Monitored by County Representative during Construction: ☐ Yes ☐ No X Unknown
Name of Site Work Contractor Who Constructed Facility: CA Barrs
Name of Professional Firm Who Routinely Monitored Construction: Unknown
Date of Completion for SWM/BMP Facility: Unknown
Date of Record Drawing/Construction Certification Submittal: 12/04/07

(Note: Record D[illegible]ing and Construction Certifications are re[illegible]ed within thirty (30) days of the completion of Sto[illegible]water Management and/or BMP facility co[illegible]ruction. 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: Grace Covenant Presbyterian Church
Mailing Address: 1677 Jamestown Road
Williamsburg, VA 23185
Business Phone: 220-0147
Fax: 220-3337
Contact Person: Cindy Taylor Hudson
E.T. Gresham Company Inc.
1038 W. 26th Street
Norfolk, VA 23517
(757) 627-4583

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: Landmark Design Group, Inc.
Mailing Address: 4029 Ironbound Rd.
Williamsburg, VA 23188
Business Phone: 757-253-2975
Fax: 757-229-0049
Responsible Plan Preparer: C.J. Bodnar
Title: P.E.
Plan Name: Site Development Plan, Grace Covenant Presbyterian Church
Firm's Project No. 2001201-000.03
Plan Date: 12/26/02
Sheet No.'s Applicable to SWM/BMP Facility: C-3 / C-5

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

Name: CA Barrs Contractor
Mailing Address: P.O. Box 1489
7601 George Washington Memorial Hwy.
Yorktown, VA 23692
Business Phone: (757) 898-7282
Fax: (757) 898-1282
Contact Person: Steve Barrs
Site Foreman/Supervisor: Unknown
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: LandMark Design Group, Inc.
Mailing Address: 4029 Ironbound Road, Suite 100
Williamsburg, VA 23188
Business Phone: 757-253-2975
Fax: 757-229-0049

Name: Peter Farrell
Title: Land Surveyor
Signature: Peter Farrell
Date: 12/17/07

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
12/17/07
PETER FARRELL
Lic. No. 002036
LAND SURVEYOR

_____ (Seal)

Virginia Licensed Land Surveyor

Construction Certification

Firm Name: ECS Mid-Atlantic, LLC
Mailing Address: ~~4~~ 108 Ingraham
Suite 1, Williamsburg, VA 23188
Business Phone: 229-6677
Fax: 229-9978

Name: Michael J Galli
Title: Principal Engineer
Signature:
Date: 8/25/08

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
Lic. No. 030684
8/25/08
PROFESSIONAL ENGINEER

_____ (Seal)

Professional Engineer

James City County, Virginia
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.)

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Facility Monitored by County Representative during Construction: ☐ Yes ☐ No X Unknown
Name of Site Work Contractor Who Constructed Facility: CA Barrs
Name of Professional Firm Who Routinely Monitored Construction: Unknown
Date of Completion for SWM/BMP Facility: Unknown
Date of Record Drawing/Construction Certification Submittal: 12/04/07

(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.)

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E.T. Gresham Company Inc.
1038 W. 26th Street
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Fax: 757-229-0049
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Mailing Address: 4029 Ironbound Road, Suite 100
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Business Phone: 757-253-2975
Fax: 757-229-0049

Name: Peter Farrell
Title: Land Surveyor
Signature: Peter Farrell
Date: 12/17/07

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
12/17/07
PETER FARRELL
Lic. No. 002036
Peter Farrell
LAND SURVEYOR

_____ (Seal)

Virginia Licensed Land Surveyor

Construction 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 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.

_____ (Seal)

Professional Engineer

Post Construction Evaluation

ECS MID-ATLANTIC, LLC

Geotechnical • Construction Materials • Environmental • Facilities

August 22, 2008

Ms. Cindy Taylor
E.T. Gresham Company, Inc.
1038 W. 26th Street
Norfolk, Virginia 23501

ECS Project No. 07:9905

Reference: Grace Covenant Presbyterian Church – Bioretention Basin #3
1677 Jamestown Road
James City County, Virginia

PC184 Sp. Ltr

Dear Ms. Taylor:

ECS Mid-Atlantic, LLC has completed a post construction evaluation of the above referenced project. This report presents the results of our limited study for the referenced basin. This portion of the project has been completed in accordance with our proposal No. 07:14049 dated July 7, 2008 and signed by you.

Introduction:

The project site is located within the parking lot area of Grace Covenant Presbyterian Church located at 1677 Jamestown Road in James City County, Virginia. We understand the church and associated parking lots and basin areas were constructed about 5 years ago. During that time, we understand inspections for the church building were performed under the Special Inspection requirements as required by code. However, inspections during the construction of the parking lots or specifically Bioretention Basin #3, was not performed. We understand from interviews with the earthwork contractor, C.A. Barrs Contractor, indicated that the basin was built according the approved plans. We have also reviewed the plans for this project dated May 7, 2002. Based on the project plans, Sheet C-5, we understand the basin was to be constructed with an under drain system consisting of a 6 inch perforated pipe (wrapped in filter fabric) in an 8 inch gravel jacket. The under drain system was to be covered with a filter fabric. Overlying the filter fabric was to be 4 ft of planting soil covered by 2 to 3 inches of mulch.

The purpose of this exploration was to explore the soil and groundwater conditions at the site and to evaluate or ascertain if the basin was constructed according to plans. Our limited investigation included drilling shallow hand auger borings to explore the subsurface soil conditions, performing a site reconnaissance to observe general topography, and analyzing field data to develop our opinion.

Observations and Conclusions:

Engineering personnel from our office visited the site to observe the existing conditions. At the time of our site visit, the site consisted of the existing church building and the associated asphalt paved parking lots. A hand auger was performed within the basin area that extended to depths of about 2 to 3 ft below site grades to identify the planting soil media underneath the mulch. We did not extend the hand augers through the planting soil media as we did not want to penetrate or damage the filter fabric or the drainage layer. The purpose of the hand auger was to identify the planting soil media which appeared to be consistent with the type of material required for these facilities. We did not encounter ground water at the time of our hand auger. Please note that we were unable to observe the in-place construction of the entire basin area including the drainage layer. However, this facility has been in operation for at least the last 5 years. As such, it is our understanding that no significant issues other than routine maintenance issues has occurred during this time frame. Also, we understand the basin area has performed adequately over time representative that the basin is performing as designed. Therefore, we believe based on the findings of this study, that the basin appears to have been constructed in accordance with project plans and specifications.

Also of note, we understand that the county required maintenance improvements to the basin area consisting of dressing up the basin area with respect to bare spots (topsoil/mulch) in addition to installing EC-2 matting over the basin area in an attempt to get the ground to stabilize. We observed that the basin area had been improved with additional topsoil/mulch and that the contractor had installed the required EC-2 matting.

General Comments:

This report has been prepared in order to aid in the evaluation of this site and to assist the Contractor and owner in the completion of this project. The report scope is limited to the specific project and location described, and the project description represents our understanding of the significant aspects relevant to soil and design characteristics.

We have appreciated being of service to you. 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 contact our office.

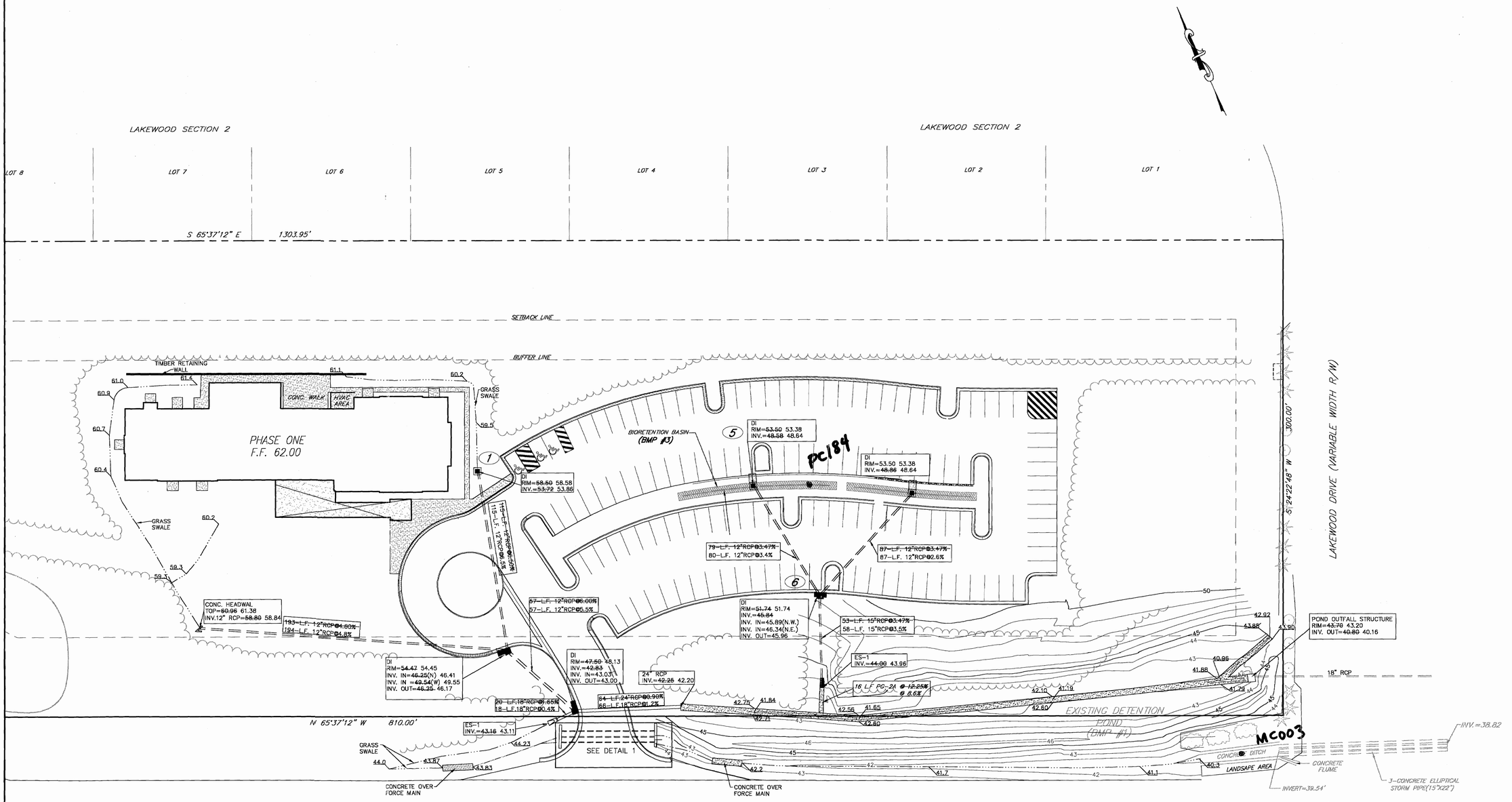
Respectfully,

ECS Mid-Atlantic, LLC.

COMMONWEALTH OF VIRGINIA
MICHAEL J. GALLI
Lic. No. 030684
8/22/08
PROFESSIONAL ENGINEER

J. David Eakes, E.I.T.
Project Engineer

Michael J. Galli, P.E.
Principal Engineer



GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

RECORD INFORMATION (TYPICAL)

POND OUTFALL STRUCTURE
RIM=43.70 43.20
INV. OUT=40.80 40.16

THESE RECORD DRAWINGS ARE BASED ON AN ACTUAL FIELD SURVEY OF STORMWATER MANAGEMENT FACILITIES PERFORMED BY LANDMARK DESIGN GROUP NOVEMBER, 2007. IMPROVEMENTS SHOWN OTHER THAN STORMWATER MANAGEMENT FACILITIES, WERE TAKEN FROM THE APPROVED SITE PLAN AND WERE NOT FIELD VERIFIED.

COMMONWEALTH OF VIRGINIA
12/4/07
PETER FARRELL
LIC. No. 002036
Peter Farrell
LAND SURVEYOR

5544 Greenwich Road
Suite 200
Virginia Beach, VA 23462
Tel. (757) 671-2000
Fax (757) 497-7933
Email: lmdg@landmarkdg.com

4029 Ironbound Road
Suite 100
Williamsburg, VA 23188
Tel. (757) 253-0979
Fax (757) 229-0048
Email: lmdg@landmarkdg.com

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

RECEIVED

STORM SEWER RECORD DRAWING

GRACE COVENANT PRESBYTERIAN CHURCH

JAMES CITY COUNTY VIRGINIA

Designed: LMDG	Date: 12/04/07
Checked: PF	Scale: 1"=30'
File Mgr./Drawn: AST	CADD File name: GRACE-STORM.DWG
Project Number: 2007193-000.00	Dwg. File No.: 18201W
Drawing Number	R-1

1 OF 2

MAINTENANCE PLAN DETENTION POND BMP

THE OWNER OR ITS DESIGNATED REPRESENTATIVE WILL INSPECT THE SWM/BMP STRUCTURE AFTER EACH SIGNIFICANT RAINFALL EVENT OR THE FOLLOWING WORKING DAY IF A WEEKEND OR HOLIDAY OCCURS. A SIGNIFICANT RAINFALL FOR THIS STRUCTURE IS DEFINED AS ONE (1) INCH OR MORE OF GAUGED RAINFALL WITHIN A 24 HOUR PERIOD. ONCE PER YEAR (MORE OR LESS) A REPRESENTATIVE OF THE COUNTY MAY JOINTLY INSPECT THE STRUCTURE. APPROPRIATE ACTION, PERFORMED AT THE COST OF THE OWNER WILL BE TAKEN TO ENSURE APPROPRIATE MAINTENANCE. KEYS TO LOCKED ACCESS POINTS OR STRUCTURES SHALL BE MADE AVAILABLE TO THE COUNTY UPON REQUEST.

THE DETENTION POND SERVES A DRAINAGE AREA OF 2.2 ACRES ASSOCIATED WITH THE 7.9-ACRE GREENMOUNT INDUSTRIAL PARK LOT 2B SITE. THE FACILITY IS A 4-POINT, DRY-TYPE DETENTION FACILITY, COUNTY TYPE F-2 BMP. SOME INFILTRATION WILL OCCUR AT AN AVERAGE INFILTRATION RATE OF 1/4 INCH PER HOUR. A DRY-TYPE DETENTION POND TEMPORARILY STORES RUNOFF AND IS NORMALLY DRY DURING NON-RAINFALL PERIODS. TYPICALLY DRAW DOWN TIMES RANGE FROM 24 TO 72 HOURS FOLLOWING A STORM EVENT. PRINCIPAL STRUCTURES ASSOCIATED WITH THE BMP CONSIST OF TWO INFLOW STORM DRAINS (12 AND 18 INCH DIAMETER), A 36-INCH VERTICAL RISER, AND A 21-INCH RCP OUTLET BARREL. THERE ARE TWO OPENINGS IN THE RISER TO OFFER CONTROL FOR THE 2- AND 10- YEAR DESIGN STORM EVENTS. DURING THE 100-YEAR STORM, THE MAXIMUM WATER LEVEL SHOULD RISE TO ABOUT 12 INCHES ABOVE THE CREST OF THE RISER AND WITHIN 12 INCHES OF THE TOP OF THE DAM. IF FUNCTIONING PROPERLY, NORMAL STORM EVENTS SHOULD REACH AN ELEVATION JUST BELOW THE TOP OF THE RISER AND THE POND SHOULD DRAW DOWN IN ABOUT 24 TO 36 HOURS.

ADDITIONAL INSPECTION AND MAINTENANCE MEASURES:

1. INSPECT FOR SEDIMENT BUILDUP BY VISUAL OBSERVATION AND A PHYSICAL DETERMINATION OF SEDIMENT DEPTH WITHIN POND STORAGE AREAS. IF THE DEPTH OF SEDIMENT REACHES THE DEPTH OF 12 INCHES ABOVE THE BOTTOM OF POND, REMOVAL IS REQUIRED. AT THE SAME TIME, OR AT LEAST ONCE PER YEAR, CLEAN PRETREATMENT DEVICES, THE RISER BOTTOM AND OUTLET PIPES OF ACCUMULATED SEDIMENTS. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA.

2. PERFORM MAINTENANCE MOWING OF POND GRASSES AT LEAST TWICE EACH YEAR. GRASSES SUCH AS TALL FESCUE SHOULD BE MOWED IN EARLY SUMMER AFTER EMERGENCE OF THE HEADS ON COOL SEASON GRASSES AND IN LATE FALL TO PREVENT SEEDS OF ANNUAL WEEDS FROM MATURING. MOWING OF LEGUMES CAN BE LESS FREQUENT. TREES, SHRUBS AND WOODY VEGETATION ARE NOT BE PERMITTED TO GROW ALONG OR ON ANY PART OF THE EMBANKMENT EMBANKMENT THAT WAS CONSTRUCTED USING ENGINEERED (COMPACTED) FILLS.

3. PERFORM SOIL SAMPLING ON STABILIZED POND SOIL AREAS AT LEAST ONCE EVERY 4 YEARS. SOIL SAMPLING AND TESTING SHOULD BE PERFORMED BY QUALIFIED INDEPENDENT SOIL TESTING LABORATORY SUCH AS VPI&SU. CONTACT THE LOCAL OFFICE OF THE VIRGINIA COOPERATIVE EXTENSION FOR FURTHER INFORMATIONS. APPLY ADDITIONAL LIME AND FERTILIZER IN ACCORDANCE WITH TEST RECOMMENDATIONS.

4. IN STABILIZED POND AREAS, IF VEGETATION COVERS LESS THAN 40% OF SOIL SURFACES, LIME, FERTILIZE AND SEED IN ACCORDANCE WITH RECOMMENDATIONS FOR NEW SEEDLINGS. IF VEGETATION COVERS MORE THAN 40% BUT LESS THAN 70% OF SOIL SURFACFS, LIME, FERTILIZE AND OVER SEED IN ACCORDANCE WITH CURRENT SEEDING RECOMMENDATIONS OR REQUIREMENTS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH).

5. PERFORM QUARTERLY INSPECTIONS OF THE RISER SECTION FOR THE OBSERVANCE OF COLLECTED TRASH AND DEBRIS. IMMEDIATELY REMOVE ANY TRASH OR DEBRIS THAT PREVENTS THE MOVEMENT OF WATER. REMOVE ANY TRASH AND LITTER DOWNSTREAM AND AT STORM DRAIN OR CHANNEL INFLOW LOCATIONS TO MAINTAIN THE INTEGRITY OF THE STRUCTURE.

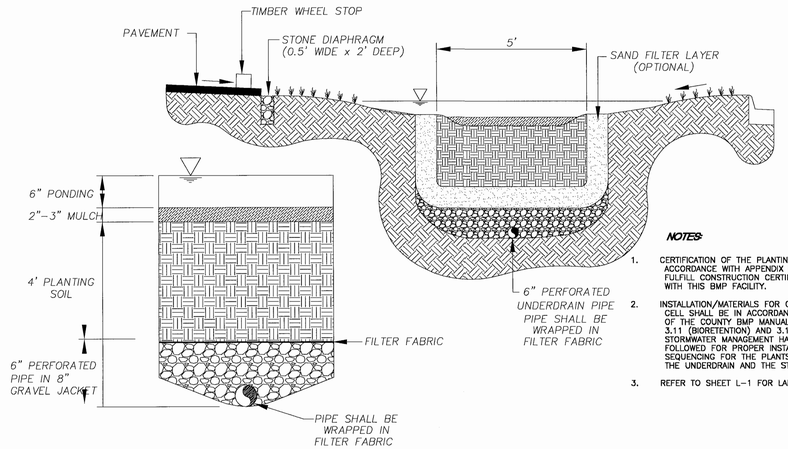
6. PERFORM ANNUAL STRUCTURAL INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE CONCRETE RISER, ANTI-VORTEX DEVICE, TRASH RACK, ORIFICES/WEIRS, OUTLET BARREL AND POND EMBANKMENT. EXPOSED METAL SURFACES SHALL BE RE-PAINTED OR RE-GALVANIZED TO MINIMIZE RUST DAMAGE OR REPLACED IF RUST DAMAGE IS IRREVERSIBLE. IF DAMAGE IS EVIDENT, FURTHER INVESTIGATION BY A QUALIFIED PROFESSIONAL MAY BE REQUIRED TO ASSESS THE INTEGRITY OF THE STRUCTURE.

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

8. PERFORM ANNUAL OBSERVATIONS OF PERIMETER AREAS SURROUNDING THE FACILITY TO ENSURE CHANGES IN LAND USE, TOPOGRAPHY OR ACCESS HAVE NOT OCCURRED AND DO NOT AFFECT THE OPERATION, MAINTENANCE, ACCESS OR SAFETY FEATURES AS PROVIDED. APPROPRIATE ACTION IS REQUIRED TO ENSURE ADEQUACY AND TO PROVIDE A CLEAR, SAFE PASSAGE FOR MAINTENANCE VEHICLES TO THE ENGINEERED EMBANKMENT AND PRINCIPAL FLOW CONTROL STRUCTURES.

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

10. THE FACILITY SHALL NOT ACCEPT ADDITIONAL DRAINAGE OR BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT OR APPROVAL BY THE ENVIRONMENTAL DIVISION OF JAMES CITY COUNTY.

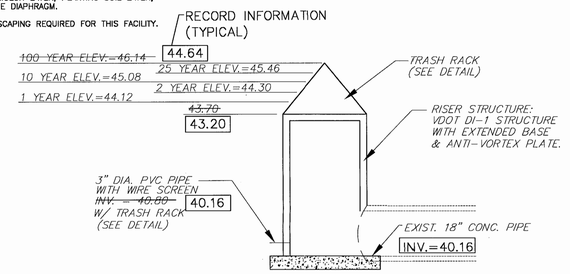


BIORETENTION BASIN SECTIONS

SCALE: NONE

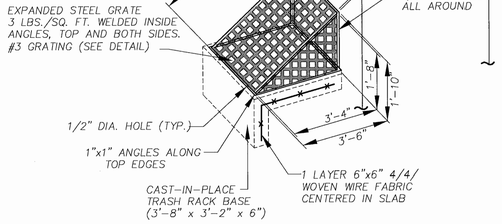
NOTES:

1. CERTIFICATION OF THE PLANTING SOIL LAYER WILL BE REQUIRED IN ACCORDANCE WITH APPENDIX E OF THE COUNTY BMP MANUAL TO FULFILL CONSTRUCTION CERTIFICATION REQUIREMENTS ASSOCIATED WITH THIS BMP FACILITY.
2. INSTALLATION/MATERIALS FOR CONSTRUCTION OF THE BIORETENTION CELL SHALL BE IN ACCORDANCE WITH GROUP D BMP REQUIREMENTS OF THE COUNTY BMP MANUAL (PAGES 48-50) AND MINIMUM STANDARDS 3.11 (BIORETENTION) AND 3.13 (PAGES 3.13-12 AND 1.3) OF THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK. THESE REFERENCES SHOULD BE FOLLOWED FOR PROPER INSTALLATION, MATERIALS AND CONSTRUCTION SEQUENCING FOR THE PLANTS, MULCH LAYER, PLANTING SOIL LAYER, THE UNDERDRAIN AND THE STONE DIAPHRAGM.
3. REFER TO SHEET L-1 FOR LANDSCAPING REQUIRED FOR THIS FACILITY.



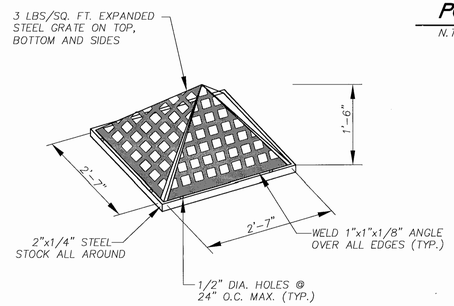
POND OUTFALL STRUCTURE

N.T.S.



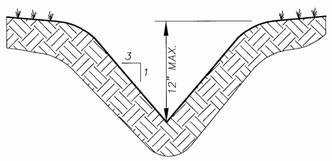
TRASH RACK DETAIL FOR LOW FLOW ORIFACE

N.T.S.



TRASH RACK DETAIL FOR DI-1

N.T.S.



TYPICAL SWALE SECTION

N.T.S.

THESE RECORD DRAWINGS ARE BASED ON AN ACTUAL FIELD SURVEY OF STORMWATER MANAGEMENT FACILITIES PERFORMED BY LANDMARK DESIGN GROUP NOVEMBER, 2007. IMPROVEMENTS SHOWN OTHER THAN STORMWATER MANAGEMENT FACILITIES, WERE TAKEN FROM THE APPROVED SITE PLAN AND WERE NOT FIELD VERIFIED.

COMMONWEALTH OF VIRGINIA
12/4/07
PETER FARRELL
LIC. No. 002036
LAND SURVEYOR

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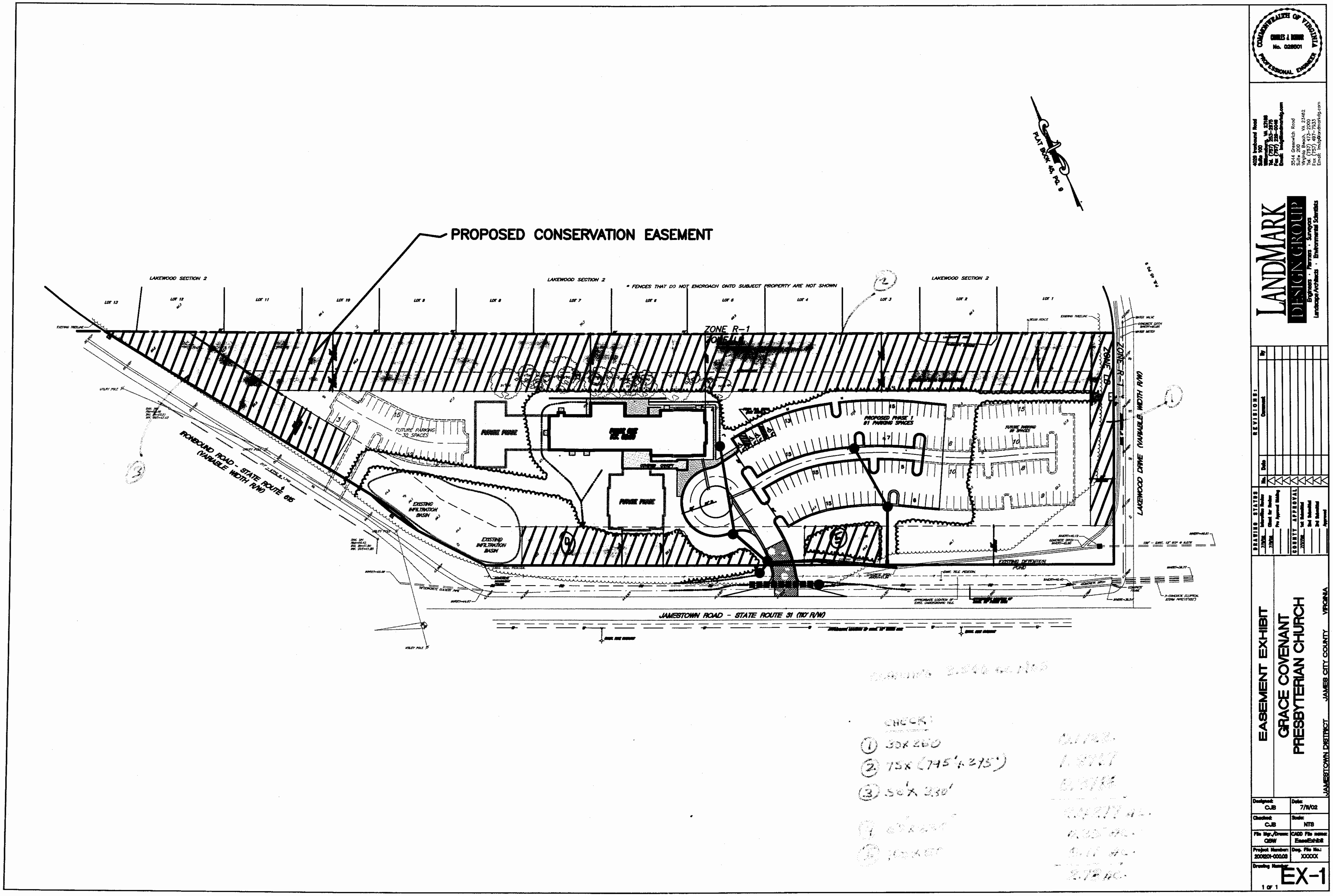
LANDMARK DESIGN GROUP
Engineers • Planners • Surveyors
Landscape Architects • Environmental Scientists

STORM SEWER RECORD DRAWING
GRACE COVENANT PRESBYTERIAN CHURCH
JAMES CITY COUNTY VIRGINIA

Designed: LMDG	Date: 12/04/07
Checked: PF	Scale: AS-NOTED
File Mgr./Drawn: AST	CADD File name: GRACE-STORM.DWG
Project Number: 2007193-000.00	Dwg. File No.: 18200W
Drawing Number: R-2	

2 OF 2

PC184_GRACE_COVENANT_PRESBYTERIAN_CHURCH - 016


PROPOSED CONSERVATION EASEMENT
LAKEWOOD SECTION 2
* FENCES THAT DO NOT ENCROACH ONTO SUBJECT PROPERTY ARE NOT SHOWN
ZONE R-1
FUTURE PARKING 30 SPACES
PROPOSED PHASE 1 81 PARKING SPACES
EXISTING INFILTRATION BASIN
EXISTING DETENTION POND
IRONBOUND ROAD - STATE ROUTE 615 (VARIABLE WIDTH R/W)
JAMESTOWN ROAD - STATE ROUTE 31 (110' R/W)
LAKEWOOD DRIVE (VARIABLE WIDTH R/W)
PLAT BOOK 48, PG. 8
LANDMARK DESIGN GROUP
Engineers · Planners · Surveyors
Landscape Architects · Environmental Scientists
EASEMENT EXHIBIT
GRACE COVENANT PRESBYTERIAN CHURCH
JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA
Designed: CJB
Date: 7/11/02
Checked: CJB
Scale: NTS
File Mgr./Drawn: QBW
CADD File name: EaseExhibit
Project Number: 200201-000.03
Dep. File No.: XXXXX
Drawing Number: EX-1
1 OF 1
CHECK:
① 30x260
② 75x(745'+375')
③ 50'x330'

LD M. PRITCHARD
NO. 4731500005

ROBERT P. PHIPPS
PARCEL NO. 4731500004

MICHAEL H. & PAULINE POLSINELLI, SR.
PARCEL NO. 4731500003

HANS J. SAILER LIVING TRUST
PARCEL NO. 4731500002

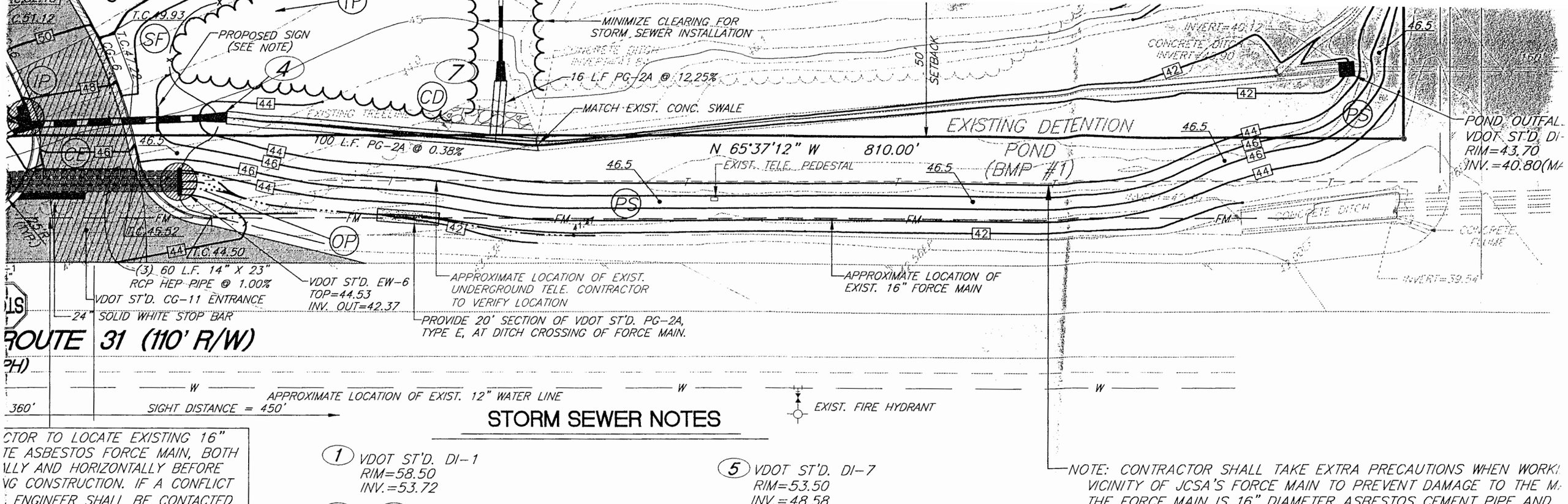
KENNETH M. JOHNSTON
PARCEL NO. 4731500001

NE R-1
NE LB

EXISTING TREELINE
WOOD FENCE
LANDSCAPE AREA
LANDSCAPE TIMBERS
50' SETBACK
25' BUFFER
SETBACK LINE
BUFFER LINE
PROPOSED LIMITS OF DISTURBANCE
MINIMIZE CLEARING FOR WATERLINE INSTALLATION
PROP. 8"x4" REDUCER
PROP. 3/4" WATER METER
PROPOSED 4" PVC WATER LINE
11-1/4° BEND
2' PARKING LOT CURB AND GUTTER (SEE DETAIL)
22-1/2° BEND
45° BEND
90° BEND
PROP. H.C. SIGNS (SEE DETAIL)
PROPOSED PHASE I
91 PARKING SPACES
BIORETENTION BASIN (BMP #3)
PROPOSED TIMBER WHEEL STOPS (SEE DETAIL)
STONE DIAPHRAGM
45 L.F. 6" PERFORATED UNDERDRAIN PIPE
(4) 4" PVC CONDUITS
VALLEY GUTTER
TEMPORARY SOIL STOCKPILE, STAGING AND EQUIPMENT STORAGE AREA TO BE SEEDED AND MULCHED UPON REMOVAL OF STOCKPILE
10'x6' UTILITY EASEMENT
PROPOSED LIMITS OF CLEARING
PROPOSED SIGN (SEE NOTE)
MINIMIZE CLEARING FOR STORM SEWER INSTALLATION
16 L.F PC-2A @ 12.25%
MATCH EXIST. CONC. SWALE
CONCRETE DITCH
INVERT=45.12
INVERT=44.00
30' SETBACK

PREVIOUS PLAN

PC184_GRACE_COVENANT_PRESBYTERIAN_CHURCH - 018



CTOR TO LOCATE EXISTING 16" TE ASBESTOS FORCE MAIN, BOTH LLY AND HORIZONTALLY BEFORE NG CONSTRUCTION. IF A CONFLICT ENGINEER SHALL BE CONTACTED ELY FOR RESOLUTION OF CONFLICT. THE PROPOSED DITCH CROSSES STING 16" FORCE MAIN, THE TOR SHALL CONFIRM THERE IS 24" ER BETWEEN THE INVERT OF THE ED DITCH AND THE CROWN OF THE AIN IN THE PRESENCE OF A NSPECTOR.

STORM SEWER NOTES

(1) VDOT ST'D. DI-1
RIM=58.50
INV.=53.72

(1) TO (2) 115 L.F.-12" RCP @ 6.50%

(2A) VDOT ST'D. EW-1 (MOD.)
TOP=60.96
INV.=58.80

(2A) TO (2) 193 L.F.-12" RCP @ 4.80%

(2) VDOT ST'D. DI-3B, L=8'
RIM=54.47
INV. IN=46.25(N)
INV. IN=49.54(W)
INV. OUT=46.25

(3) VDOT ST'D. DI-3A, L=8'
RIM=47.50

(2) TO (3) 57 L.F.-15" RCP @ 6.00%

(3) VDOT ST'D. DI-3A, L=8'
RIM=47.50
INV.=42.83

(3A) TO (3) 20 L.F.-18" RCP @ 1.65%

(3A) VDOT ST'D ES-1
INV=43.16

3 TO 4 64 L.F.-24" RCP @ 0.90%

(4) VDOT ST'D. ES-1
INV.=42.25

(5) VDOT ST'D. DI-7
RIM=53.50
INV.=48.58

(5) TO (6) 79 L.F.-12" RCP @ 3.47%

(6) VDOT ST'D. DI-3C,L=6'
RIM=51.74
INV.=45.84

(6) TO (7) 53 L.F.-15" RCP @ 3.47%

(7) VDOT ST'D. ES-1
INV.=44.00

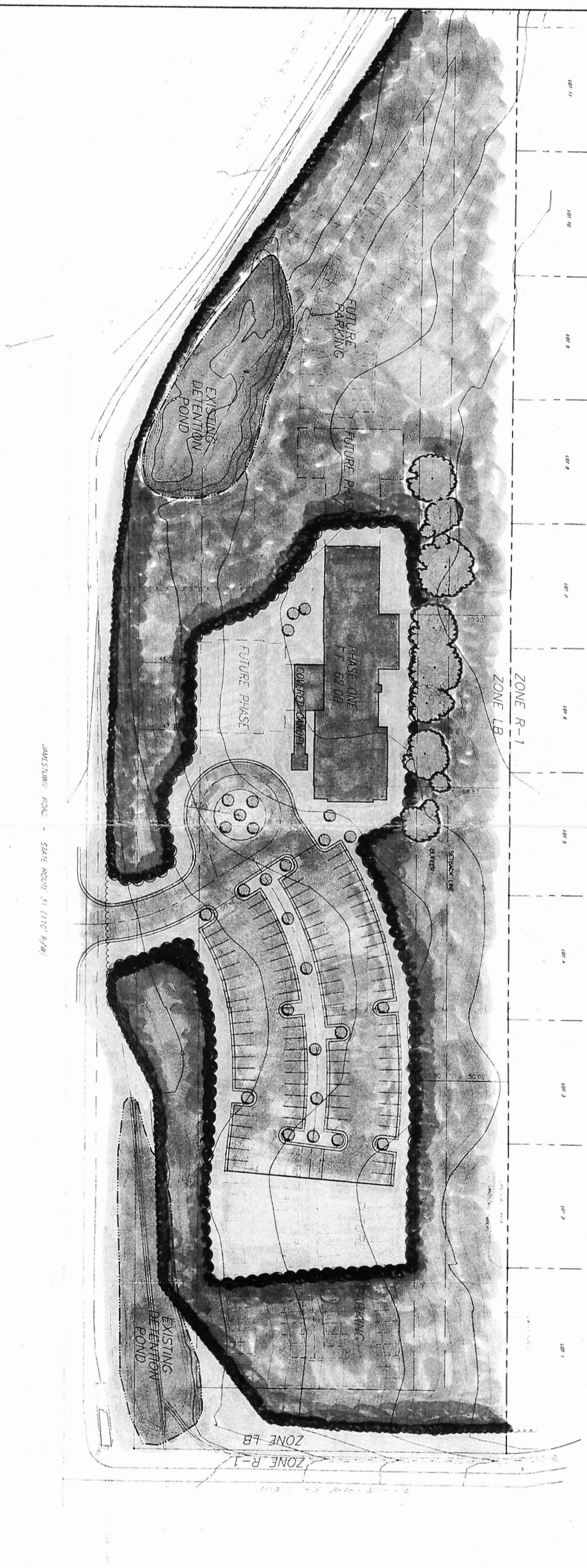
NOTE: CONTRACTOR SHALL TAKE EXTRA PRECAUTIONS WHEN WORKI VICINITY OF JCSA'S FORCE MAIN TO PREVENT DAMAGE TO THE M THE FORCE MAIN IS 16" DIAMETER ASBESTOS CEMENT PIPE AND SUSTAIN HEAVY LOADING. MATS SHALL BE USED WHEREVER EQUI MUST TRAVERSE OVER TOP OF PIPE TO PREVENT POINT LOADING.

NOTE: SIGN SHALL BE GROUND MOUNTED MONUMENT TYPE, HAVE NO MORE THAN 3 COLORS AND BE NO LARGER THAN 32 SQUARE FEET AND NOT ERECTED TO A HEIGHT GREATER THAN 8 FEET.

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)
1 inch = 30 ft.



MASTER PLAN EXHIBIT

GRACE COVENANT PRESBYTERIAN CHURCH

JAMES CITY COUNTY, VIRGINIA

DRAWING STATUS
- Interoffice Review
- Client for Review
- Pre Approval Bidding

COUNTY APPROVAL
- 1st Submittal
- 2nd Submittal
- 3rd Submittal
- Approved

REVISIONS:

No.	Date	Comment	By

Designed: CRO
Drawn: MP
Checked: CRO
Date: 11/18/01
File Mgr./Drawn: BSG
CADD File name: Exhibit.dwg
Scale: 1"=40'
Project Number: 2001201-000.03
Dwg. File No.:
Drawing Number: 1 OF 1

LANDMARK DESIGN GROUP
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Landscape Architects • Environmental Consultants

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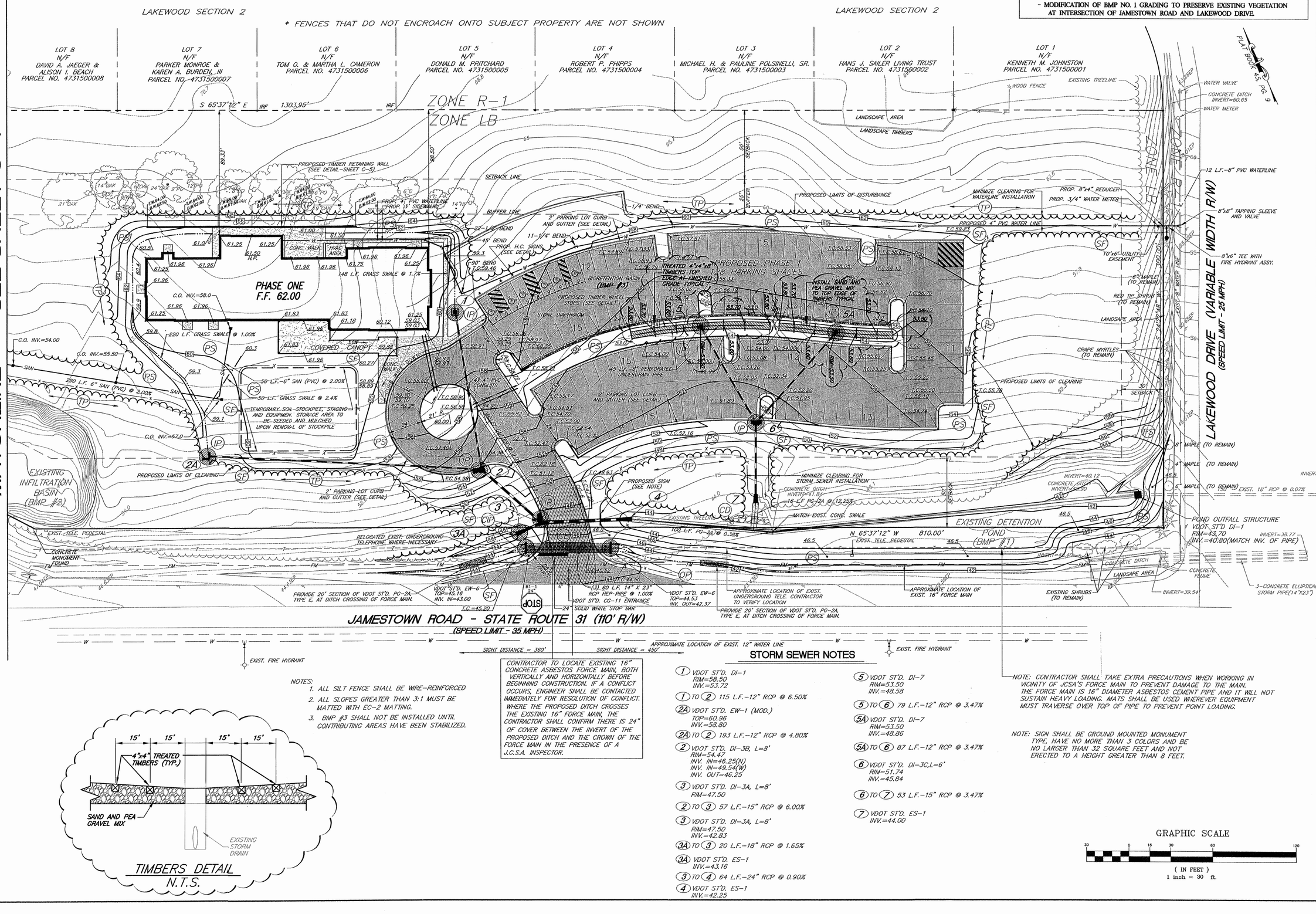
Fax (757) 497-7933
Email: lmdg@landmarkdg.com

AMENDMENT TO APPROVED PLAN NO. SP-066-02

PLAN AMENDMENT DATED OCTOBER 8, 2002 IS FOR HE FOLLOWING CHANGES ONLY:

- 50' OF CLEARING FOR ADDITIONAL PARKING AT OWNERS REQUEST.
- ADDITIONAL STORM DRAINAGE TO ACCOMODATE PARKING ADDITION.
- MODIFICATION OF BMP NO. 1 GRADING TO PRESERVE EXISTING VEGETATION AT INTERSECTION OF JAMESTOWN ROAD AND LAKEWOOD DRIVE.



NOTES:

1. ALL SILT FENCE SHALL BE WIRE-REINFORCED
2. ALL SLOPES GREATER THAN 3:1 MUST BE MATTED WITH EC-2 MATTING.
3. BMP #3 SHALL NOT BE INSTALLED UNTIL CONTRIBUTING AREAS HAVE BEEN STABILIZED.

CONTRACTOR TO LOCATE EXISTING 16" CONCRETE ASBESTOS FORCE MAIN, BOTH VERTICALLY AND HORIZONTALLY BEFORE BEGINNING CONSTRUCTION. IF A CONFLICT OCCURS, ENGINEER SHALL BE CONTACTED IMMEDIATELY FOR RESOLUTION OF CONFLICT. WHERE THE PROPOSED DITCH CROSSES THE EXISTING 16" FORCE MAIN, THE CONTRACTOR SHALL CONFIRM THERE IS 24" OF COVER BETWEEN THE INVERT OF THE PROPOSED DITCH AND THE CROWN OF THE FORCE MAIN IN THE PRESENCE OF A J.C.S.A. INSPECTOR.

STORM SEWER NOTES

1. VDOT ST'D. DI-1 RIM=58.50 INV.=53.72
2. (1) TO (2) 115 L.F.-12" RCP @ 6.50%
3. (2A) VDOT ST'D. EW-1 (MOD.) TOP=60.96 INV.=58.80
4. (2A) TO (2) 193 L.F.-12" RCP @ 4.80%
5. (2) VDOT ST'D. DI-3B, L=8' RIM=54.47 INV. IN=46.25(N) INV. IN=49.54(W) INV. OUT=46.25
6. (3) VDOT ST'D. DI-3A, L=8' RIM=47.50
7. (2) TO (3) 57 L.F.-15" RCP @ 6.00%
8. (3) VDOT ST'D. DI-3A, L=8' RIM=47.50 INV.=42.83
9. (3A) TO (3) 20 L.F.-18" RCP @ 1.65%
10. (3A) VDOT ST'D. ES-1 INV.=43.16
11. (3) TO (4) 64 L.F.-24" RCP @ 0.90%
12. (4) VDOT ST'D. ES-1 INV.=42.25
13. (5) VDOT ST'D. DI-7 RIM=53.50 INV.=48.58
14. (5) TO (6) 79 L.F.-12" RCP @ 3.47%
15. (5A) VDOT ST'D. DI-7 RIM=53.50 INV.=48.86
16. (5A) TO (6) 87 L.F.-12" RCP @ 3.47%
17. (6) VDOT ST'D. DI-3C, L=6' RIM=51.74 INV.=45.84
18. (6) TO (7) 53 L.F.-15" RCP @ 3.47%
19. (7) VDOT ST'D. ES-1 INV.=44.00

NOTE: CONTRACTOR SHALL TAKE EXTRA PRECAUTIONS WHEN WORKING IN VICINITY OF JCSA'S FORCE MAIN TO PREVENT DAMAGE TO THE MAIN. THE FORCE MAIN IS 16" DIAMETER ASBESTOS CEMENT PIPE AND IT WILL NOT SUSTAIN HEAVY LOADING. MATS SHALL BE USED WHEREVER EQUIPMENT MUST TRAVERSE OVER TOP OF PIPE TO PREVENT POINT LOADING.

NOTE: SIGN SHALL BE GROUND MOUNTED MONUMENT TYPE, HAVE NO MORE THAN 3 COLORS AND BE NO LARGER THAN 32 SQUARE FEET AND NOT ERECTED TO A HEIGHT GREATER THAN 8 FEET.

TIMBERS DETAIL
N.T.S.

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

COMMONWEALTH OF VIRGINIA
CHARLES J. BOONAR
No. 028501
21st December 2002
PROFESSIONAL ENGINEER

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Tel. (757) 473-2000
Fax (757) 497-7933
Email: img@landmarkdg.com

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

REVISIONS:

No.	Date	Comment	By
1	7/17/02	REVISED PER JCC COMMENTS	CJB
2	8/22/02	REVISED PER JCC COMMENTS	CJB
3	10/8/02	REVISED BMP #1 GRADING	CJB
4	12/10/02	REVISED PARKING LAYOUT	CJB
5	12/24/02	REVISED PER JCC COMMENTS	CSW
6	01/16/03	REVISED ADDED TIMBERS	JSC

DRAWING STATUS

4/3/02	Interoffice Review	
4/8/02	Client for Review	
	Pre Approval Blocking	

COUNTY APPROVAL

5/7/02	1st Submittal	
7/19/02	2nd Submittal	
12/10/02	3rd Submittal	
	Approved	

SITE DEVELOPMENT PLAN

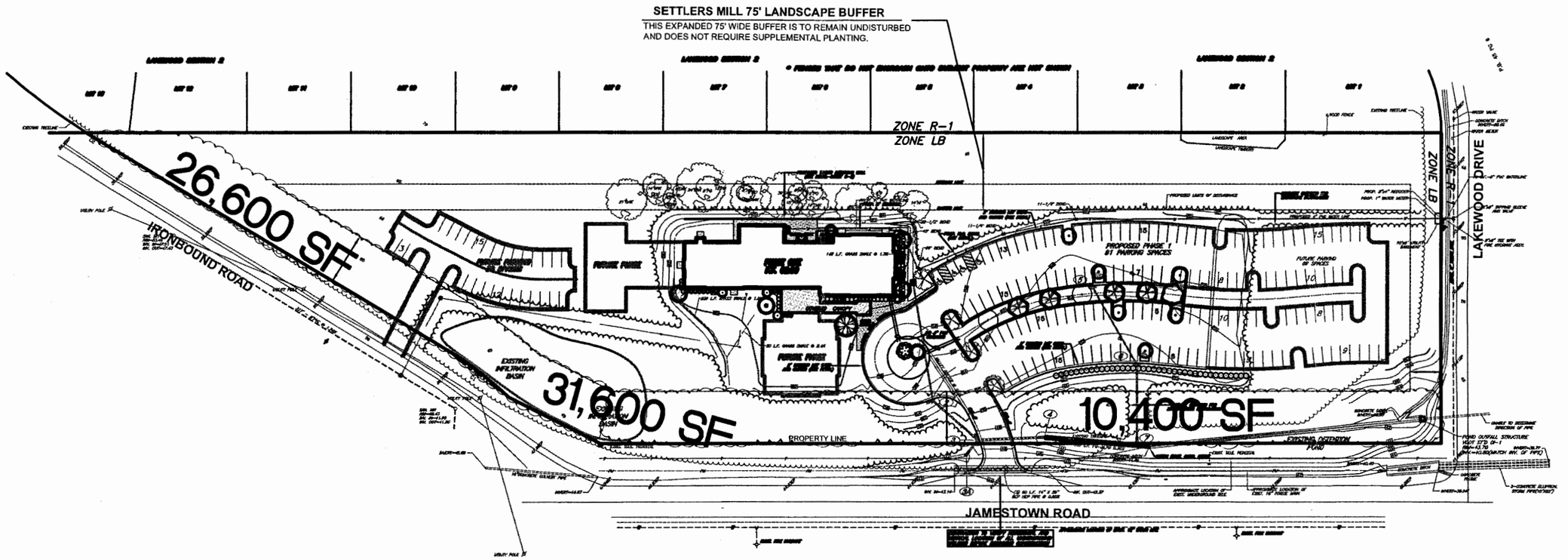
GRACE COVENANT PRESBYTERIAN CHURCH

JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA

Designed: AJR	Date: 5/7/02
Checked: CJB	Scale: 1"=30'
File Mgr./Drawn: GSW	CADD File name: sheet 3.dwg
Project Number: 200120I-000.03	Dwg. File No.: 13162 W
Drawing Number	C-3

3 OF 10

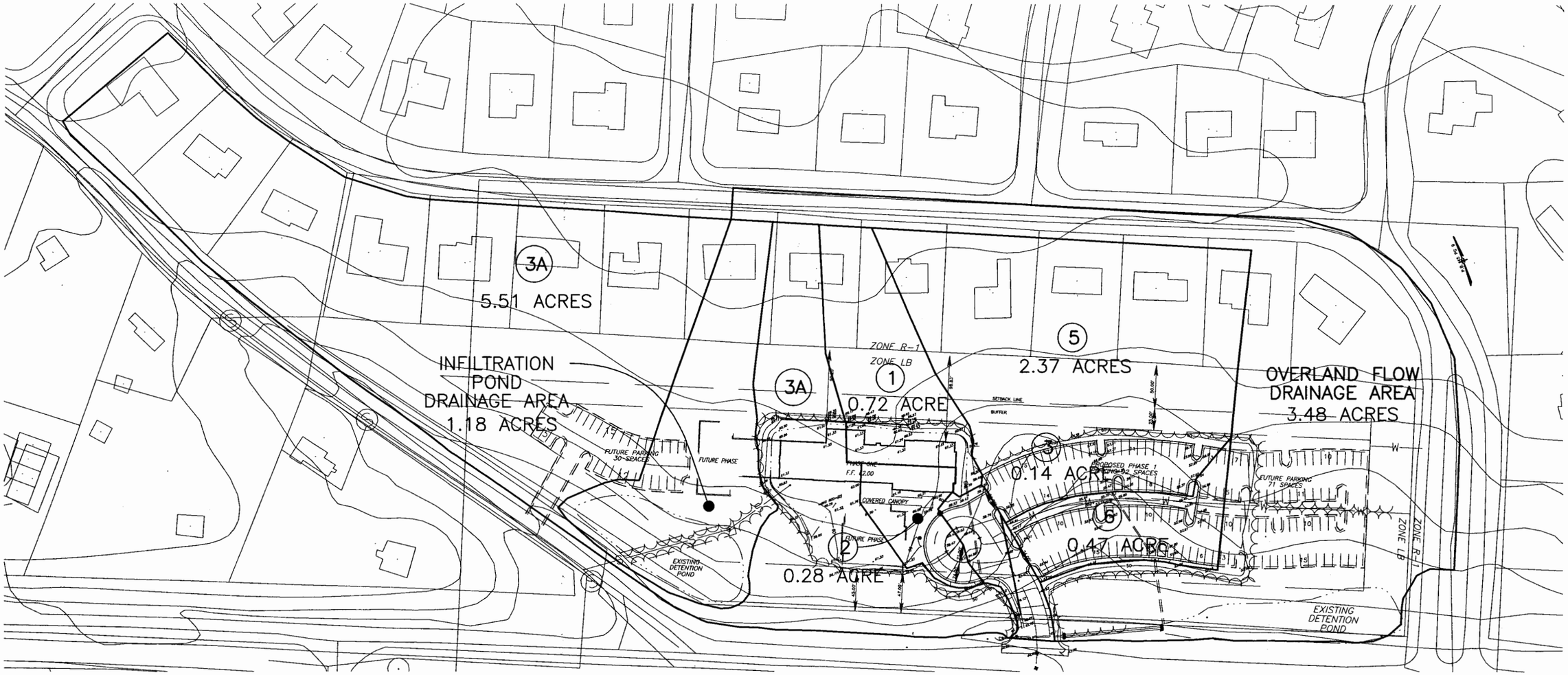
PC184_GRACE_COVENANT_PRESBYTERIAN_CHURCH - 021



RIGHT-OF-WAY AND TRANSITION BUFFER PLANTING PLAN

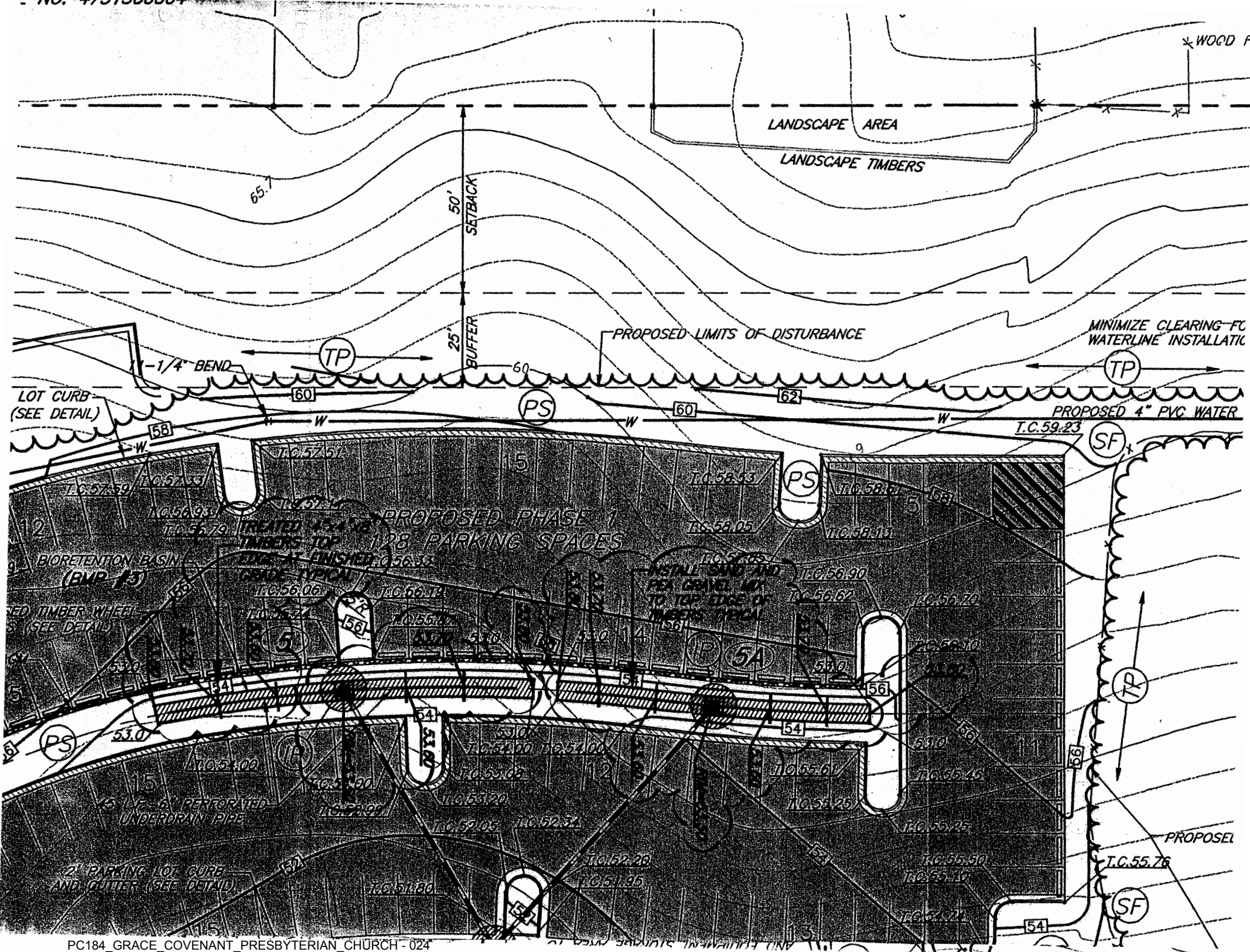
SCALE 1"=100'

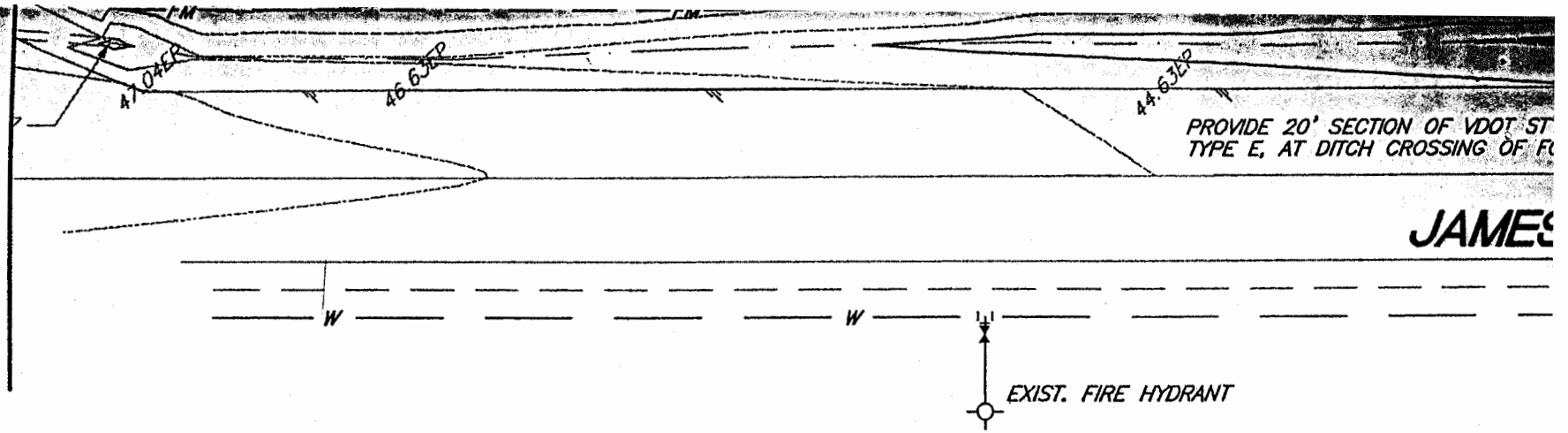
68600SF
1.57Ac.



GRACE COVENANT PRESBYTERIAN CHURCH
DRAINAGE AREA EXHIBIT

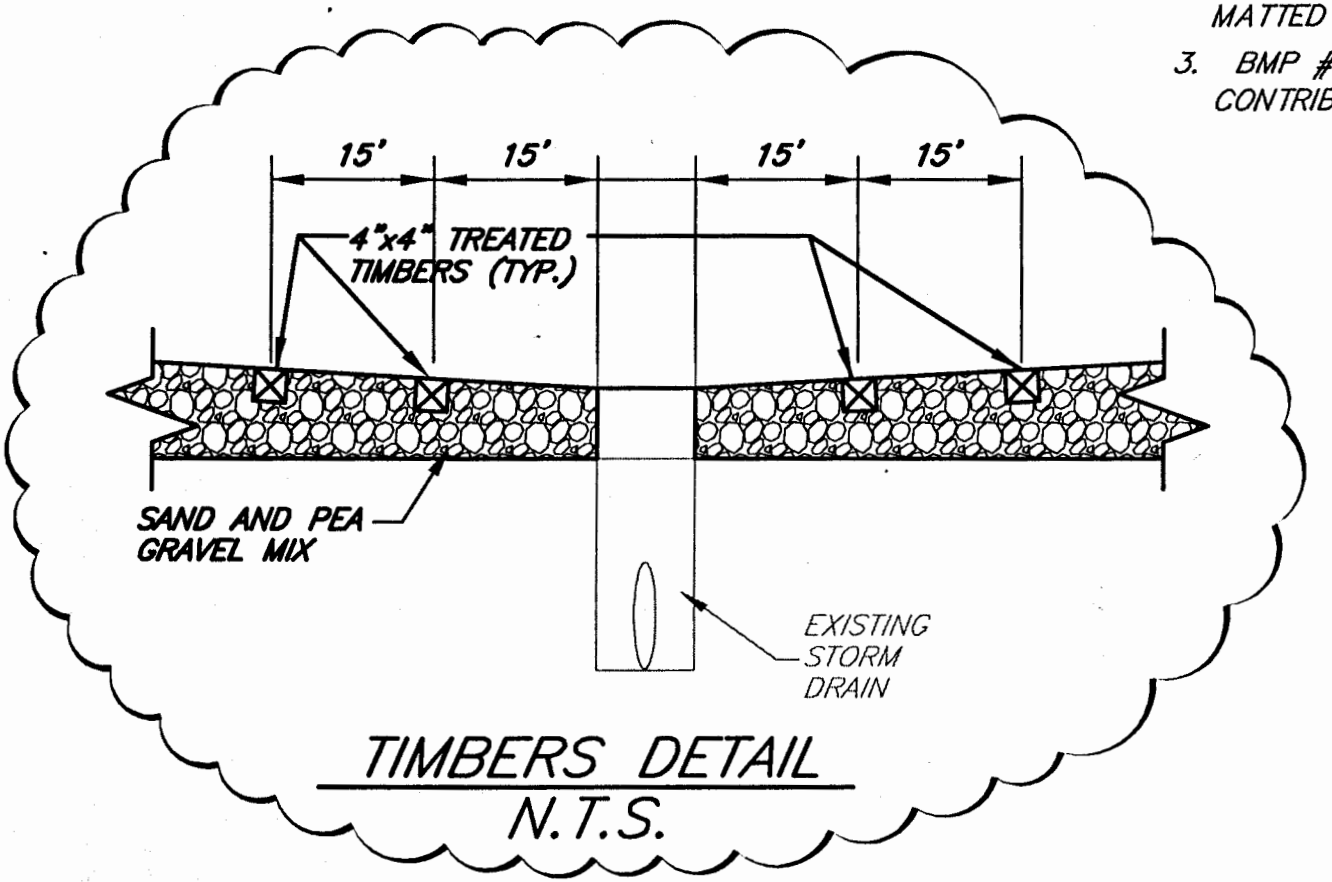
SCALE: 1" = 120' DATE: 5/9/02


LANDSCAPE AREA
LANDSCAPE TIMBERS
50' SETBACK
25' BUFFER
PROPOSED LIMITS OF DISTURBANCE
MINIMIZE CLEARING FO
WATERLINE INSTALLATIO
1-1/4" BEND
LOT CURB (SEE DETAIL)
PROPOSED 4" PVC WATER
T.C.59.23
PROPOSED PHASE 1
128 PARKING SPACES
TREATED 4"x4"x8' TIMBERS TOP EDGE AT FINISHED GRADE TYPICAL
INSTALL SAND AND PEA GRAVEL MIX TO TOP EDGE OF TIMBERS TYPICAL
BIORETENTION BASIN (BMP #3)
ED TIMBER WHEEL (SEE DETAIL)
6" PVC PERFORATED UNDERDRAIN PIPE
2' PARKING LOT CURB AND GUTTER (SEE DETAIL)
PROPOSEI
T.C.55.76



NOTES:

1. ALL SILT FENCE SH
2. ALL SLOPES GREAT
   MATTED WITH EC-2
3. BMP #3 SHALL NO
   CONTRIBUTING AREA



TIMBERS DETAIL
N.T.S.

GRACE COVENANT PRESBYTERIAN CHURCH

SP-66-02

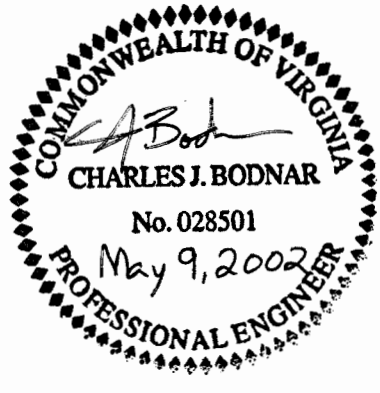
JAMESTOWN ROAD

May 9, 2002

LMDG File No. 2001201-000.03

SUPPORTING ENGINEERING DOCUMENTS

- EROSION AND SEDIMENT CONTROL NARRATIVE
- RIGHT-OF-WAY BUFFER EXHIBIT AND CALCULATION
- DRAINAGE CALCULATIONS
  - NARRATIVE
  - WEIGHTED "C" CALCULATIONS
  - TIME OF CONCENTRATION CALCULATIONS
  - PIPE SIZING AND HYDRAULIC GRADELINE CALCULATIONS
  - GUTTER SPREAD CALCULATIONS
  - BMP POINT CALCULATIONS
  - WATER QUALITY VOLUME CALCULATION
  - HYDROGRAPH SUMMARY REPORT
  - PRE-DEVELOPED HYDROGRAPHS
  - POST-DEVELOPED HYDROGRAPHS
  - EXISTING CONDITIONS ROUTED HYDROGRAPHS
  - ORIGINAL DESIGN PRE-DEVELOPED ROUTED HYDROGRAPHS
  - ORIGINAL DESIGN POST-DEVELOPED ROUTED HYDROGRAPHS
  - POST-DEVELOPED ROUTED HYDROGRAPHS
  - AES BASIN CALCULATIONS



LANDMARK DESIGN GROUP

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EROSION AND SEDIMENT CONTROL NARRATIVE

GRACE COVENANT
JAMES CITY COUNTY, VIRGINIA

EROSION AND SEDIMENT CONTROL PLAN NARRATIVE
MARCH 28, 2002

PROJECT DESCRIPTION

Grace Covenant Presbyterian Church is a proposed new 323-seat sanctuary. The site is located on the northwest corner of the Jamestown Road and Lakewood Drive intersection. The total site acreage is 7.288 acres. The site development plans depict all elements of proposed roadways, site grading, utility installations, and drainage facilities. The project site is identified as assessor's Parcel No. 1-73B, Tax Map 47-3, and is zoned LB – Limited Business.

EXISTING SITE CONDITIONS

The project limits are undeveloped and wooded with light understory. The landform in the general area is a rolling terrain with slopes varying from relatively flat to slopes of approximately 25 % to 100 % along the existing detention basin and borrow pit. Elevations within the overall project site generally range from elevation 40 to elevation 72. Drainage from the project is directed to an existing detention basin at the intersection of Jamestown Road and Lakewood Drive. This basin drains to another stormwater management facility across Lakewood Drive and ultimately drains under Jamestown Road.

SOILS

The predominant soil types which will be disturbed during construction of Grace Covenant Presbyterian Church are Craven-Uchee complex, Emporia complex, Norfolk fine sandy loam, and Slagle fine sandy loam, as depicted on soil mapping contained in the USDA - Soil Conservation Service, Soil Survey of James City and York Counties and the City of Williamsburg, Virginia.

Craven-Uchee complex consists of moderately well drained Craven soils and well-drained Uchee soils. Areas of this complex are on side slopes and narrow ridge tops. Typically, the surface layer of the Craven soils is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is pale olive fine sandy loam 5 inches thick. The subsoil extends to a depth of 42 inches. It is yellowish brown clay in the upper part and yellowish brown sandy clay loam mottled with gray in the middle and lower parts. The substratum is brownish yellow fine sandy loam mottled with gray in the upper part and gray loamy fine sand with yellow mottles in the lower part, and extends to a depth of at least 72 inches. Typically, the surface layer of the Uchee soils is dark grayish brown loamy fine sand about 5 inches thick. The subsurface layer is

light yellowish brown and very pale brown loamy fine sand 19 inches thick. The subsoil extends to a depth of 56 inches. It is strong brown sandy clay loam and clay mottled with gray and red from 36 to 56 inches. The substratum from 56 to at least 65 inches is variegated red, brown, and gray stratified sandy loam and sandy clay loam. In the Craven soils, permeability is slow: and in the Uchee soils, it is moderate in the upper part of the subsoil and moderately slow in the lower part. The available water capacity is moderate for the Craven soils and low or moderate for the Uchee soils. Surface runoff is rapid. The erosion hazard is severe. The subsoil of both soils has moderate shrink-swell potential. During winter and early spring a seasonal high water table is at a depth of 2 to 3 feet in the Craven soil and 3 ½ feet to 5 feet in the Uchee soil. This soil is in capability subclass IVe. These soils are in hydrologic soil group C and A.

Emporia complex appears on side slopes along drainageways. Typically, the surface layer of this soil is dark grayish brown fine sandy loam about 4 inches thick. The subsoil extends to a depth of 45-50 inches and is yellowish brown loam with mostly strong brown mottles in the upper parts; yellowish brown, firm sandy clay loam with strong brown and gray mottles in the middle part; and mottled gray and brown, firm sandy clay loam in the lower part. The substratum is variegated gray, brown, and red, firm sandy clay loam to a depth of at least 75 inches. In this Emporia soil, permeability is moderate in the upper part of the subsoil and moderately slow to slow in the lower part. The available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The subsoil has moderate shrink-swell potential. A perched high water table is at a depth of 3 to 4 ½ feet in winter and spring. This soil is in capability subclass VIIe. The hydrologic soil group for this soil is C.

Norfolk fine sandy loam is deep, nearly level, and well drained. It is on medium upland ridges. Typically, the surface layer of this soil is grayish brown fine sandy loam about 10 inches thick. The subsurface layer is yellowish brown fine sandy loam 7 inches thick. The subsoil extends to a depth of al least 72 inches. It is mostly yellowish brown sandy clay loam and strong brown sandy clay loam with yellowish brown mottles. Included with this soil are small areas of well drained Emporia and Kempsville soils and moderately well drained Slagle soils. The permeability of the Norfolk soil is moderate and available water capacity is moderate. The erosion hazard is moderate. The subsoil has low shrink-swell potential. This soil is in capability subclass IIe. The hydrologic soil group for this soil is B.

Slagle fine sandy loam is deep, gently sloping, and moderately well drained. It is on terraces and side slopes on the uplands. Typically, the surface layer of this soil is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is light yellowish brown fine sandy loam 5 inches thick. The subsoil extends to a depth of 50 inches. It is mostly mottled yellowish brown clay loam to a depth of 25 inches. Below this depth, the subsoil is mostly mottled clay loam and sandy clay loam. The permeability of this soil is moderate in the upper part of the subsoil and moderately slow or slow in the lower part. The available water capacity is moderate. The erosion hazard is moderate. The subsoil has moderate shrink-swell potential. A perched high water table is at a depth of 1.5 to 3 feet in the winter and spring. This soil is in capability subclass IIe. The hydrologic soil group for this soil is C.

CRITICAL EROSION AREAS

The soils identified on the site suggest a moderate erosion hazard. The areas with greater than 25% slopes are the side slopes of the existing borrow pit and the side slopes of the detention basin. As no work will be done within the existing borrow pit, and the existing detention basin will be regraded as part of this plan, no critical erosion areas are pertinent to this site.

EROSION AND SEDIMENT CONTROL MEASURES

All vegetative and structural erosion and sediment control practices will be constructed and maintained according to minimum standards and specifications of the Virginia Erosion and Sediment Control Handbook, 1992, and in accordance with James City County Standards. Detailed plans of erosion control for each phase will be prepared which will include all elements of location of all control practices.

STRUCTURAL PRACTICE:

The following control practices are anticipated for this project.

1. TEMPORARY CONSTRUCTION ENTRANCE (3.02)

   Temporary construction entrance shall be installed where shown on the plans.

2. CONSTRUCTION ROAD STABILIZATION (3.03)

   Proposed roadway areas shall receive the base course of gravel as soon as practical following grading and subbase preparation.

3. SILT FENCE (3.05)

   Silt fence shall be installed where shown on the plans.

4. STORM DRAIN INLET PROTECTION (3.07)

   Storm drain inlet protection will be installed for all drainage inlet structures.

5. TEMPORARY DIVERSION DIKE (3.09)

   Diversion dikes shall be installed where shown on the plans.

6. TEMPORARY FILL DIVERSION (3.10)

Temporary fill diversions shall be constructed at the top of all fill areas at the end of each workday as needed.

7. OUTLET PROTECTION (3.18)

Outlet protection shall be placed at all drainage outfalls.

8. TEMPORARY SEDIMENT BASIN (3.14)

Temporary sediment basins shall be installed where shown on the plans.

9. TREE PROTECTION (3.38)

Tree protection fencing or other suitable devices shall be placed along the "limits of clearing" to protect desirable trees from mechanical and other injury during land disturbing and construction activity.

VEGETATIVE PRACTICES:

1. TOPSOIL STOCKPILE

Topsoil shall be stripped from areas to be graded and stockpiled for later use. Stockpile locations shall be determined at pre-construction meeting.

2. TEMPORARY SEEDING (3.31)

All distributed areas on-site will be seeded with fast-germinating, temporary vegetation immediately following grading or where exposed soil surfaces will not be brought to final grade for a period of time exceeding 30 days. Selection of the appropriate seed mixture as recommended by the Virginia Erosion and Sediment Control Handbook, 1992 will depend on the time of year it is to be applied.

CONSTRUCTION SEQUENCE

1. Establish tree protection and clearing limits flagging.

2. Clear sufficient area for placement of construction entrance. The construction entrance shall be in place immediately (no longer than 24 hours) following clearing activities.

3. Clear sufficient areas to allow the regrading of the existing detention basin.

4. Clear sufficient areas to allow placement of perimeter silt fence and construction of perimeter diversion dikes.

5. Proceed with site clearing and grubbing operation and commence rough grading. **During this activity, temporary fill diversions, slope drains or other measures may be required.**

6. Installation of the storm drainage system shall commence as soon as practical during or following grading activities for a particular area. Preparation of the roadway subgrade and installation of sewer and water utilities may commence at this time. Storm drain inlet protection shall be required as soon as inlet structures are in place.

7. Commence installation of curbing and roadway base courses.

8. Temporary or permanent soil stabilization shall be required for all denuded lot areas.

9. During all phases of construction, the contractor shall perform daily inspection of all receiving drainage outfalls and basin outfalls for sediment transport from Grace Covenant Presbyterian Church construction. Accumulated sediment build up is to be removed and disposed of on-site after each storm event. The contractor shall be responsible for any additional sediment controls and removal of sediment caused by Grace Covenant Presbyterian Church construction. **The off-site bmp facility is not to be used for sediment control and additional controls/ clearing may be needed.**

PERMANENT STABILIZATION

All areas disturbed by grading will be stabilized with permanent seeding immediately following finish grading. Seeding will be done according to Std. and Spec. 3.32 of the Virginia erosion and Sediment Control Handbook, 1992. Permanently seeded areas shall be protected during establishment with straw mulch.

MAINTENANCE

Maintenance of temporary erosion and sediment control devices is the responsibility of the developer. In general, all erosion and sediment control measures shall be checked weekly and after each significant rainfall. The sediment basins shall be checked regularly for sediment cleanout. Silt fencing shall be inspected immediately after each rainfall and at least daily during prolonged rainfall for undermining or repair. All seeded areas shall be checked to insure a good stand of grass is maintained. Seeded areas deficient shall be reseeded as necessary.

RIGHT-OF-WAY BUFFER EXHIBIT AND CALCULATION

RIGHT-OF-WAY BUFFER CALCULATION
FOR
GRACE COVENANT CHURCH

LMDG File No. 2001201-000.03

- As Jamestown and Ironbound Roads are Community Corridor Buffers, a buffer, with an average width of 50-feet, must be preserved along these right-of-ways.
- Street frontage of 1,280 linear feet, at an average width of 50-feet, requires an area of 64,000 square feet.
- Attached drawing shows the vegetative buffer along the right-of-ways equaling 68,600 square feet. Thus, the right-of-way buffer requirement is met.

DRAINAGE CALCULATIONS

NARRATIVE

DRAINAGE NARRATIVE
FOR
GRACE COVENANT

LMDG File No. 2001201-000.03

All drainage calculations have been performed in accordance with the requirements of the Virginia Department of Transportation *Drainage Manual.*

Calculation of the weighted runoff coefficient, c, for each drainage structure is included as part of this package. A post-developed drainage area map is included at the rear of this calculation package.

Pipe sizing calculations have been performed for all new storm drainage piping within the development. All pipes have been sized to have the following minimum standards:

- Minimum velocity of 2.50 feet per second per second per the *VDOT Drainage Manual.*
- Minimum cover of 2.0 feet.

The hydraulic gradeline calculations, in accordance with the *VDOT Drainage Manual*, have been performed to show that no water will be within the pavement or grass areas during a 10-year storm event. The tailwater for each pipe system was set at the elevation of the 10-year storm rise within the stormwater management basin.

The culvert under the new entrance has been shown to be the same as the culvert under Lakewood Drive. As the AES calculations show that the culvert was designed to handle the post-developed runoff for everything draining to the culvert, and our entrance is upstream of this culvert, no calculations are provided for the adequacy of this culvert.

The Stormwater management facilities consist of two basins: an existing borrow pit (to be treated as an infiltration basin) and an extended detention basin at the corner of Jamestown Road and Lakewood Drive. Per a meeting with Mr. Scott Thomas (JCC Environmental Division), the geotechnical engineer will perform a hand auger in the bottom of the borrow pit to provide evidence that well-draining sand exists. A copy of the auger will be sent to JCC Environmental upon its completion. Per the referenced meeting, no other calculations are required for the borrow pit.

The extended detention basin at the corner of Jamestown Road and Lakewood Drive was built in conjunction with the construction of Lakewood Drive. The design calculations for this basin are included in this calculation package. From comparing the design drawings and field topographic survey, it appears that the facility was not constructed in accordance with the approved plan. It appears that the berm (between the Jamestown Road drainage ditch and the basin) was not constructed.

Hydrograph routing has been performed using the inteliSOLVE *Hydroflow* program's *Hydrographs* module. We have performed the following calculations to look at the adequacy of the basin:

1. Pre-developed hydrographs were created to determine the amount of runoff currently draining to this basin. These hydrographs were calculated using the **Rational Method.** Storm intensity (inches/hour) was determined using the constants and formula provided in the *Virginia Stormwater Management Handbook.* These hydrographs can be found in a separate section of this calculation manual.

2. Post-developed hydrographs were created to determine the amount of runoff that will drain to this basin after the development of this site. These hydrographs were calculated using the Rational Method. Storm intensity (inches/hour) was determined using the constants and formulas provided in the *Virginia Stormwater Management Handbook.* These hydrographs can be found in a separate section of this calculation manual. The post-developed time of concentration and the pre-developed time of concentration are the same as the runoff coming off Lakewood Drive is the longest time of concentration and is not affected by our development.

3. The pre-developed hydrographs were routed through the basin as constructed in the field. The 1 and 2-year storm events routed through the basin. The 10, 25 and 100-year events overflowed the basin and flooded into Jamestown Road. *Hydroflow* will not allow a routing of a basin if the hydrograph cannot be stored within the area of the basin; thus, only the 1 and 2-year routings can be found in the later section of this calculation manual.

4. We then checked the original design to ensure that it was adequate. The pre-developed hydrographs were routed through the basin as designed by AES Consulting Engineers. The routed hydrographs for the 1, 2, 10, 25 and 100-year storm events can be found in a separate section of this calculation manual. All hydrographs routed through the basin with no overflow of the top of bank of the basin.

5. The post-developed hydrographs were then routed through the designed original basin. The routed hydrographs for the 1, 2, 10, 25 and 100-year storm events can be found in a separate section of this calculation manual. All hydrographs routed through the basin with no overflow of the top of bank of the basin.

6. As part of this project, the basin will be regraded to closely match the original design basin for storage volume. This regrading is shown on the construction drawings.

7. As the original BMP was constructed prior to the enactment of the CBPA, our design must modify the existing basin to provide treatment for water quality. The calculation of the water quality volume can be found in a separate section of this calculation manual. In addition, the site must meet the 10 BMP point requirement of James City County. The calculation of the BMP points can be found in a separate section of this calculation manual.

8. In order to provide the required water quality treatment, we are modifying the basin outfall to provide the required 24-hour storage and release of the water quality volume. The outfall control structure is detailed on the plans. The routed hydrographs for the 1, 2, 10, 25 and 100-year storm events are included in a separate section of this calculation

manual. All hydrographs routed through the basin with no overflow of the top of bank of the basin.

Gutter spread calculations have been provided for all curb inlets within the development. Spread calculations have been performed in accordance with the requirements of the Virginia Department of Transportation.

WEIGHTED "C" CALCULATIONS

Subject _____

Computed _____ Checked _____

LANDMARK DESIGN GROUP

Project # _____

Client _____

Date _____ Sheet # _____

Engineers • Planners • Surveyors • Landscape Architects • Environmental Scientists

DRAINAGE AREA A

INLET No. 1 DRAINAGE AREA

AREA	COVER	C FACTOR	%	WEIGHTED C.
0.0832 Ac.	IMPERVIOUS	0.90	13.7	0.12
0.0865 Ac.	LAWN	0.30	14.3	0.04
0.4367 Ac.	WOODED	0.25	72.0	0.18
0.6064 Ac.	TOTAL		100	0.34

INLET No. 2 DRAINAGE AREA.

AREA	COVER	C-FACTOR	%	WEIGHTED C.
0.1733 Ac	IMPERVIOUS	0.90	63	0.57
0.1018 Ac.	LAWN	0.30	37	0.11
0.2751 Ac	TOTAL		100	0.68

INLET No. 3 DRAINAGE AREA

AREA	COVER	C-FACTOR	%	WEIGHTED C
.0075 Ac	LAWN	0.30	5.3	.02
.1330 Ac	IMPERVIOUS	0.90	94.7	.85
.1405 Ac.	TOTAL		100.00	.87

STRUCTURE 3A DRAINAGE AREA

AREA	COVER	C-FACTOR	%	WEIGHTED C
3.9843. Ac	WOODED	0.25	89.2	.22
0.0965 Ac	IMPERVIOUS	0.90	2.2	.02
0.3848 Ac	LAWN	0.30	8.6	.03
4.4656 Ac	TOTAL		100.0	.27

Subject _____

Computed _____ Checked _____

LANDMARK DESIGN GROUP

Project # _____

Client _____

Date _____ Sheet # _____

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INLET No. 5 DRAINAGE AREA

AREA	COVER	C-FACTOR	%	WEIGHTED C
0.3386 Ac.	IMPERVIOUS	0.90	19.2	0.17
1.3256 Ac	WOODED	0.25	75.2	0.19
0.0981 Ac.	LAWN	0.30	5.6	0.02
1.7623 Ac.	TOTAL		100.0	0.38

INLET No. 6. DRAINAGE AREA

AREA	COVER	C-FACTOR	%	WEIGHTED C
0.3577 Ac.	IMPERVIOUS	0.90	75.7	0.68
0.1148 Ac.	LAWNS	0.30	24.3	0.07
0.4725 Ac			100.0	0.75

OTHER DRAINAGE TO POND

AREA	COVER	C-FACTOR	%	WEIGHTED C
1.8147	IMPERVIOUS	0.90		
4.3233	LAWNS	0.30		
6.1380				

TOTALS AREA A

OFF-SITE	IMPERVIOUS	1.8147	Ac	} DESIGN DOES NOT ANTICIPATE FUTURE DEV
ON-SITE	IMPERVIOUS	1.1823	Ac	
TOTAL	IMPERVIOUS	2.9970	Ac.	
OFF-SITE	DR. AREA.			
ON-SITE	DR. AREA	6.2349		
TOTAL	D. AREA A.	13.8604	Ac	

Subject _____

_____

Computed _____ Checked _____

LANDMARK DESIGN GROUP

Project # _____

Client _____

Date _____ Sheet # _____

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DRAINAGE AREA B INFILTRATION POND.

ON SITE	DRAINAGE AREA	0.9694 Ac
OFF SITE	DRAINAGE AREA.	0.1280 Ac
TOTAL		1.0974 Ac.

PIPE SIZING AND HYDRAULIC GRADELINE CALCULATIONS

Project: Grace Covenant Church
Location: James City County, Virginia
Design: Al Ramsay
Date: 6-May-02
Revision:

Yr. Storm: 10

N Value: 0.013 RCP
0.012 HDPE

STORM SEWER DESIGN COMPUTATIONS

FROM PT.	TO PT.	DRAIN AREA	RUN-OFF COEFF.	C x A INCR.	C x A ACCUM.	INLET TIME	RAIN FALL	RUNOFF "Q" INCR.	RUNOFF "Q" ACCUM.	INVERT UP	INVERT LOW	LENGTH	SLOPE	PIPE DIAM.	PIPE MATR'L	VELOCITY	CAPACITY	FLOW TIME	FLOW RATIO	RIM	COVER
		acres	"C"			min.	in/hr	cfs	cfs			ft.	ft./ft.	inches		ft./sec.	cfs	min.	Qp/Qf		
5	6	2.37	0.45	1.07	1.07	10.00	5.93	6.37	6.37	47.98	44.50	87	0.0400	12	RCP	9.10	7.14	0.16	0.89	55.07	6.09
6	7	0.47	0.75	0.35	1.42	10.16	5.90	2.11	8.45	44.50	43.00	75	0.0200	15	RCP	7.46	9.16	0.17	0.92	51.74	5.99
				TIME	CONC. =	10.33															
1	2	0.72	0.35	0.25	0.25	10.00	5.93	1.50	1.50	53.72	46.25	115	0.0650	12	RCP	11.60	9.11	0.17	0.16	58.50	3.78
2	3	0.28	0.68	0.19	0.44	10.17	5.90	1.11	2.60	46.25	42.83	57	0.0600	15	RCP	12.93	15.87	0.07	0.16	54.47	6.97
3	4	0.14	0.87	0.12	2.43	10.24	5.89	0.73	14.45	42.83	42.25	64	0.0090	24	RCP	6.85	21.52	0.16	0.67	47.50	2.67
				TIME	CONC. =	10.39															
3A	3	5.51	0.34	1.87	1.87	10.00	5.93	11.20	11.20	43.16	42.83	20	0.0165	18	RCP	7.66	13.53	0.04	0.83	45.00	0.34
				TIME	CONC. =	10.04															

Project: Grace Covenant Church
Location: James City County, Virginia
Design: Al Ramsay
Date: 20-Mar-02
Revision:

HYDRAULIC GRADELINE CALCULATIONS

Yr. Storm: 10

1. Enter Tailwater Elevation (ft.) ? 7 44.92 10-YR ✓
4 44.92

2. Enter "N" value for pipe? HDPE 0.012
RCP 0.013

FROM PT.	TO PT.	Q OUT (cfs)	PIPE MATERIAL	PIPE DIA.	L OUT (ft.)	FRICTION SLOPE	DNSTREAM INVERT	V OUT (FPS)	M.H.	INLET SHAPE	Q IN (cfs)	PIPE DIA.	F.L.E.	H.G.E.
5	6	6.37	RCP	12	87	0.0323	44.50	8.11	N	Y	0.00	0	54.57	49.73 ✓
6	7	8.45	RCP	15	75	0.0172	43.00	6.88	Y	Y	6.37	12	51.24	46.43 ✓
1	2	1.50	RCP	12	115	0.0018	46.25	1.91	N	Y	0.00	0	58.00	47.26 ✓
2	3	2.60	RCP	15	57	0.0016	42.83	2.12	N	Y	1.50	12	53.97	45.47 ✓
3	4	14.45	RCP	24	64	0.0041	42.25	4.60	N	Y	2.60	15	47.50	45.34 ✓
3A	3	11.20	RCP	18	20	0.0114	42.83	6.34	N	Y	0.00	0	44.66	45.87

GUTTER SPREAD CALCULATIONS

PROJECT 2001201-000.03
HEC12 Version: V2.91 Run Date:
03-28-2002

==========
INLET NUMBER 2 LENGTH 8.0 STATION 0

DRAINAGE AREA = 0.275 ACRES C VALUE = .680 CA = 0.18
7
SUM CA= 0.187 INT= 4.00 CFS= 0.748 CO= 0.000 GUTTER FLOW=
0.748

GUTTER SLOPE = 0.0550 FT/FT PAVEMENT CROSS SLOPE = 0.0833 F
T/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.79	1.5	0.84	0.0833	1.0	0.99	2.0	0.111	0.194

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 8.1 8' ✓ EFFICIENCY= 1.00
CFS INTERCEPTED= 0.75 CFS CARRYOVER= 0.00

==========
INLET NUMBER 3 LENGTH 8.0 STATION 0

DRAINAGE AREA = 0.140 ACRES C VALUE = .870 CA = 0.12
2
SUM CA= 0.122 INT= 4.00 CFS= 0.487 CO= 0.000 GUTTER FLOW=
0.487

GUTTER SLOPE = 0.1000 FT/FT PAVEMENT CROSS SLOPE = 0.0208 F
T/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.36	1.5	1.10	0.0833	4.0	1.00	3.1	0.174	0.194

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 8.0 9' ✓ EFFICIENCY= 1.00
CFS INTERCEPTED= 0.49 CFS CARRYOVER= 0.00

□

==========
INLET NUMBER 5 LENGTH 10.0 ✓ STATION 0

DRAINAGE AREA = 1.762 ACRES C VALUE = .380 CA = 0.67
0

FOR THE FIRST SIDE
SUM CA= 0.670 INT= 4.00 CFS= 2.678 CO= 0.000 GUTTER FLOW=
2.678
FOR THE OTHER SIDE
SUM CA= 0.000 INT= 4.00 CFS= 0.000 CO= 0.000 GUTTER FLOW=
0.000
AT THE INLET

SUM CA= 0.670 INT= 4.00 CFS= 2.678 CO= 0.000 GUTTER FLOW=
2.678

GUTTER SLOPE = 0.0150 FT/FT PAVEMENT CROSS SLOPE = 0.0300 F
T/FT

SPREAD AT A SLOPE OF .015 (ft./ft.) AND 2.68 (cfs) IS 6.44 (ft.
)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 12.70 H (ft) = 0.458
DEPTH OF WATER (ft) = 0.20 SPREAD (ft) = 6.77

==========
INLET NUMBER 6 LENGTH 6.0 STATION 0

DRAINAGE AREA = 0.472 ACRES C VALUE = .750 CA = 0.35
4

FOR THE FIRST SIDE
SUM CA= 0.354 INT= 4.00 CFS= 1.416 CO= 0.000 GUTTER FLOW=

```
  1.416
FOR THE OTHER SIDE
SUM CA=   0.000 INT=  4.00  CFS=   0.000  CO=  0.000 GUTTER FLOW=
  0.000
AT THE INLET

SUM CA=   0.354 INT=  4.00  CFS=   1.416  CO=  0.000 GUTTER FLOW=
  1.416

GUTTER SLOPE = 0.0150 FT/FT       PAVEMENT CROSS SLOPE =  0.0300 F
T/FT


SPREAD AT A SLOPE OF .015 (ft./ft.) AND   1.42 (cfs) IS  4.82 (ft.
)

       XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
    P EFFEC. LENGTH (ft) =  8.70                H (ft) = 0.458
    DEPTH OF WATER (ft) =   0.17          SPREAD (ft)  =  5.70
```

BMP POINT CALCULATIONS

BMP POINT CALCULATIONS
FOR
GRACE COVENANT CHURCH

LMDG File No. 2001201-000.03

- Per boundary of site, the site area is 7.288 acres.

- Per meeting of March 8, 2002, with Scott Thomas (JCC Environmental Division), the existing borrow pit can be counted as an infiltration basin for the project. The borrow pit accepts drainage from 0.969 acres of the site, and 0.128 acres of off-site. Thus, the total drainage area served by the existing borrow pit is 1.097 acres.

BMP #2

BMP Points = $\frac{1.097}{7.288}$ x 8 = **1.20 BMP points**

- The existing dry detention basin (Part of the subdivision design) will be modified to become an extended dry detention basin. This basin will be designed to serve a site drainage area of 6.235 acres. In addition, this basin serves an off-site drainage area of 7.626 acres. Thus, the total drainage area served by this basin is 13.861 acres.

BMP #1

BMP Points = $\frac{13.861}{7.288}$ x 4 = **7.61 BMP points**

- A total of 3.566 acres of open space will remain in its natural state for this project.

BMP Points = $\frac{3.566}{7.288}$ x 100 x 0.10 = **4.89 BMP points**

- Total BMP Points for Site = 1.20 + 7.61 + 4.89 = **13.70 BMP points**

WATER QUALITY VOLUME CALCULATIONS

WATER QUALITY VOLUME CALCULATION
FOR
GRACE COVENANT CHURCH

LMDG File No. 2001201-000.03

- Per the *James City County Guidelines for Design and Construction of Stormwater Management* BMP's, an extended detention system is required to have a water quality volume equal to 1-inch (0.08 feet) times the impervious area draining to the basin.
- The impervious area draining to the existing BMP is 2.997 acres, or 130,549 square feet.
- The water quality volume required is 10,444 cubic feet (0.08 * 130549).

IMP AREA = 2.997 AC.
PLAN SP-66-02 = 1.18 AC IMPERV
FUTURE = 1.81 AC.
CN 2.997 AC. IMPERV
NEED BREAKDOWN.
VOLUME BASED ON SCS OR MUD RATIONAL NOT UNIVERSAL RAT.
SCPV

HYDROGRAPH SUMMARY REPORT

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	Manual	13.66	22	66	59,334	1	----	------	------	1-Yr. Pre-Develope
2	Manual	16.40	22	66	71,227	2	----	------	------	2-Yr. Pre-Develope
3	Manual	22.85	22	66	99,224	10	----	------	------	10-Yr. Pre-Develop
4	Manual	26.26	22	66	114,061	25	----	------	------	25-Yr. Pre-Develop
5	Manual	31.73	22	66	137,768	100	----	------	------	100-Yr. Pre-Develo
6	Manual	15.36	22	66	66,726	1	----	------	------	1-Yr. Post-Develop
7	Manual	18.45	22	66	80,111	2	----	------	------	2-Yr. Post-Develop
8	Manual	25.70	22	66	111,606	10	----	------	------	10-Yr. Post-Develo
9	Manual	29.54	22	66	128,278	25	----	------	------	25-Yr. Post-Develo
10	Manual	35.69	22	66	154,981	100	----	------	------	100-Yr. Post-Devel
11	Reservoir	9.74	22	88	59,374	1	1	42.55	5,350	1-Yr. Exist. Condi
12	Reservoir	11.19	22	88	71,447	2	2	42.95	8,128	2-Yr. Exist. Condi
13	Reservoir	6.94	22	88	59,334	1	1	42.03	18,041	Orig. 1-Yr design
14	Reservoir	7.65	22	88	71,227	2	2	42.25	22,643	Original 2-Yr desi
15	Reservoir	9.27	22	110	99,224	10	3	42.83	34,873	Orig 10-Yr. Design
16	Reservoir	10.09	22	110	114,061	25	4	43.16	41,894	Orig. 25-Yr Design
17	Reservoir	11.30	22	110	137,768	100	5	43.71	53,452	Orig 100-Yr Design
18	Reservoir	7.43	22	88	66,726	1	6	42.18	21,151	Orig. 1-Yr Post
19	Reservoir	8.16	22	110	80,111	2	7	42.42	26,237	Orig. 2-Yr Post
20	Reservoir	9.95	22	110	111,606	10	8	43.10	40,727	Orig. 10-Yr Post
21	Reservoir	10.82	22	110	128,278	25	9	43.49	48,781	Orig. 25-Yr Post
22	Reservoir	12.08	22	110	154,981	100	10	44.09	62,128	Orig. 100-Yr Post
23	Reservoir	11.02	22	88	66,726	1	6	44.27	23,950	Proposed Design 1-
24	Reservoir	11.28	22	88	80,111	2	7	44.40	26,505	Proposed Design 2-
25	Reservoir	12.28	22	88	111,606	10	8	44.92	36,646	Proposed Design 10
26	Reservoir	13.08	22	110	128,278	25	9	45.37	45,441	Proposed Design 25
27	Reservoir	14.30	22	110	154,981	100	10	46.11 OHW	59,918	Proposed Design 100

Proj. file: swmfdesign.GPW | IDF file: Norfolk.IDF | Run date: 03-28-2002

PRE-DEVELOPED HYDROGRAPHS

File: Universal Pre.xls
PROJECT: **GRACE COVENANT**
Description: **Pre-development to BMP**
Date: 26-Mar-02
Revised

LandMark Design Group
4029 Ironbound Road, Suite 100
Williamsburg, VA 23188

UNIVERSAL RATIONAL METHOD FOR HYDROGRAPH GENERATION

Drainage Area	=	13.94	Acres
Runoff Coefficient	=	0.38	
Time of Concentration	=	22.00	Min

1 Yr computed peak discharge	=	13.66	cfs
2 Yr computed peak discharge	=	16.40	cfs
10 Yr computed peak discharge	=	22.85	cfs
25 Yr computed peak discharge	=	26.26	cfs
100 Yr computed peak discharge	=	31.73	cfs

COMPUTED HYDROGRAPH VERTEX POINTS

1 Yr Fequency		2 Yr Fequency		10 Yr Frequency		25 Yr Frequency		100 Yr Frequency	
Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)
0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
22.0	2.87	22.0	3.44	22.0	4.80	22.0	5.52	22.0	6.66
44.0	4.10	44.0	4.92	44.0	6.85	44.0	7.88	44.0	9.52
66.0	13.66	66.0	16.40	66.0	22.85	66.0	26.26	66.0	31.73
88.0	7.38	88.0	8.86	88.0	12.34	88.0	14.18	88.0	17.13
110.0	5.33	110.0	6.40	110.0	8.91	110.0	10.24	110.0	12.37
132.0	3.41	132.0	4.10	132.0	5.71	132.0	6.57	132.0	7.93
154.0	2.46	154.0	2.95	154.0	4.11	154.0	4.73	154.0	5.71
176.0	2.05	176.0	2.46	176.0	3.43	176.0	3.94	176.0	4.76
198.0	1.91	198.0	2.30	198.0	3.20	198.0	3.68	198.0	4.44
220.0	1.78	220.0	2.13	220.0	2.97	220.0	3.41	220.0	4.12
242.0	0.00	242.0	0.00	242.0	0.00	242.0	0.00	242.0	0.00

EQUATIONS
I=B/(tc+D)^E B,D,E constants based on NWS Hydro 35
tp=3*tc
tb=11*tc
Qp=C*I*A

Hydrograph Report

English

Hyd. No. 1

1-Yr. Pre-Developed

Hydrograph type = Manual
Storm frequency = 1 yrs

Peak discharge = 13.66 cfs
Time interval = 22 min

Total Volume = 59,334 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)
0.37	2.87
0.73	4.10
1.10	13.66 <<
1.47	7.38
1.83	5.33
2.20	3.41
2.57	2.46
2.93	2.05
3.30	1.91
3.67	1.78

...End

Hydrograph Report

English

Hyd. No. 2

2-Yr. Pre-Developed

Hydrograph type	= Manual	Peak discharge	= 16.40 cfs
Storm frequency	= 2 yrs	Time interval	= 22 min

Total Volume = 71,227 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)
0.37	3.44
0.73	4.92
1.10	16.40 <<
1.47	8.86
1.83	6.40
2.20	4.10
2.57	2.95
2.93	2.46
3.30	2.30
3.67	2.13

...End

Hydrograph Report

English

Hyd. No. 3

10-Yr. Pre-Developed

Hydrograph type = Manual
Storm frequency = 10 yrs

Peak discharge = 22.85 cfs
Time interval = 22 min

Total Volume = 99,224 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow cfs)
0.37	4.80
0.73	6.85
1.10	22.85 <<
1.47	12.34
1.83	8.91
2.20	5.71
2.57	4.11
2.93	3.43
3.30	3.20
3.67	2.97

...End

Hydrograph Report

English

Hyd. No. 4

25-Yr. Pre-Developed

Hydrograph type = Manual
Storm frequency = 25 yrs

Peak discharge = 26.26 cfs
Time interval = 22 min

Total Volume = 114,061 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow cfs)
0.37	5.52
0.73	7.88
1.10	26.26 <<
1.47	14.18
1.83	10.24
2.20	6.57
2.57	4.73
2.93	3.94
3.30	3.68
3.67	3.41

...End

Hydrograph Report

English

Hyd. No. 5

100-Yr. Pre-Developed

Hydrograph type = Manual
Storm frequency = 100 yrs

Peak discharge = 31.73 cfs
Time interval = 22 min

Total Volume = 137,768 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow cfs)
0.37	6.66
0.73	9.52
1.10	31.73 <<
1.47	17.13
1.83	12.37
2.20	7.93
2.57	5.71
2.93	4.76
3.30	4.44
3.67	4.12

...End

POST-DEVELOPED RUNOFF HYDROGRAPHS

File: Universal Post.xls
PROJECT: **GRACE COVENANT**
Description: **Postdevelopment to BMP**

LandMark Design Group
4029 Ironbound Road, Suite 100
Williamsburg, VA 23188

Date: 26-Mar-02
Revised:

UNIVERSAL RATIONAL METHOD FOR HYDROGRAPH GENERATION

Drainage Area	=	13.86	Acres
Runoff Coefficient	=	0.43	
Time of Concentration	=	22.00	Min

SUBSTANTIATE C=0.43 FOR POST. NEW BREAKDOWN

1Yr computed peak discharge	=	15.36	cfs
2 Yr computed peak discharge	=	18.45	cfs
10 Yr computed peak discharge	=	25.70	cfs
25 Yr computed peak discharge	=	29.54	cfs
100 Yr computed peak discharge	=	35.69	cfs

COMPUTED HYDROGRAPH VERTEX POINTS

1 Yr Fequency		2 Yr Fequency		10 Yr Frequency		25 Yr Frequency		100 Yr Frequency	
Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)
0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
22.0	3.23	22.0	3.87	22.0	5.40	22.0	6.20	22.0	7.49
44.0	4.61	44.0	5.53	44.0	7.71	44.0	8.86	44.0	10.71
66.0	15.36	66.0	18.45	66.0	25.70	66.0	29.54	66.0	35.69
88.0	8.30	88.0	9.96	88.0	13.88	88.0	15.95	88.0	19.27
110.0	5.99	110.0	7.20	110.0	10.02	110.0	11.52	110.0	13.92
132.0	3.84	132.0	4.61	132.0	6.42	132.0	7.38	132.0	8.92
154.0	2.77	154.0	3.32	154.0	4.63	154.0	5.32	154.0	6.42
176.0	2.30	176.0	2.77	176.0	3.85	176.0	4.43	176.0	5.35
198.0	2.15	198.0	2.58	198.0	3.60	198.0	4.14	198.0	5.00
220.0	2.00	220.0	2.40	220.0	3.34	220.0	3.84	220.0	4.64
242.0	0.00	242.0	0.00	242.0	0.00	242.0	0.00	242.0	0.00

EQUATIONS
I=B/(tc+D)^E
tp=3*tc
tb=11*tc
Qp=C*I*A

B,D,E constants based on NWS Hydro 35

Hydrograph Report

English

Hyd. No. 6

1-Yr. Post-Developed

Hydrograph type = Manual
Storm frequency = 1 yrs

Peak discharge = 15.36 cfs
Time interval = 22 min

Total Volume = 66,726 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow cfs)
0.37	3.23
0.73	4.61
1.10	15.36 <<
1.47	8.30
1.83	5.99
2.20	3.84
2.57	2.77
2.93	2.30
3.30	2.15
3.67	2.00

...End

Hydrograph Report

English

Hyd. No. 7

2-Yr. Post-Developed

Hydrograph type = Manual
Storm frequency = 2 yrs

Peak discharge = 18.45 cfs
Time interval = 22 min

Total Volume = 80,111 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow cfs)
0.37	3.87
0.73	5.53
1.10	18.45 <<
1.47	9.96
1.83	7.20
2.20	4.61
2.57	3.32
2.93	2.77
3.30	2.58
3.67	2.40

...End

Hydrograph Report

English

Hyd. No. 8

10-Yr. Post-Developed

Hydrograph type	= Manual	Peak discharge	= 25.70 cfs
Storm frequency	= 10 yrs	Time interval	= 22 min

Total Volume = 111,606 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow cfs)
0.37	5.40
0.73	7.71
1.10	25.70 <<
1.47	13.88
1.83	10.02
2.20	6.42
2.57	4.63
2.93	3.85
3.30	3.60
3.67	3.34

...End

Hydrograph Report

English

Hyd. No. 9

25-Yr. Post-Developed

Hydrograph type = Manual
Storm frequency = 25 yrs

Peak discharge = 29.54 cfs
Time interval = 22 min

Total Volume = 128,278 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow cfs)
0.37	6.20
0.73	8.86
1.10	29.54 <<
1.47	15.95
1.83	11.52
2.20	7.38
2.57	5.32
2.93	4.43
3.30	4.14
3.67	3.84

...End

Hydrograph Report

English

Hyd. No. 10

100-Yr. Post-Developed

Hydrograph type = Manual
Storm frequency = 100 yrs

Peak discharge = 35.69 cfs
Time interval = 22 min

Total Volume = 154,981 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)
0.37	7.49
0.73	10.71
1.10	35.69 <<
1.47	19.27
1.83	13.92
2.20	8.92
2.57	6.42
2.93	5.35
3.30	5.00
3.67	4.64

...End

EXISTING CONDITIONS ROUTED HYDROGRAPHS

Hydrograph Report

English

Hyd. No. 11

1-Yr. Exist. Condition

Hydrograph type	= Reservoir	Peak discharge	= 9.74 cfs
Storm frequency	= 1 yrs	Time interval	= 22 min
Inflow hyd. No.	= 1	Reservoir name	= Existing Pond
Max. Elevation	= 42.55 ft	Max. Storage	= 5,350 cuft

Storage Indication method used.

Total Volume = 59,374 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
0.37	2.87	40.93	2.85	-----	-----	-----	-----	-----	-----	-----	2.85
0.73	4.10	41.15	3.79	-----	-----	-----	-----	-----	-----	-----	3.79
1.10	13.66 <<	42.31	8.76	-----	-----	-----	-----	-----	-----	-----	8.76
1.47	7.38	42.55 <<	9.74	-----	-----	-----	-----	-----	-----	-----	9.74 <<
1.83	5.33	42.10	7.77	-----	-----	-----	-----	-----	-----	-----	7.77
2.20	3.41	41.17	3.87	-----	-----	-----	-----	-----	-----	-----	3.87
2.57	2.46	40.84	2.38	-----	-----	-----	-----	-----	-----	-----	2.38
2.93	2.05	40.78	2.13	-----	-----	-----	-----	-----	-----	-----	2.13
3.30	1.91	40.72	1.83	-----	-----	-----	-----	-----	-----	-----	1.83
3.67	1.78	40.73	1.86	-----	-----	-----	-----	-----	-----	-----	1.86

...End

Reservoir Report

English

Reservoir No. 1 - Existing 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	40.12	01	0	0
0.88	41.00	38	17	17
1.88	42.00	2,912	1,475	1,492
2.88	43.00	11,002	6,957	8,449

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	0.0	0.0	0.0
Span in	= 18.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.12	0.00	0.00	0.00
Length ft	= 64.0	0.0	0.0	0.0
Slope %	= 0.50	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
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	40.12	0.00	---	---	---	---	---	---	---	0.00
0.09	2	40.21	0.05	---	---	---	---	---	---	---	0.05
0.18	3	40.30	0.17	---	---	---	---	---	---	---	0.17
0.26	5	40.38	0.41	---	---	---	---	---	---	---	0.41
0.35	7	40.47	0.65	---	---	---	---	---	---	---	0.65
0.44	9	40.56	1.05	---	---	---	---	---	---	---	1.05
0.53	10	40.65	1.44	---	---	---	---	---	---	---	1.44
0.62	12	40.74	1.89	---	---	---	---	---	---	---	1.89
0.70	14	40.82	2.32	---	---	---	---	---	---	---	2.32
0.79	15	40.91	2.74	---	---	---	---	---	---	---	2.74
0.88	17	41.00	3.16	---	---	---	---	---	---	---	3.16

Continues on next page...

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
0.98	165	41.10	3.55	---	---	---	---	---	---	---	3.55
1.08	312	41.20	4.02	---	---	---	---	---	---	---	4.02
1.18	460	41.30	4.42	---	---	---	---	---	---	---	4.42
1.28	607	41.40	4.71	---	---	---	---	---	---	---	4.71
1.38	755	41.50	4.97	---	---	---	---	---	---	---	4.97
1.48	902	41.60	5.00	---	---	---	---	---	---	---	5.00
1.58	1,050	41.70	5.50	---	---	---	---	---	---	---	5.50
1.68	1,197	41.80	6.15	---	---	---	---	---	---	---	6.15
1.78	1,345	41.90	6.74	---	---	---	---	---	---	---	6.74
1.88	1,492	42.00	7.28	---	---	---	---	---	---	---	7.28
1.98	2,188	42.10	7.78	---	---	---	---	---	---	---	7.78
2.08	2,884	42.20	8.25	---	---	---	---	---	---	---	8.25
2.18	3,579	42.30	8.70	---	---	---	---	---	---	---	8.70
2.28	4,275	42.40	9.13	---	---	---	---	---	---	---	9.13
2.38	4,971	42.50	9.53	---	---	---	---	---	---	---	9.53
2.48	5,666	42.60	9.92	---	---	---	---	---	---	---	9.92
2.58	6,362	42.70	10.30	---	---	---	---	---	---	---	10.30
2.68	7,058	42.80	10.66	---	---	---	---	---	---	---	10.66
2.78	7,753	42.90	11.01	---	---	---	---	---	---	---	11.01
2.88	8,449	43.00	11.35	---	---	---	---	---	---	---	11.35

...End

Hydrograph Report

English

Hyd. No. 12

2-Yr. Exist. Condition

Hydrograph type	= Reservoir	Peak discharge	= 11.19 cfs
Storm frequency	= 2 yrs	Time interval	= 22 min
Inflow hyd. No.	= 2	Reservoir name	= Existing Pond
Max. Elevation	= 42.95 ft	Max. Storage	= 8,128 cuft

Storage Indication method used.

Total Volume = 71,447 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
0.37	3.44	41.04	3.32	-----	-----	-----	-----	-----	-----	-----	3.32
0.73	4.92	41.31	4.44	-----	-----	-----	-----	-----	-----	-----	4.44
1.10	16.40 <<	42.54	9.67	-----	-----	-----	-----	-----	-----	-----	9.67
1.47	8.86	42.95	11.19	-----	-----	-----	-----	-----	-----	-----	11.19 <<
1.83	6.40	42.45	9.34	-----	-----	-----	-----	-----	-----	-----	9.34
2.20	4.10	41.83	6.32	-----	-----	-----	-----	-----	-----	-----	6.32
2.57	2.95	40.88	2.58	-----	-----	-----	-----	-----	-----	-----	2.58
2.93	2.46	40.93	2.82	-----	-----	-----	-----	-----	-----	-----	2.82
3.30	2.30	40.75	1.94	-----	-----	-----	-----	-----	-----	-----	1.94
3.67	2.13	40.86	2.49	-----	-----	-----	-----	-----	-----	-----	2.49

...End

Reservoir Report

English

Reservoir No. 1 - Existing 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	40.12	01	0	0
0.88	41.00	38	17	17
1.88	42.00	2,912	1,475	1,492
2.88	43.00	11,002	6,957	8,449

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	0.0	0.0	0.0
Span in	= 18.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.12	0.00	0.00	0.00
Length ft	= 64.0	0.0	0.0	0.0
Slope %	= 0.50	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
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	40.12	0.00	---	---	---	---	---	---	---	0.00
0.09	2	40.21	0.05	---	---	---	---	---	---	---	0.05
0.18	3	40.30	0.17	---	---	---	---	---	---	---	0.17
0.26	5	40.38	0.41	---	---	---	---	---	---	---	0.41
0.35	7	40.47	0.65	---	---	---	---	---	---	---	0.65
0.44	9	40.56	1.05	---	---	---	---	---	---	---	1.05
0.53	10	40.65	1.44	---	---	---	---	---	---	---	1.44
0.62	12	40.74	1.89	---	---	---	---	---	---	---	1.89
0.70	14	40.82	2.32	---	---	---	---	---	---	---	2.32
0.79	15	40.91	2.74	---	---	---	---	---	---	---	2.74
0.88	17	41.00	3.16	---	---	---	---	---	---	---	3.16

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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
0.98	165	41.10	3.55	---	---	---	---	---	---	---	3.55
1.08	312	41.20	4.02	---	---	---	---	---	---	---	4.02
1.18	460	41.30	4.42	---	---	---	---	---	---	---	4.42
1.28	607	41.40	4.71	---	---	---	---	---	---	---	4.71
1.38	755	41.50	4.97	---	---	---	---	---	---	---	4.97
1.48	902	41.60	5.00	---	---	---	---	---	---	---	5.00
1.58	1,050	41.70	5.50	---	---	---	---	---	---	---	5.50
1.68	1,197	41.80	6.15	---	---	---	---	---	---	---	6.15
1.78	1,345	41.90	6.74	---	---	---	---	---	---	---	6.74
1.88	1,492	42.00	7.28	---	---	---	---	---	---	---	7.28
1.98	2,188	42.10	7.78	---	---	---	---	---	---	---	7.78
2.08	2,884	42.20	8.25	---	---	---	---	---	---	---	8.25
2.18	3,579	42.30	8.70	---	---	---	---	---	---	---	8.70
2.28	4,275	42.40	9.13	---	---	---	---	---	---	---	9.13
2.38	4,971	42.50	9.53	---	---	---	---	---	---	---	9.53
2.48	5,666	42.60	9.92	---	---	---	---	---	---	---	9.92
2.58	6,362	42.70	10.30	---	---	---	---	---	---	---	10.30
2.68	7,058	42.80	10.66	---	---	---	---	---	---	---	10.66
2.78	7,753	42.90	11.01	---	---	---	---	---	---	---	11.01
2.88	8,449	43.00	11.35	---	---	---	---	---	---	---	11.35

...End

ORIGINAL DESIGN PRE-DEVELOPED ROUTED HYDROGRAPHS

Hydrograph Report

English

Hyd. No. 13

Orig. 1-Yr design

Hydrograph type	= Reservoir	Peak discharge	= 6.94 cfs
Storm frequency	= 1 yrs	Time interval	= 22 min
Inflow hyd. No.	= 1	Reservoir name	= Original Design
Max. Elevation	= 42.03 ft	Max. Storage	= 18,041 cuft

Storage Indication method used.

Total Volume = 59,334 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
0.37	2.87	40.31	0.21	-----	-----	-----	-----	-----	-----	-----	0.21
0.73	4.10	40.68	1.57	-----	-----	-----	-----	-----	-----	-----	1.57
1.10	13.66 <<	41.44	5.40	-----	-----	-----	-----	-----	-----	-----	5.40
1.47	7.38	42.03	6.94	-----	-----	-----	-----	-----	-----	-----	6.94 <<
1.83	5.33	42.00	6.82	-----	-----	-----	-----	-----	-----	-----	6.82
2.20	3.41	41.72	5.78	-----	-----	-----	-----	-----	-----	-----	5.78
2.57	2.46	41.36	5.13	-----	-----	-----	-----	-----	-----	-----	5.13
2.93	2.05	41.05	3.74	-----	-----	-----	-----	-----	-----	-----	3.74
3.30	1.91	40.87	2.73	-----	-----	-----	-----	-----	-----	-----	2.73
3.67	1.78	40.78	2.19	-----	-----	-----	-----	-----	-----	-----	2.19
4.03	0.00	40.65	1.44	-----	-----	-----	-----	-----	-----	-----	1.44
4.40	0.00	40.49	0.74	-----	-----	-----	-----	-----	-----	-----	0.74
4.77	0.00	40.41	0.49	-----	-----	-----	-----	-----	-----	-----	0.49
5.13	0.00	40.35	0.32	-----	-----	-----	-----	-----	-----	-----	0.32
5.50	0.00	40.31	0.21	-----	-----	-----	-----	-----	-----	-----	0.21
5.87	0.00	40.28	0.18	-----	-----	-----	-----	-----	-----	-----	0.18
6.23	0.00	40.26	0.15	-----	-----	-----	-----	-----	-----	-----	0.15
6.60	0.00	40.24	0.13	-----	-----	-----	-----	-----	-----	-----	0.13
6.97	0.00	40.22	0.11	-----	-----	-----	-----	-----	-----	-----	0.11
7.33	0.00	40.21	0.10	-----	-----	-----	-----	-----	-----	-----	0.10
7.70	0.00	40.19	0.08	-----	-----	-----	-----	-----	-----	-----	0.08
8.07	0.00	40.18	0.07	-----	-----	-----	-----	-----	-----	-----	0.07

...End

Reservoir Report

English

Reservoir No. 2 - Original Design

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	40.12	00	0	0
1.88	42.00	18,500	17,390	17,390
3.88	44.00	23,750	42,250	59,640
5.88	46.00	30,250	54,000	113,640

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	0.0	0.0	0.0
Span in	= 18.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.12	0.00	0.00	0.00
Length ft	= 152.0	0.0	0.0	0.0
Slope %	= 0.40	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
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	40.12	0.00	---	---	---	---	---	---	---	0.00
0.19	1,739	40.31	0.21	---	---	---	---	---	---	---	0.21
0.38	3,478	40.50	0.74	---	---	---	---	---	---	---	0.74
0.56	5,217	40.68	1.59	---	---	---	---	---	---	---	1.59
0.75	6,956	40.87	2.74	---	---	---	---	---	---	---	2.74
0.94	8,695	41.06	3.80	---	---	---	---	---	---	---	3.80
1.13	10,434	41.25	4.74	---	---	---	---	---	---	---	4.74
1.32	12,173	41.44	5.40	---	---	---	---	---	---	---	5.40
1.50	13,912	41.62	5.38	---	---	---	---	---	---	---	5.38
1.69	15,651	41.81	6.16	---	---	---	---	---	---	---	6.16
1.88	17,390	42.00	6.84	---	---	---	---	---	---	---	6.84

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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
2.08	21,615	42.20	7.50	---	---	---	---	---	---	---	7.50
2.28	25,840	42.40	8.11	---	---	---	---	---	---	---	8.11
2.48	30,065	42.60	8.67	---	---	---	---	---	---	---	8.67
2.68	34,290	42.80	9.20	---	---	---	---	---	---	---	9.20
2.88	38,515	43.00	9.70	---	---	---	---	---	---	---	9.70
3.08	42,740	43.20	10.18	---	---	---	---	---	---	---	10.18
3.28	46,965	43.40	10.64	---	---	---	---	---	---	---	10.64
3.48	51,190	43.60	11.07	---	---	---	---	---	---	---	11.07
3.68	55,415	43.80	11.49	---	---	---	---	---	---	---	11.49
3.88	59,640	44.00	11.90	---	---	---	---	---	---	---	11.90
4.08	65,040	44.20	12.29	---	---	---	---	---	---	---	12.29
4.28	70,440	44.40	12.67	---	---	---	---	---	---	---	12.67
4.48	75,840	44.60	13.04	---	---	---	---	---	---	---	13.04
4.68	81,240	44.80	13.40	---	---	---	---	---	---	---	13.40
4.88	86,640	45.00	13.74	---	---	---	---	---	---	---	13.74
5.08	92,040	45.20	14.09	---	---	---	---	---	---	---	14.09
5.28	97,440	45.40	14.42	---	---	---	---	---	---	---	14.42
5.48	102,840	45.60	14.74	---	---	---	---	---	---	---	14.74
5.68	108,240	45.80	15.06	---	---	---	---	---	---	---	15.06
5.88	113,640	46.00	15.37	---	---	---	---	---	---	---	15.37

...End

Hydrograph Report

English

Hyd. No. 14

Original 2-Yr design

Hydrograph type	= Reservoir	Peak discharge	= 7.65 cfs
Storm frequency	= 2 yrs	Time interval	= 22 min
Inflow hyd. No.	= 2	Reservoir name	= Original Design
Max. Elevation	= 42.25 ft	Max. Storage	= 22,643 cuft

Storage Indication method used.

Total Volume = 71,227 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
0.37	3.44	40.34	0.31	-----	-----	-----	-----	-----	-----	-----	0.31
0.73	4.92	40.77	2.10	-----	-----	-----	-----	-----	-----	-----	2.10
1.10	16.40 <<	41.73	5.80	-----	-----	-----	-----	-----	-----	-----	5.80
1.47	8.86	42.25	7.65	-----	-----	-----	-----	-----	-----	-----	7.65 <<
1.83	6.40	42.25	7.65	-----	-----	-----	-----	-----	-----	-----	7.65
2.20	4.10	42.11	7.21	-----	-----	-----	-----	-----	-----	-----	7.21
2.57	2.95	41.81	6.13	-----	-----	-----	-----	-----	-----	-----	6.13
2.93	2.46	41.38	5.21	-----	-----	-----	-----	-----	-----	-----	5.21
3.30	2.30	41.07	3.87	-----	-----	-----	-----	-----	-----	-----	3.87
3.67	2.13	40.91	2.93	-----	-----	-----	-----	-----	-----	-----	2.93
4.03	0.00	40.72	1.81	-----	-----	-----	-----	-----	-----	-----	1.81
4.40	0.00	40.53	0.88	-----	-----	-----	-----	-----	-----	-----	0.88
4.77	0.00	40.43	0.54	-----	-----	-----	-----	-----	-----	-----	0.54
5.13	0.00	40.36	0.36	-----	-----	-----	-----	-----	-----	-----	0.36
5.50	0.00	40.32	0.24	-----	-----	-----	-----	-----	-----	-----	0.24
5.87	0.00	40.29	0.18	-----	-----	-----	-----	-----	-----	-----	0.18
6.23	0.00	40.26	0.16	-----	-----	-----	-----	-----	-----	-----	0.16
6.60	0.00	40.24	0.13	-----	-----	-----	-----	-----	-----	-----	0.13
6.97	0.00	40.23	0.12	-----	-----	-----	-----	-----	-----	-----	0.12
7.33	0.00	40.21	0.10	-----	-----	-----	-----	-----	-----	-----	0.10
7.70	0.00	40.20	0.08	-----	-----	-----	-----	-----	-----	-----	0.08

...End

Reservoir Report

English

Reservoir No. 2 - Original Design

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	40.12	00	0	0
1.88	42.00	18,500	17,390	17,390
3.88	44.00	23,750	42,250	59,640
5.88	46.00	30,250	54,000	113,640

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	0.0	0.0	0.0
Span in	= 18.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.12	0.00	0.00	0.00
Length ft	= 152.0	0.0	0.0	0.0
Slope %	= 0.40	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
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	40.12	0.00	---	---	---	---	---	---	---	0.00
0.19	1,739	40.31	0.21	---	---	---	---	---	---	---	0.21
0.38	3,478	40.50	0.74	---	---	---	---	---	---	---	0.74
0.56	5,217	40.68	1.59	---	---	---	---	---	---	---	1.59
0.75	6,956	40.87	2.74	---	---	---	---	---	---	---	2.74
0.94	8,695	41.06	3.80	---	---	---	---	---	---	---	3.80
1.13	10,434	41.25	4.74	---	---	---	---	---	---	---	4.74
1.32	12,173	41.44	5.40	---	---	---	---	---	---	---	5.40
1.50	13,912	41.62	5.38	---	---	---	---	---	---	---	5.38
1.69	15,651	41.81	6.16	---	---	---	---	---	---	---	6.16
1.88	17,390	42.00	6.84	---	---	---	---	---	---	---	6.84

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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
2.08	21,615	42.20	7.50	---	---	---	---	---	---	---	7.50
2.28	25,840	42.40	8.11	---	---	---	---	---	---	---	8.11
2.48	30,065	42.60	8.67	---	---	---	---	---	---	---	8.67
2.68	34,290	42.80	9.20	---	---	---	---	---	---	---	9.20
2.88	38,515	43.00	9.70	---	---	---	---	---	---	---	9.70
3.08	42,740	43.20	10.18	---	---	---	---	---	---	---	10.18
3.28	46,965	43.40	10.64	---	---	---	---	---	---	---	10.64
3.48	51,190	43.60	11.07	---	---	---	---	---	---	---	11.07
3.68	55,415	43.80	11.49	---	---	---	---	---	---	---	11.49
3.88	59,640	44.00	11.90	---	---	---	---	---	---	---	11.90
4.08	65,040	44.20	12.29	---	---	---	---	---	---	---	12.29
4.28	70,440	44.40	12.67	---	---	---	---	---	---	---	12.67
4.48	75,840	44.60	13.04	---	---	---	---	---	---	---	13.04
4.68	81,240	44.80	13.40	---	---	---	---	---	---	---	13.40
4.88	86,640	45.00	13.74	---	---	---	---	---	---	---	13.74
5.08	92,040	45.20	14.09	---	---	---	---	---	---	---	14.09
5.28	97,440	45.40	14.42	---	---	---	---	---	---	---	14.42
5.48	102,840	45.60	14.74	---	---	---	---	---	---	---	14.74
5.68	108,240	45.80	15.06	---	---	---	---	---	---	---	15.06
5.88	113,640	46.00	15.37	---	---	---	---	---	---	---	15.37

...End

Hydrograph Report

English

Hyd. No. 15

Orig 10-Yr. Design

Hydrograph type	= Reservoir	Peak discharge	= 9.27 cfs
Storm frequency	= 10 yrs	Time interval	= 22 min
Inflow hyd. No.	= 3	Reservoir name	= Original Design
Max. Elevation	= 42.83 ft	Max. Storage	= 34,873 cuft

Storage Indication method used.

Total Volume = 99,224 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
0.37	4.80	40.42	0.54	-----	-----	-----	-----	-----	-----	-----	0.54
0.73	6.85	40.98	3.34	-----	-----	-----	-----	-----	-----	-----	3.34
1.10	22.85 <<	42.15	7.33	-----	-----	-----	-----	-----	-----	-----	7.33
1.47	12.34	42.74	9.03	-----	-----	-----	-----	-----	-----	-----	9.03
1.83	8.91	42.83	9.27	-----	-----	-----	-----	-----	-----	-----	9.27 <<
2.20	5.71	42.71	8.98	-----	-----	-----	-----	-----	-----	-----	8.98
2.57	4.11	42.48	8.34	-----	-----	-----	-----	-----	-----	-----	8.34
2.93	3.43	42.22	7.56	-----	-----	-----	-----	-----	-----	-----	7.56
3.30	3.20	41.96	6.69	-----	-----	-----	-----	-----	-----	-----	6.69
3.67	2.97	41.43	5.39	-----	-----	-----	-----	-----	-----	-----	5.39
4.03	0.00	41.08	3.92	-----	-----	-----	-----	-----	-----	-----	3.92
4.40	0.00	40.69	1.62	-----	-----	-----	-----	-----	-----	-----	1.62
4.77	0.00	40.51	0.82	-----	-----	-----	-----	-----	-----	-----	0.82
5.13	0.00	40.42	0.52	-----	-----	-----	-----	-----	-----	-----	0.52
5.50	0.00	40.36	0.34	-----	-----	-----	-----	-----	-----	-----	0.34
5.87	0.00	40.32	0.23	-----	-----	-----	-----	-----	-----	-----	0.23
6.23	0.00	40.29	0.18	-----	-----	-----	-----	-----	-----	-----	0.18
6.60	0.00	40.26	0.16	-----	-----	-----	-----	-----	-----	-----	0.16
6.97	0.00	40.24	0.13	-----	-----	-----	-----	-----	-----	-----	0.13
7.33	0.00	40.22	0.11	-----	-----	-----	-----	-----	-----	-----	0.11
7.70	0.00	40.21	0.10	-----	-----	-----	-----	-----	-----	-----	0.10

...End

Reservoir Report

English

Reservoir No. 2 - Original Design

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	40.12	00	0	0
1.88	42.00	18,500	17,390	17,390
3.88	44.00	23,750	42,250	59,640
5.88	46.00	30,250	54,000	113,640

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	0.0	0.0	0.0
Span in	= 18.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.12	0.00	0.00	0.00
Length ft	= 152.0	0.0	0.0	0.0
Slope %	= 0.40	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
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	40.12	0.00	---	---	---	---	---	---	---	0.00
0.19	1,739	40.31	0.21	---	---	---	---	---	---	---	0.21
0.38	3,478	40.50	0.74	---	---	---	---	---	---	---	0.74
0.56	5,217	40.68	1.59	---	---	---	---	---	---	---	1.59
0.75	6,956	40.87	2.74	---	---	---	---	---	---	---	2.74
0.94	8,695	41.06	3.80	---	---	---	---	---	---	---	3.80
1.13	10,434	41.25	4.74	---	---	---	---	---	---	---	4.74
1.32	12,173	41.44	5.40	---	---	---	---	---	---	---	5.40
1.50	13,912	41.62	5.38	---	---	---	---	---	---	---	5.38
1.69	15,651	41.81	6.16	---	---	---	---	---	---	---	6.16
1.88	17,390	42.00	6.84	---	---	---	---	---	---	---	6.84

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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
2.08	21,615	42.20	7.50	---	---	---	---	---	---	---	7.50
2.28	25,840	42.40	8.11	---	---	---	---	---	---	---	8.11
2.48	30,065	42.60	8.67	---	---	---	---	---	---	---	8.67
2.68	34,290	42.80	9.20	---	---	---	---	---	---	---	9.20
2.88	38,515	43.00	9.70	---	---	---	---	---	---	---	9.70
3.08	42,740	43.20	10.18	---	---	---	---	---	---	---	10.18
3.28	46,965	43.40	10.64	---	---	---	---	---	---	---	10.64
3.48	51,190	43.60	11.07	---	---	---	---	---	---	---	11.07
3.68	55,415	43.80	11.49	---	---	---	---	---	---	---	11.49
3.88	59,640	44.00	11.90	---	---	---	---	---	---	---	11.90
4.08	65,040	44.20	12.29	---	---	---	---	---	---	---	12.29
4.28	70,440	44.40	12.67	---	---	---	---	---	---	---	12.67
4.48	75,840	44.60	13.04	---	---	---	---	---	---	---	13.04
4.68	81,240	44.80	13.40	---	---	---	---	---	---	---	13.40
4.88	86,640	45.00	13.74	---	---	---	---	---	---	---	13.74
5.08	92,040	45.20	14.09	---	---	---	---	---	---	---	14.09
5.28	97,440	45.40	14.42	---	---	---	---	---	---	---	14.42
5.48	102,840	45.60	14.74	---	---	---	---	---	---	---	14.74
5.68	108,240	45.80	15.06	---	---	---	---	---	---	---	15.06
5.88	113,640	46.00	15.37	---	---	---	---	---	---	---	15.37

...End

Hydrograph Report

English

Hyd. No. 16

Orig. 25-Yr Design

Hydrograph type	= Reservoir	Peak discharge	= 10.09 cfs
Storm frequency	= 25 yrs	Time interval	= 22 min
Inflow hyd. No.	= 4	Reservoir name	= Original Design
Max. Elevation	= 43.16 ft	Max. Storage	= 41,894 cuft

Storage Indication method used.

Total Volume = 114,061 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
0.37	5.52	40.47	0.66	-----	-----	-----	-----	-----	-----	-----	0.66
0.73	7.88	41.09	3.97	-----	-----	-----	-----	-----	-----	-----	3.97
1.10	26.26 <<	42.30	7.81	-----	-----	-----	-----	-----	-----	-----	7.81
1.47	14.18	43.02	9.74	-----	-----	-----	-----	-----	-----	-----	9.74
1.83	10.24	43.16 <<	10.09	-----	-----	-----	-----	-----	-----	-----	10.09 <<
2.20	6.57	43.06	9.85	-----	-----	-----	-----	-----	-----	-----	9.85
2.57	4.73	42.82	9.25	-----	-----	-----	-----	-----	-----	-----	9.25
2.93	3.94	42.54	8.49	-----	-----	-----	-----	-----	-----	-----	8.49
3.30	3.68	42.27	7.71	-----	-----	-----	-----	-----	-----	-----	7.71
3.67	3.41	42.03	6.94	-----	-----	-----	-----	-----	-----	-----	6.94
4.03	0.00	41.43	5.39	-----	-----	-----	-----	-----	-----	-----	5.39
4.40	0.00	40.86	2.66	-----	-----	-----	-----	-----	-----	-----	2.66
4.77	0.00	40.59	1.16	-----	-----	-----	-----	-----	-----	-----	1.16
5.13	0.00	40.46	0.64	-----	-----	-----	-----	-----	-----	-----	0.64
5.50	0.00	40.38	0.42	-----	-----	-----	-----	-----	-----	-----	0.42
5.87	0.00	40.33	0.28	-----	-----	-----	-----	-----	-----	-----	0.28
6.23	0.00	40.30	0.20	-----	-----	-----	-----	-----	-----	-----	0.20
6.60	0.00	40.27	0.17	-----	-----	-----	-----	-----	-----	-----	0.17
6.97	0.00	40.25	0.14	-----	-----	-----	-----	-----	-----	-----	0.14
7.33	0.00	40.23	0.12	-----	-----	-----	-----	-----	-----	-----	0.12
7.70	0.00	40.22	0.11	-----	-----	-----	-----	-----	-----	-----	0.11

...End

Reservoir Report

English

Reservoir No. 2 - Original Design

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	40.12	00	0	0
1.88	42.00	18,500	17,390	17,390
3.88	44.00	23,750	42,250	59,640
5.88	46.00	30,250	54,000	113,640

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	0.0	0.0	0.0
Span in	= 18.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.12	0.00	0.00	0.00
Length ft	= 152.0	0.0	0.0	0.0
Slope %	= 0.40	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
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	40.12	0.00	---	---	---	---	---	---	---	0.00
0.19	1,739	40.31	0.21	---	---	---	---	---	---	---	0.21
0.38	3,478	40.50	0.74	---	---	---	---	---	---	---	0.74
0.56	5,217	40.68	1.59	---	---	---	---	---	---	---	1.59
0.75	6,956	40.87	2.74	---	---	---	---	---	---	---	2.74
0.94	8,695	41.06	3.80	---	---	---	---	---	---	---	3.80
1.13	10,434	41.25	4.74	---	---	---	---	---	---	---	4.74
1.32	12,173	41.44	5.40	---	---	---	---	---	---	---	5.40
1.50	13,912	41.62	5.38	---	---	---	---	---	---	---	5.38
1.69	15,651	41.81	6.16	---	---	---	---	---	---	---	6.16
1.88	17,390	42.00	6.84	---	---	---	---	---	---	---	6.84

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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
2.08	21,615	42.20	7.50	---	---	---	---	---	---	---	7.50
2.28	25,840	42.40	8.11	---	---	---	---	---	---	---	8.11
2.48	30,065	42.60	8.67	---	---	---	---	---	---	---	8.67
2.68	34,290	42.80	9.20	---	---	---	---	---	---	---	9.20
2.88	38,515	43.00	9.70	---	---	---	---	---	---	---	9.70
3.08	42,740	43.20	10.18	---	---	---	---	---	---	---	10.18
3.28	46,965	43.40	10.64	---	---	---	---	---	---	---	10.64
3.48	51,190	43.60	11.07	---	---	---	---	---	---	---	11.07
3.68	55,415	43.80	11.49	---	---	---	---	---	---	---	11.49
3.88	59,640	44.00	11.90	---	---	---	---	---	---	---	11.90
4.08	65,040	44.20	12.29	---	---	---	---	---	---	---	12.29
4.28	70,440	44.40	12.67	---	---	---	---	---	---	---	12.67
4.48	75,840	44.60	13.04	---	---	---	---	---	---	---	13.04
4.68	81,240	44.80	13.40	---	---	---	---	---	---	---	13.40
4.88	86,640	45.00	13.74	---	---	---	---	---	---	---	13.74
5.08	92,040	45.20	14.09	---	---	---	---	---	---	---	14.09
5.28	97,440	45.40	14.42	---	---	---	---	---	---	---	14.42
5.48	102,840	45.60	14.74	---	---	---	---	---	---	---	14.74
5.68	108,240	45.80	15.06	---	---	---	---	---	---	---	15.06
5.88	113,640	46.00	15.37	---	---	---	---	---	---	---	15.37

...End

Hydrograph Report

English

Hyd. No. 17

Orig 100-Yr Design

Hydrograph type	= Reservoir	Peak discharge	= 11.30 cfs
Storm frequency	= 100 yrs	Time interval	= 22 min
Inflow hyd. No.	= 5	Reservoir name	= Original Design
Max. Elevation	= 43.71 ft	Max. Storage	= 53,452 cuft

Storage Indication method used.

Total Volume = 137,768 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
0.37	6.66	40.53	0.90	-----	-----	-----	-----	-----	-----	-----	0.90
0.73	9.52	41.28	4.84	-----	-----	-----	-----	-----	-----	-----	4.84
1.10	31.73 <<	42.55	8.54	-----	-----	-----	-----	-----	-----	-----	8.54
1.47	17.13	43.48	10.80	-----	-----	-----	-----	-----	-----	-----	10.80
1.83	12.37	43.71	11.30	-----	-----	-----	-----	-----	-----	-----	11.30 <<
2.20	7.93	43.64	11.16	-----	-----	-----	-----	-----	-----	-----	11.16
2.57	5.71	43.39	10.60	-----	-----	-----	-----	-----	-----	-----	10.60
2.93	4.76	43.07	9.88	-----	-----	-----	-----	-----	-----	-----	9.88
3.30	4.44	42.77	9.12	-----	-----	-----	-----	-----	-----	-----	9.12
3.67	4.12	42.49	8.36	-----	-----	-----	-----	-----	-----	-----	8.36
4.03	0.00	42.13	7.27	-----	-----	-----	-----	-----	-----	-----	7.27
4.40	0.00	41.40	5.27	-----	-----	-----	-----	-----	-----	-----	5.27
4.77	0.00	40.84	2.56	-----	-----	-----	-----	-----	-----	-----	2.56
5.13	0.00	40.58	1.12	-----	-----	-----	-----	-----	-----	-----	1.12
5.50	0.00	40.45	0.63	-----	-----	-----	-----	-----	-----	-----	0.63
5.87	0.00	40.38	0.41	-----	-----	-----	-----	-----	-----	-----	0.41
6.23	0.00	40.33	0.27	-----	-----	-----	-----	-----	-----	-----	0.27
6.60	0.00	40.30	0.19	-----	-----	-----	-----	-----	-----	-----	0.19
6.97	0.00	40.27	0.17	-----	-----	-----	-----	-----	-----	-----	0.17
7.33	0.00	40.25	0.14	-----	-----	-----	-----	-----	-----	-----	0.14
7.70	0.00	40.23	0.12	-----	-----	-----	-----	-----	-----	-----	0.12

...End

Reservoir Report

English

Reservoir No. 2 - Original Design

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	40.12	00	0	0
1.88	42.00	18,500	17,390	17,390
3.88	44.00	23,750	42,250	59,640
5.88	46.00	30,250	54,000	113,640

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	0.0	0.0	0.0
Span in	= 18.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.12	0.00	0.00	0.00
Length ft	= 152.0	0.0	0.0	0.0
Slope %	= 0.40	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
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	40.12	0.00	---	---	---	---	---	---	---	0.00
0.19	1,739	40.31	0.21	---	---	---	---	---	---	---	0.21
0.38	3,478	40.50	0.74	---	---	---	---	---	---	---	0.74
0.56	5,217	40.68	1.59	---	---	---	---	---	---	---	1.59
0.75	6,956	40.87	2.74	---	---	---	---	---	---	---	2.74
0.94	8,695	41.06	3.80	---	---	---	---	---	---	---	3.80
1.13	10,434	41.25	4.74	---	---	---	---	---	---	---	4.74
1.32	12,173	41.44	5.40	---	---	---	---	---	---	---	5.40
1.50	13,912	41.62	5.38	---	---	---	---	---	---	---	5.38
1.69	15,651	41.81	6.16	---	---	---	---	---	---	---	6.16
1.88	17,390	42.00	6.84	---	---	---	---	---	---	---	6.84

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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
2.08	21,615	42.20	7.50	---	---	---	---	---	---	---	7.50
2.28	25,840	42.40	8.11	---	---	---	---	---	---	---	8.11
2.48	30,065	42.60	8.67	---	---	---	---	---	---	---	8.67
2.68	34,290	42.80	9.20	---	---	---	---	---	---	---	9.20
2.88	38,515	43.00	9.70	---	---	---	---	---	---	---	9.70
3.08	42,740	43.20	10.18	---	---	---	---	---	---	---	10.18
3.28	46,965	43.40	10.64	---	---	---	---	---	---	---	10.64
3.48	51,190	43.60	11.07	---	---	---	---	---	---	---	11.07
3.68	55,415	43.80	11.49	---	---	---	---	---	---	---	11.49
3.88	59,640	44.00	11.90	---	---	---	---	---	---	---	11.90
4.08	65,040	44.20	12.29	---	---	---	---	---	---	---	12.29
4.28	70,440	44.40	12.67	---	---	---	---	---	---	---	12.67
4.48	75,840	44.60	13.04	---	---	---	---	---	---	---	13.04
4.68	81,240	44.80	13.40	---	---	---	---	---	---	---	13.40
4.88	86,640	45.00	13.74	---	---	---	---	---	---	---	13.74
5.08	92,040	45.20	14.09	---	---	---	---	---	---	---	14.09
5.28	97,440	45.40	14.42	---	---	---	---	---	---	---	14.42
5.48	102,840	45.60	14.74	---	---	---	---	---	---	---	14.74
5.68	108,240	45.80	15.06	---	---	---	---	---	---	---	15.06
5.88	113,640	46.00	15.37	---	---	---	---	---	---	---	15.37

...End

ORIGINAL DESIGN POST-DEVELOPED ROUTED HYDROGRAPHS

Hydrograph Report

English

Hyd. No. 18

Orig. 1-Yr Post

Hydrograph type	= Reservoir	Peak discharge	= 7.43 cfs
Storm frequency	= 1 yrs	Time interval	= 22 min
Inflow hyd. No.	= 6	Reservoir name	= Original Design
Max. Elevation	= 42.18 ft	Max. Storage	= 21,151 cuft

Storage Indication method used.

Total Volume = 66,726 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
0.37	3.23	40.33	0.27	-----	-----	-----	-----	-----	-----	-----	0.27
0.73	4.61	40.74	1.91	-----	-----	-----	-----	-----	-----	-----	1.91
1.10	15.36 <<	41.64	5.43	-----	-----	-----	-----	-----	-----	-----	5.43
1.47	8.30	42.18 <<	7.43	-----	-----	-----	-----	-----	-----	-----	7.43 <<
1.83	5.99	42.16	7.38	-----	-----	-----	-----	-----	-----	-----	7.38
2.20	3.84	42.02	6.92	-----	-----	-----	-----	-----	-----	-----	6.92
2.57	2.77	41.64	5.45	-----	-----	-----	-----	-----	-----	-----	5.45
2.93	2.30	41.27	4.82	-----	-----	-----	-----	-----	-----	-----	4.82
3.30	2.15	41.00	3.45	-----	-----	-----	-----	-----	-----	-----	3.45
3.67	2.00	40.86	2.65	-----	-----	-----	-----	-----	-----	-----	2.65
4.03	0.00	40.69	1.65	-----	-----	-----	-----	-----	-----	-----	1.65
4.40	0.00	40.52	0.84	-----	-----	-----	-----	-----	-----	-----	0.84
4.77	0.00	40.42	0.52	-----	-----	-----	-----	-----	-----	-----	0.52
5.13	0.00	40.36	0.35	-----	-----	-----	-----	-----	-----	-----	0.35
5.50	0.00	40.32	0.23	-----	-----	-----	-----	-----	-----	-----	0.23
5.87	0.00	40.29	0.18	-----	-----	-----	-----	-----	-----	-----	0.18
6.23	0.00	40.26	0.16	-----	-----	-----	-----	-----	-----	-----	0.16
6.60	0.00	40.24	0.13	-----	-----	-----	-----	-----	-----	-----	0.13
6.97	0.00	40.22	0.11	-----	-----	-----	-----	-----	-----	-----	0.11
7.33	0.00	40.21	0.10	-----	-----	-----	-----	-----	-----	-----	0.10
7.70	0.00	40.20	0.08	-----	-----	-----	-----	-----	-----	-----	0.08

...End

Reservoir Report

English

Reservoir No. 2 - Original Design

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	40.12	00	0	0
1.88	42.00	18,500	17,390	17,390
3.88	44.00	23,750	42,250	59,640
5.88	46.00	30,250	54,000	113,640

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	0.0	0.0	0.0
Span in	= 18.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.12	0.00	0.00	0.00
Length ft	= 152.0	0.0	0.0	0.0
Slope %	= 0.40	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
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	40.12	0.00	---	---	---	---	---	---	---	0.00
0.19	1,739	40.31	0.21	---	---	---	---	---	---	---	0.21
0.38	3,478	40.50	0.74	---	---	---	---	---	---	---	0.74
0.56	5,217	40.68	1.59	---	---	---	---	---	---	---	1.59
0.75	6,956	40.87	2.74	---	---	---	---	---	---	---	2.74
0.94	8,695	41.06	3.80	---	---	---	---	---	---	---	3.80
1.13	10,434	41.25	4.74	---	---	---	---	---	---	---	4.74
1.32	12,173	41.44	5.40	---	---	---	---	---	---	---	5.40
1.50	13,912	41.62	5.38	---	---	---	---	---	---	---	5.38
1.69	15,651	41.81	6.16	---	---	---	---	---	---	---	6.16
1.88	17,390	42.00	6.84	---	---	---	---	---	---	---	6.84

Continues on next page...

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
2.08	21,615	42.20	7.50	---	---	---	---	---	---	---	7.50
2.28	25,840	42.40	8.11	---	---	---	---	---	---	---	8.11
2.48	30,065	42.60	8.67	---	---	---	---	---	---	---	8.67
2.68	34,290	42.80	9.20	---	---	---	---	---	---	---	9.20
2.88	38,515	43.00	9.70	---	---	---	---	---	---	---	9.70
3.08	42,740	43.20	10.18	---	---	---	---	---	---	---	10.18
3.28	46,965	43.40	10.64	---	---	---	---	---	---	---	10.64
3.48	51,190	43.60	11.07	---	---	---	---	---	---	---	11.07
3.68	55,415	43.80	11.49	---	---	---	---	---	---	---	11.49
3.88	59,640	44.00	11.90	---	---	---	---	---	---	---	11.90
4.08	65,040	44.20	12.29	---	---	---	---	---	---	---	12.29
4.28	70,440	44.40	12.67	---	---	---	---	---	---	---	12.67
4.48	75,840	44.60	13.04	---	---	---	---	---	---	---	13.04
4.68	81,240	44.80	13.40	---	---	---	---	---	---	---	13.40
4.88	86,640	45.00	13.74	---	---	---	---	---	---	---	13.74
5.08	92,040	45.20	14.09	---	---	---	---	---	---	---	14.09
5.28	97,440	45.40	14.42	---	---	---	---	---	---	---	14.42
5.48	102,840	45.60	14.74	---	---	---	---	---	---	---	14.74
5.68	108,240	45.80	15.06	---	---	---	---	---	---	---	15.06
5.88	113,640	46.00	15.37	---	---	---	---	---	---	---	15.37

...End

Hydrograph Report

English

Hyd. No. 19

Orig. 2-Yr Post

Hydrograph type	= Reservoir	Peak discharge	= 8.16 cfs
Storm frequency	= 2 yrs	Time interval	= 22 min
Inflow hyd. No.	= 7	Reservoir name	= Original Design
Max. Elevation	= 42.42 ft	Max. Storage	= 26,237 cuft

Storage Indication method used.

Total Volume = 80,111 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
0.37	3.87	40.37	0.38	-----	-----	-----	-----	-----	-----	-----	0.38
0.73	5.53	40.83	2.51	-----	-----	-----	-----	-----	-----	-----	2.51
1.10	18.45 <<	41.90	6.49	-----	-----	-----	-----	-----	-----	-----	6.49
1.47	9.96	42.39	8.08	-----	-----	-----	-----	-----	-----	-----	8.08
1.83	7.20	42.42	8.16	-----	-----	-----	-----	-----	-----	-----	8.16 <<
2.20	4.61	42.29	7.77	-----	-----	-----	-----	-----	-----	-----	7.77
2.57	3.32	42.07	7.08	-----	-----	-----	-----	-----	-----	-----	7.08
2.93	2.77	41.69	5.67	-----	-----	-----	-----	-----	-----	-----	5.67
3.30	2.58	41.32	4.97	-----	-----	-----	-----	-----	-----	-----	4.97
3.67	2.40	41.05	3.74	-----	-----	-----	-----	-----	-----	-----	3.74
4.03	0.00	40.79	2.25	-----	-----	-----	-----	-----	-----	-----	2.25
4.40	0.00	40.56	1.03	-----	-----	-----	-----	-----	-----	-----	1.03
4.77	0.00	40.44	0.59	-----	-----	-----	-----	-----	-----	-----	0.59
5.13	0.00	40.37	0.39	-----	-----	-----	-----	-----	-----	-----	0.39
5.50	0.00	40.33	0.26	-----	-----	-----	-----	-----	-----	-----	0.26
5.87	0.00	40.29	0.19	-----	-----	-----	-----	-----	-----	-----	0.19
6.23	0.00	40.27	0.16	-----	-----	-----	-----	-----	-----	-----	0.16
6.60	0.00	40.25	0.14	-----	-----	-----	-----	-----	-----	-----	0.14
6.97	0.00	40.23	0.12	-----	-----	-----	-----	-----	-----	-----	0.12
7.33	0.00	40.21	0.10	-----	-----	-----	-----	-----	-----	-----	0.10
7.70	0.00	40.20	0.09	-----	-----	-----	-----	-----	-----	-----	0.09

...End

Reservoir Report

English

Reservoir No. 2 - Original Design

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	40.12	00	0	0
1.88	42.00	18,500	17,390	17,390
3.88	44.00	23,750	42,250	59,640
5.88	46.00	30,250	54,000	113,640

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	0.0	0.0	0.0
Span in	= 18.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.12	0.00	0.00	0.00
Length ft	= 152.0	0.0	0.0	0.0
Slope %	= 0.40	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
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	40.12	0.00	---	---	---	---	---	---	---	0.00
0.19	1,739	40.31	0.21	---	---	---	---	---	---	---	0.21
0.38	3,478	40.50	0.74	---	---	---	---	---	---	---	0.74
0.56	5,217	40.68	1.59	---	---	---	---	---	---	---	1.59
0.75	6,956	40.87	2.74	---	---	---	---	---	---	---	2.74
0.94	8,695	41.06	3.80	---	---	---	---	---	---	---	3.80
1.13	10,434	41.25	4.74	---	---	---	---	---	---	---	4.74
1.32	12,173	41.44	5.40	---	---	---	---	---	---	---	5.40
1.50	13,912	41.62	5.38	---	---	---	---	---	---	---	5.38
1.69	15,651	41.81	6.16	---	---	---	---	---	---	---	6.16
1.88	17,390	42.00	6.84	---	---	---	---	---	---	---	6.84

Continues on next page...

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
2.08	21,615	42.20	7.50	---	---	---	---	---	---	---	7.50
2.28	25,840	42.40	8.11	---	---	---	---	---	---	---	8.11
2.48	30,065	42.60	8.67	---	---	---	---	---	---	---	8.67
2.68	34,290	42.80	9.20	---	---	---	---	---	---	---	9.20
2.88	38,515	43.00	9.70	---	---	---	---	---	---	---	9.70
3.08	42,740	43.20	10.18	---	---	---	---	---	---	---	10.18
3.28	46,965	43.40	10.64	---	---	---	---	---	---	---	10.64
3.48	51,190	43.60	11.07	---	---	---	---	---	---	---	11.07
3.68	55,415	43.80	11.49	---	---	---	---	---	---	---	11.49
3.88	59,640	44.00	11.90	---	---	---	---	---	---	---	11.90
4.08	65,040	44.20	12.29	---	---	---	---	---	---	---	12.29
4.28	70,440	44.40	12.67	---	---	---	---	---	---	---	12.67
4.48	75,840	44.60	13.04	---	---	---	---	---	---	---	13.04
4.68	81,240	44.80	13.40	---	---	---	---	---	---	---	13.40
4.88	86,640	45.00	13.74	---	---	---	---	---	---	---	13.74
5.08	92,040	45.20	14.09	---	---	---	---	---	---	---	14.09
5.28	97,440	45.40	14.42	---	---	---	---	---	---	---	14.42
5.48	102,840	45.60	14.74	---	---	---	---	---	---	---	14.74
5.68	108,240	45.80	15.06	---	---	---	---	---	---	---	15.06
5.88	113,640	46.00	15.37	---	---	---	---	---	---	---	15.37

...End

Hydrograph Report

English

Hyd. No. 20

Orig. 10-Yr Post

Hydrograph type	= Reservoir	Peak discharge	= 9.95 cfs
Storm frequency	= 10 yrs	Time interval	= 22 min
Inflow hyd. No.	= 8	Reservoir name	= Original Design
Max. Elevation	= 43.10 ft	Max. Storage	= 40,727 cuft

Storage Indication method used.

Total Volume = 111,606 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
0.37	5.40	40.46	0.64	-----	-----	-----	-----	-----	-----	-----	0.64
0.73	7.71	41.07	3.87	-----	-----	-----	-----	-----	-----	-----	3.87
1.10	25.70 <<	42.28	7.73	-----	-----	-----	-----	-----	-----	-----	7.73
1.47	13.88	42.97	9.63	-----	-----	-----	-----	-----	-----	-----	9.63
1.83	10.02	43.10	9.95	-----	-----	-----	-----	-----	-----	-----	9.95 <<
2.20	6.42	43.00	9.71	-----	-----	-----	-----	-----	-----	-----	9.71
2.57	4.63	42.76	9.10	-----	-----	-----	-----	-----	-----	-----	9.10
2.93	3.85	42.48	8.34	-----	-----	-----	-----	-----	-----	-----	8.34
3.30	3.60	42.22	7.56	-----	-----	-----	-----	-----	-----	-----	7.56
3.67	3.34	41.97	6.74	-----	-----	-----	-----	-----	-----	-----	6.74
4.03	0.00	41.36	5.14	-----	-----	-----	-----	-----	-----	-----	5.14
4.40	0.00	40.82	2.44	-----	-----	-----	-----	-----	-----	-----	2.44
4.77	0.00	40.57	1.08	-----	-----	-----	-----	-----	-----	-----	1.08
5.13	0.00	40.45	0.61	-----	-----	-----	-----	-----	-----	-----	0.61
5.50	0.00	40.38	0.40	-----	-----	-----	-----	-----	-----	-----	0.40
5.87	0.00	40.33	0.27	-----	-----	-----	-----	-----	-----	-----	0.27
6.23	0.00	40.30	0.19	-----	-----	-----	-----	-----	-----	-----	0.19
6.60	0.00	40.27	0.17	-----	-----	-----	-----	-----	-----	-----	0.17
6.97	0.00	40.25	0.14	-----	-----	-----	-----	-----	-----	-----	0.14
7.33	0.00	40.23	0.12	-----	-----	-----	-----	-----	-----	-----	0.12
7.70	0.00	40.21	0.10	-----	-----	-----	-----	-----	-----	-----	0.10

...End

Reservoir Report

English

Reservoir No. 2 - Original Design

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	40.12	00	0	0
1.88	42.00	18,500	17,390	17,390
3.88	44.00	23,750	42,250	59,640
5.88	46.00	30,250	54,000	113,640

Culvert / Orifice Structures

		[A]	[B]	[C]	[D]
Rise in	=	18.0	0.0	0.0	0.0
Span in	=	18.0	0.0	0.0	0.0
No. Barrels	=	1	0	0	0
Invert El. ft	=	40.12	0.00	0.00	0.00
Length ft	=	152.0	0.0	0.0	0.0
Slope %	=	0.40	0.00	0.00	0.00
N-Value	=	.013	.000	.000	.000
Orif. Coeff.	=	0.60	0.00	0.00	0.00
Multi-Stage	=	-----	No	No	No

Weir Structures

		[A]	[B]	[C]	[D]
Crest Len ft	=	0.00	0.00	0.00	0.00
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	40.12	0.00	---	---	---	---	---	---	---	0.00
0.19	1,739	40.31	0.21	---	---	---	---	---	---	---	0.21
0.38	3,478	40.50	0.74	---	---	---	---	---	---	---	0.74
0.56	5,217	40.68	1.59	---	---	---	---	---	---	---	1.59
0.75	6,956	40.87	2.74	---	---	---	---	---	---	---	2.74
0.94	8,695	41.06	3.80	---	---	---	---	---	---	---	3.80
1.13	10,434	41.25	4.74	---	---	---	---	---	---	---	4.74
1.32	12,173	41.44	5.40	---	---	---	---	---	---	---	5.40
1.50	13,912	41.62	5.38	---	---	---	---	---	---	---	5.38
1.69	15,651	41.81	6.16	---	---	---	---	---	---	---	6.16
1.88	17,390	42.00	6.84	---	---	---	---	---	---	---	6.84

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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
2.08	21,615	42.20	7.50	---	---	---	---	---	---	---	7.50
2.28	25,840	42.40	8.11	---	---	---	---	---	---	---	8.11
2.48	30,065	42.60	8.67	---	---	---	---	---	---	---	8.67
2.68	34,290	42.80	9.20	---	---	---	---	---	---	---	9.20
2.88	38,515	43.00	9.70	---	---	---	---	---	---	---	9.70
3.08	42,740	43.20	10.18	---	---	---	---	---	---	---	10.18
3.28	46,965	43.40	10.64	---	---	---	---	---	---	---	10.64
3.48	51,190	43.60	11.07	---	---	---	---	---	---	---	11.07
3.68	55,415	43.80	11.49	---	---	---	---	---	---	---	11.49
3.88	59,640	44.00	11.90	---	---	---	---	---	---	---	11.90
4.08	65,040	44.20	12.29	---	---	---	---	---	---	---	12.29
4.28	70,440	44.40	12.67	---	---	---	---	---	---	---	12.67
4.48	75,840	44.60	13.04	---	---	---	---	---	---	---	13.04
4.68	81,240	44.80	13.40	---	---	---	---	---	---	---	13.40
4.88	86,640	45.00	13.74	---	---	---	---	---	---	---	13.74
5.08	92,040	45.20	14.09	---	---	---	---	---	---	---	14.09
5.28	97,440	45.40	14.42	---	---	---	---	---	---	---	14.42
5.48	102,840	45.60	14.74	---	---	---	---	---	---	---	14.74
5.68	108,240	45.80	15.06	---	---	---	---	---	---	---	15.06
5.88	113,640	46.00	15.37	---	---	---	---	---	---	---	15.37

...End

Hydrograph Report

English

Hyd. No. 21

Orig. 25-Yr Post

Hydrograph type	= Reservoir	Peak discharge	= 10.82 cfs
Storm frequency	= 25 yrs	Time interval	= 22 min
Inflow hyd. No.	= 9	Reservoir name	= Original Design
Max. Elevation	= 43.49 ft	Max. Storage	= 48,781 cuft

Storage Indication method used.

Total Volume = 128,278 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
0.37	6.20	40.51	0.79	-----	-----	-----	-----	-----	-----	-----	0.79
0.73	8.86	41.20	4.51	-----	-----	-----	-----	-----	-----	-----	4.51
1.10	29.54 <<	42.45	8.25	-----	-----	-----	-----	-----	-----	-----	8.25
1.47	15.95	43.29	10.39	-----	-----	-----	-----	-----	-----	-----	10.39
1.83	11.52	43.49	10.82	-----	-----	-----	-----	-----	-----	-----	10.82 <<
2.20	7.38	43.41	10.65	-----	-----	-----	-----	-----	-----	-----	10.65
2.57	5.32	43.16	10.07	-----	-----	-----	-----	-----	-----	-----	10.07
2.93	4.43	42.85	9.34	-----	-----	-----	-----	-----	-----	-----	9.34
3.30	4.14	42.56	8.57	-----	-----	-----	-----	-----	-----	-----	8.57
3.67	3.84	42.30	7.80	-----	-----	-----	-----	-----	-----	-----	7.80
4.03	0.00	41.93	6.59	-----	-----	-----	-----	-----	-----	-----	6.59
4.40	0.00	41.16	4.28	-----	-----	-----	-----	-----	-----	-----	4.28
4.77	0.00	40.72	1.82	-----	-----	-----	-----	-----	-----	-----	1.82
5.13	0.00	40.53	0.89	-----	-----	-----	-----	-----	-----	-----	0.89
5.50	0.00	40.43	0.54	-----	-----	-----	-----	-----	-----	-----	0.54
5.87	0.00	40.36	0.36	-----	-----	-----	-----	-----	-----	-----	0.36
6.23	0.00	40.32	0.24	-----	-----	-----	-----	-----	-----	-----	0.24
6.60	0.00	40.29	0.18	-----	-----	-----	-----	-----	-----	-----	0.18
6.97	0.00	40.26	0.16	-----	-----	-----	-----	-----	-----	-----	0.16
7.33	0.00	40.24	0.14	-----	-----	-----	-----	-----	-----	-----	0.14
7.70	0.00	40.23	0.12	-----	-----	-----	-----	-----	-----	-----	0.12

...End

Reservoir Report

English

Reservoir No. 2 - Original Design

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	40.12	00	0	0
1.88	42.00	18,500	17,390	17,390
3.88	44.00	23,750	42,250	59,640
5.88	46.00	30,250	54,000	113,640

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	0.0	0.0	0.0
Span in	= 18.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.12	0.00	0.00	0.00
Length ft	= 152.0	0.0	0.0	0.0
Slope %	= 0.40	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
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	40.12	0.00	---	---	---	---	---	---	---	0.00
0.19	1,739	40.31	0.21	---	---	---	---	---	---	---	0.21
0.38	3,478	40.50	0.74	---	---	---	---	---	---	---	0.74
0.56	5,217	40.68	1.59	---	---	---	---	---	---	---	1.59
0.75	6,956	40.87	2.74	---	---	---	---	---	---	---	2.74
0.94	8,695	41.06	3.80	---	---	---	---	---	---	---	3.80
1.13	10,434	41.25	4.74	---	---	---	---	---	---	---	4.74
1.32	12,173	41.44	5.40	---	---	---	---	---	---	---	5.40
1.50	13,912	41.62	5.38	---	---	---	---	---	---	---	5.38
1.69	15,651	41.81	6.16	---	---	---	---	---	---	---	6.16
1.88	17,390	42.00	6.84	---	---	---	---	---	---	---	6.84

Continues on next page...

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
2.08	21,615	42.20	7.50	---	---	---	---	---	---	---	7.50
2.28	25,840	42.40	8.11	---	---	---	---	---	---	---	8.11
2.48	30,065	42.60	8.67	---	---	---	---	---	---	---	8.67
2.68	34,290	42.80	9.20	---	---	---	---	---	---	---	9.20
2.88	38,515	43.00	9.70	---	---	---	---	---	---	---	9.70
3.08	42,740	43.20	10.18	---	---	---	---	---	---	---	10.18
3.28	46,965	43.40	10.64	---	---	---	---	---	---	---	10.64
3.48	51,190	43.60	11.07	---	---	---	---	---	---	---	11.07
3.68	55,415	43.80	11.49	---	---	---	---	---	---	---	11.49
3.88	59,640	44.00	11.90	---	---	---	---	---	---	---	11.90
4.08	65,040	44.20	12.29	---	---	---	---	---	---	---	12.29
4.28	70,440	44.40	12.67	---	---	---	---	---	---	---	12.67
4.48	75,840	44.60	13.04	---	---	---	---	---	---	---	13.04
4.68	81,240	44.80	13.40	---	---	---	---	---	---	---	13.40
4.88	86,640	45.00	13.74	---	---	---	---	---	---	---	13.74
5.08	92,040	45.20	14.09	---	---	---	---	---	---	---	14.09
5.28	97,440	45.40	14.42	---	---	---	---	---	---	---	14.42
5.48	102,840	45.60	14.74	---	---	---	---	---	---	---	14.74
5.68	108,240	45.80	15.06	---	---	---	---	---	---	---	15.06
5.88	113,640	46.00	15.37	---	---	---	---	---	---	---	15.37

...End

Hydrograph Report

English

Hyd. No. 22

Orig. 100-Yr Post

Hydrograph type	= Reservoir	Peak discharge	= 12.08 cfs
Storm frequency	= 100 yrs	Time interval	= 22 min
Inflow hyd. No.	= 10	Reservoir name	= Original Design
Max. Elevation	= 44.09 ft	Max. Storage	= 62,128 cuft

Storage Indication method used.

Total Volume = 154,981 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
0.37	7.49	40.58	1.10	-----	-----	-----	-----	-----	-----	-----	1.10
0.73	10.71	41.42	5.33	-----	-----	-----	-----	-----	-----	-----	5.33
1.10	35.69 <<	42.74	9.06	-----	-----	-----	-----	-----	-----	-----	9.06
1.47	19.27	43.82	11.53	-----	-----	-----	-----	-----	-----	-----	11.53
1.83	13.92	44.09	12.08	-----	-----	-----	-----	-----	-----	-----	12.08 <<
2.20	8.92	44.06	12.02	-----	-----	-----	-----	-----	-----	-----	12.02
2.57	6.42	43.82	11.54	-----	-----	-----	-----	-----	-----	-----	11.54
2.93	5.35	43.49	10.83	-----	-----	-----	-----	-----	-----	-----	10.83
3.30	5.00	43.16	10.09	-----	-----	-----	-----	-----	-----	-----	10.09
3.67	4.64	42.85	9.34	-----	-----	-----	-----	-----	-----	-----	9.34
4.03	0.00	42.45	8.25	-----	-----	-----	-----	-----	-----	-----	8.25
4.40	0.00	41.96	6.70	-----	-----	-----	-----	-----	-----	-----	6.70
4.77	0.00	41.17	4.36	-----	-----	-----	-----	-----	-----	-----	4.36
5.13	0.00	40.73	1.86	-----	-----	-----	-----	-----	-----	-----	1.86
5.50	0.00	40.53	0.90	-----	-----	-----	-----	-----	-----	-----	0.90
5.87	0.00	40.43	0.55	-----	-----	-----	-----	-----	-----	-----	0.55
6.23	0.00	40.36	0.36	-----	-----	-----	-----	-----	-----	-----	0.36
6.60	0.00	40.32	0.24	-----	-----	-----	-----	-----	-----	-----	0.24
6.97	0.00	40.29	0.19	-----	-----	-----	-----	-----	-----	-----	0.19
7.33	0.00	40.26	0.16	-----	-----	-----	-----	-----	-----	-----	0.16
7.70	0.00	40.24	0.14	-----	-----	-----	-----	-----	-----	-----	0.14

...End

Reservoir Report

English

Reservoir No. 2 - Original Design

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	40.12	00	0	0
1.88	42.00	18,500	17,390	17,390
3.88	44.00	23,750	42,250	59,640
5.88	46.00	30,250	54,000	113,640

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	0.0	0.0	0.0
Span in	= 18.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.12	0.00	0.00	0.00
Length ft	= 152.0	0.0	0.0	0.0
Slope %	= 0.40	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
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	40.12	0.00	---	---	---	---	---	---	---	0.00
0.19	1,739	40.31	0.21	---	---	---	---	---	---	---	0.21
0.38	3,478	40.50	0.74	---	---	---	---	---	---	---	0.74
0.56	5,217	40.68	1.59	---	---	---	---	---	---	---	1.59
0.75	6,956	40.87	2.74	---	---	---	---	---	---	---	2.74
0.94	8,695	41.06	3.80	---	---	---	---	---	---	---	3.80
1.13	10,434	41.25	4.74	---	---	---	---	---	---	---	4.74
1.32	12,173	41.44	5.40	---	---	---	---	---	---	---	5.40
1.50	13,912	41.62	5.38	---	---	---	---	---	---	---	5.38
1.69	15,651	41.81	6.16	---	---	---	---	---	---	---	6.16
1.88	17,390	42.00	6.84	---	---	---	---	---	---	---	6.84

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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
2.08	21,615	42.20	7.50	---	---	---	---	---	---	---	7.50
2.28	25,840	42.40	8.11	---	---	---	---	---	---	---	8.11
2.48	30,065	42.60	8.67	---	---	---	---	---	---	---	8.67
2.68	34,290	42.80	9.20	---	---	---	---	---	---	---	9.20
2.88	38,515	43.00	9.70	---	---	---	---	---	---	---	9.70
3.08	42,740	43.20	10.18	---	---	---	---	---	---	---	10.18
3.28	46,965	43.40	10.64	---	---	---	---	---	---	---	10.64
3.48	51,190	43.60	11.07	---	---	---	---	---	---	---	11.07
3.68	55,415	43.80	11.49	---	---	---	---	---	---	---	11.49
3.88	59,640	44.00	11.90	---	---	---	---	---	---	---	11.90
4.08	65,040	44.20	12.29	---	---	---	---	---	---	---	12.29
4.28	70,440	44.40	12.67	---	---	---	---	---	---	---	12.67
4.48	75,840	44.60	13.04	---	---	---	---	---	---	---	13.04
4.68	81,240	44.80	13.40	---	---	---	---	---	---	---	13.40
4.88	86,640	45.00	13.74	---	---	---	---	---	---	---	13.74
5.08	92,040	45.20	14.09	---	---	---	---	---	---	---	14.09
5.28	97,440	45.40	14.42	---	---	---	---	---	---	---	14.42
5.48	102,840	45.60	14.74	---	---	---	---	---	---	---	14.74
5.68	108,240	45.80	15.06	---	---	---	---	---	---	---	15.06
5.88	113,640	46.00	15.37	---	---	---	---	---	---	---	15.37

...End

POST-DEVELOPED ROUTED HYDROGRAPHS

Hydrograph Report

English

Hyd. No. 23

Proposed Design 1-Yr

Hydrograph type	= Reservoir	Peak discharge	= 11.02 cfs
Storm frequency	= 1 yrs	Time interval	= 22 min
Inflow hyd. No.	= 6	Reservoir name	= Modified Origin
Max. Elevation	= 44.27 ft	Max. Storage	= 23,950 cuft

Storage Indication method used.

Total Volume = 66,726 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
0.37	3.23	42.13	5.37	0.25	-----	-----	-----	-----	-----	-----	0.25
0.73	4.61	42.66	6.78	0.30	-----	-----	-----	-----	-----	-----	0.30
1.10	15.36 <<	43.89	10.19	0.39	-----	-----	2.75	-----	-----	-----	3.14
1.47	8.30	44.27 <<	11.02	0.25	-----	-----	12.96	-----	-----	-----	11.02 <<
1.83	5.99	44.10	10.68	0.36	-----	-----	8.03	-----	-----	-----	8.12
2.20	3.84	43.98	10.41	0.39	-----	-----	4.69	-----	-----	-----	5.08
2.57	2.77	43.88	10.17	0.39	-----	-----	2.55	-----	-----	-----	2.94
2.93	2.30	43.85	10.11	0.39	-----	-----	2.06	-----	-----	-----	2.45
3.30	2.15	43.84	10.08	0.39	-----	-----	1.79	-----	-----	-----	2.18
3.67	2.00	43.83	10.07	0.39	-----	-----	1.66	-----	-----	-----	2.05
4.03	0.00	43.75	9.86	0.39	-----	-----	0.72	-----	-----	-----	1.11
4.40	0.00	43.63	9.57	0.38	-----	-----	0.13	-----	-----	-----	0.51
4.77	0.00	43.56	9.41	0.37	-----	-----	-----	-----	-----	-----	0.37
5.13	0.00	43.51	9.27	0.37	-----	-----	-----	-----	-----	-----	0.37
5.50	0.00	43.45	9.13	0.37	-----	-----	-----	-----	-----	-----	0.37
5.87	0.00	43.40	8.99	0.36	-----	-----	-----	-----	-----	-----	0.36
6.23	0.00	43.35	8.85	0.36	-----	-----	-----	-----	-----	-----	0.36
6.60	0.00	43.29	8.70	0.35	-----	-----	-----	-----	-----	-----	0.35
6.97	0.00	43.24	8.56	0.35	-----	-----	-----	-----	-----	-----	0.35
7.33	0.00	43.19	8.42	0.35	-----	-----	-----	-----	-----	-----	0.35
7.70	0.00	43.14	8.27	0.34	-----	-----	-----	-----	-----	-----	0.34
8.07	0.00	43.09	8.13	0.34	-----	-----	-----	-----	-----	-----	0.34
8.43	0.00	43.04	7.98	0.33	-----	-----	-----	-----	-----	-----	0.33
8.80	0.00	42.99	7.84	0.33	-----	-----	-----	-----	-----	-----	0.33
9.17	0.00	42.94	7.69	0.33	-----	-----	-----	-----	-----	-----	0.33
9.53	0.00	42.89	7.54	0.32	-----	-----	-----	-----	-----	-----	0.32
9.90	0.00	42.85	7.39	0.32	-----	-----	-----	-----	-----	-----	0.32
10.27	0.00	42.80	7.24	0.31	-----	-----	-----	-----	-----	-----	0.31
10.63	0.00	42.75	7.08	0.31	-----	-----	-----	-----	-----	-----	0.31
11.00	0.00	42.71	6.93	0.31	-----	-----	-----	-----	-----	-----	0.31
11.37	0.00	42.66	6.77	0.30	-----	-----	-----	-----	-----	-----	0.30
11.73	0.00	42.62	6.62	0.30	-----	-----	-----	-----	-----	-----	0.30
12.10	0.00	42.57	6.46	0.29	-----	-----	-----	-----	-----	-----	0.29
12.47	0.00	42.53	6.29	0.29	-----	-----	-----	-----	-----	-----	0.29
12.83	0.00	42.49	6.13	0.29	-----	-----	-----	-----	-----	-----	0.29
13.20	0.00	42.45	5.97	0.28	-----	-----	-----	-----	-----	-----	0.28

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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
13.57	0.00	42.40	5.81	0.28	-----	-----	-----	-----	-----	-----	0.28
13.93	0.00	42.36	5.75	0.27	-----	-----	-----	-----	-----	-----	0.27
14.30	0.00	42.32	5.70	0.27	-----	-----	-----	-----	-----	-----	0.27
14.67	0.00	42.28	5.66	0.27	-----	-----	-----	-----	-----	-----	0.27
15.03	0.00	42.24	5.61	0.26	-----	-----	-----	-----	-----	-----	0.26
15.40	0.00	42.21	5.56	0.26	-----	-----	-----	-----	-----	-----	0.26
15.77	0.00	42.17	5.48	0.26	-----	-----	-----	-----	-----	-----	0.26
16.13	0.00	42.13	5.38	0.25	-----	-----	-----	-----	-----	-----	0.25
16.50	0.00	42.09	5.28	0.25	-----	-----	-----	-----	-----	-----	0.25
16.87	0.00	42.06	5.19	0.24	-----	-----	-----	-----	-----	-----	0.24
17.23	0.00	42.02	5.10	0.24	-----	-----	-----	-----	-----	-----	0.24
17.60	0.00	41.84	4.33	0.22	-----	-----	-----	-----	-----	-----	0.22
17.97	0.00	41.48	2.20	0.17	-----	-----	-----	-----	-----	-----	0.17
18.33	0.00	41.21	0.93	0.11	-----	-----	-----	-----	-----	-----	0.11

...End

Reservoir Report

English

Reservoir No. 4 - Modified Original Design

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	40.80	01	0	0
1.20	42.00	1,415	850	850
3.20	44.00	16,432	17,847	18,697
5.35	46.15	22,725	42,094	60,790

D1-1 outflow 15

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	= 40.80	40.80	0.00	0.00
Length ft	= 152.0	5.0	0.0	0.0
Slope %	= 0.40	1.00	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	= 10.33	0.00	0.00	0.00
Crest El. ft	= 43.70	0.00	0.00	0.00
Weir Coeff.	= 3.00	0.00	0.00	0.00
Eqn. Exp.	= 1.50	0.00	0.00	0.00
Multi-Stage	= Yes	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	40.80	0.00	0.00	---	---	0.00	---	---	---	0.00
0.12	85	40.92	0.08	0.03	---	---	0.00	---	---	---	0.03
0.24	170	41.04	0.31	0.06	---	---	0.00	---	---	---	0.06
0.36	255	41.16	0.73	0.10	---	---	0.00	---	---	---	0.10
0.48	340	41.28	1.18	0.13	---	---	0.00	---	---	---	0.13
0.60	425	41.40	1.76	0.16	---	---	0.00	---	---	---	0.16
0.72	510	41.52	2.43	0.18	---	---	0.00	---	---	---	0.18
0.84	595	41.64	3.30	0.19	---	---	0.00	---	---	---	0.19
0.96	680	41.76	3.95	0.21	---	---	0.00	---	---	---	0.21
1.08	765	41.88	4.50	0.22	---	---	0.00	---	---	---	0.22
1.20	850	42.00	5.04	0.24	---	---	0.00	---	---	---	0.24

Continues on next page...

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
1.40	2,634	42.20	5.56	0.26	---	---	0.00	---	---	---	0.26
1.60	4,419	42.40	5.79	0.28	---	---	0.00	---	---	---	0.28
1.80	6,204	42.60	6.56	0.30	---	---	0.00	---	---	---	0.30
2.00	7,988	42.80	7.24	0.31	---	---	0.00	---	---	---	0.31
2.20	9,773	43.00	7.87	0.33	---	---	0.00	---	---	---	0.33
2.40	11,558	43.20	8.45	0.35	---	---	0.00	---	---	---	0.35
2.60	13,343	43.40	8.99	0.36	---	---	0.00	---	---	---	0.36
2.80	15,127	43.60	9.51	0.38	---	---	0.00	---	---	---	0.38
3.00	16,912	43.80	9.99	0.39	---	---	0.98	---	---	---	1.37
3.20	18,697	44.00	10.46	0.39	---	---	5.09	---	---	---	5.48
3.41	22,906	44.22	10.91	0.34	---	---	11.12	---	---	---	10.91
3.63	27,115	44.43	11.35	0.00	---	---	18.54	---	---	---	11.35
3.84	31,325	44.65	11.77	0.00	---	---	27.12	---	---	---	11.77
4.06	35,534	44.86	12.17	0.00	---	---	36.73	---	---	---	12.17
4.28	39,743	45.08	12.57	0.00	---	---	47.27	---	---	---	12.57
4.49	43,953	45.29	12.95	0.00	---	---	58.65	---	---	---	12.95
4.71	48,162	45.51	13.32	0.00	---	---	70.82	---	---	---	13.32
4.92	52,372	45.72	13.68	0.00	---	---	83.74	---	---	---	13.68
5.14	56,581	45.94	14.03	0.00	---	---	97.36	---	---	---	14.03
5.35	60,790	46.15	14.37	0.00	---	---	111.64	---	---	---	14.37

...End

Hydrograph Report

English

Hyd. No. 24

Proposed Design 2-Yr.

Hydrograph type	= Reservoir	Peak discharge	= 11.28 cfs
Storm frequency	= 2 yrs	Time interval	= 22 min
Inflow hyd. No.	= 7	Reservoir name	= Modified Origin
Max. Elevation	= 44.40 ft	Max. Storage	= 26,505 cuft

Storage Indication method used.

Total Volume = 80,111 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
0.37	3.87	42.17	5.49	0.26	-----	-----	-----	-----	-----	-----	0.26
0.73	5.53	42.83	7.32	0.32	-----	-----	-----	-----	-----	-----	0.32
1.10	18.45 <<	44.04	10.54	0.38	-----	-----	6.27	-----	-----	-----	6.54
1.47	9.96	44.40 <<	11.28	0.05	-----	-----	17.47	-----	-----	-----	11.28 <<
1.83	7.20	44.23	10.94	0.32	-----	-----	11.58	-----	-----	-----	10.94
2.20	4.61	44.04	10.54	0.38	-----	-----	6.20	-----	-----	-----	6.47
2.57	3.32	43.92	10.26	0.39	-----	-----	3.37	-----	-----	-----	3.76
2.93	2.77	43.87	10.17	0.39	-----	-----	2.51	-----	-----	-----	2.90
3.30	2.58	43.86	10.13	0.39	-----	-----	2.24	-----	-----	-----	2.63
3.67	2.40	43.85	10.12	0.39	-----	-----	2.07	-----	-----	-----	2.46
4.03	0.00	43.76	9.90	0.39	-----	-----	0.79	-----	-----	-----	1.18
4.40	0.00	43.63	9.59	0.38	-----	-----	0.17	-----	-----	-----	0.55
4.77	0.00	43.57	9.42	0.37	-----	-----	-----	-----	-----	-----	0.37
5.13	0.00	43.51	9.28	0.37	-----	-----	-----	-----	-----	-----	0.37
5.50	0.00	43.46	9.14	0.37	-----	-----	-----	-----	-----	-----	0.37
5.87	0.00	43.40	9.00	0.36	-----	-----	-----	-----	-----	-----	0.36
6.23	0.00	43.35	8.86	0.36	-----	-----	-----	-----	-----	-----	0.36
6.60	0.00	43.30	8.71	0.35	-----	-----	-----	-----	-----	-----	0.35
6.97	0.00	43.24	8.57	0.35	-----	-----	-----	-----	-----	-----	0.35
7.33	0.00	43.19	8.43	0.35	-----	-----	-----	-----	-----	-----	0.35
7.70	0.00	43.14	8.28	0.34	-----	-----	-----	-----	-----	-----	0.34
8.07	0.00	43.09	8.14	0.34	-----	-----	-----	-----	-----	-----	0.34
8.43	0.00	43.04	7.99	0.33	-----	-----	-----	-----	-----	-----	0.33
8.80	0.00	42.99	7.85	0.33	-----	-----	-----	-----	-----	-----	0.33
9.17	0.00	42.94	7.70	0.33	-----	-----	-----	-----	-----	-----	0.33
9.53	0.00	42.90	7.55	0.32	-----	-----	-----	-----	-----	-----	0.32
9.90	0.00	42.85	7.40	0.32	-----	-----	-----	-----	-----	-----	0.32
10.27	0.00	42.80	7.25	0.31	-----	-----	-----	-----	-----	-----	0.31
10.63	0.00	42.76	7.09	0.31	-----	-----	-----	-----	-----	-----	0.31
11.00	0.00	42.71	6.94	0.31	-----	-----	-----	-----	-----	-----	0.31
11.37	0.00	42.67	6.78	0.30	-----	-----	-----	-----	-----	-----	0.30
11.73	0.00	42.62	6.63	0.30	-----	-----	-----	-----	-----	-----	0.30
12.10	0.00	42.58	6.47	0.29	-----	-----	-----	-----	-----	-----	0.29
12.47	0.00	42.53	6.30	0.29	-----	-----	-----	-----	-----	-----	0.29
12.83	0.00	42.49	6.14	0.29	-----	-----	-----	-----	-----	-----	0.29
13.20	0.00	42.45	5.98	0.28	-----	-----	-----	-----	-----	-----	0.28

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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
13.57	0.00	42.41	5.82	0.28	-----	-----	-----	-----	-----	-----	0.28
13.93	0.00	42.37	5.75	0.27	-----	-----	-----	-----	-----	-----	0.27
14.30	0.00	42.33	5.71	0.27	-----	-----	-----	-----	-----	-----	0.27
14.67	0.00	42.29	5.66	0.27	-----	-----	-----	-----	-----	-----	0.27
15.03	0.00	42.25	5.61	0.26	-----	-----	-----	-----	-----	-----	0.26
15.40	0.00	42.21	5.57	0.26	-----	-----	-----	-----	-----	-----	0.26
15.77	0.00	42.17	5.48	0.26	-----	-----	-----	-----	-----	-----	0.26
16.13	0.00	42.13	5.39	0.25	-----	-----	-----	-----	-----	-----	0.25
16.50	0.00	42.10	5.29	0.25	-----	-----	-----	-----	-----	-----	0.25
16.87	0.00	42.06	5.20	0.24	-----	-----	-----	-----	-----	-----	0.24
17.23	0.00	42.02	5.11	0.24	-----	-----	-----	-----	-----	-----	0.24
17.60	0.00	41.87	4.47	0.22	-----	-----	-----	-----	-----	-----	0.22
17.97	0.00	41.50	2.33	0.17	-----	-----	-----	-----	-----	-----	0.17
18.33	0.00	41.23	0.99	0.12	-----	-----	-----	-----	-----	-----	0.12

...End

Reservoir Report

English

Reservoir No. 4 - Modified Original Design

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	40.80	01	0	0
1.20	42.00	1,415	850	850
3.20	44.00	16,432	17,847	18,697
5.35	46.15	22,725	42,094	60,790

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	= 40.80	40.80	0.00	0.00
Length ft	= 152.0	5.0	0.0	0.0
Slope %	= 0.40	1.00	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	= 10.33	0.00	0.00	0.00
Crest El. ft	= 43.70	0.00	0.00	0.00
Weir Coeff.	= 3.00	0.00	0.00	0.00
Eqn. Exp.	= 1.50	0.00	0.00	0.00
Multi-Stage	= Yes	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	40.80	0.00	0.00	---	---	0.00	---	---	---	0.00
0.12	85	40.92	0.08	0.03	---	---	0.00	---	---	---	0.03
0.24	170	41.04	0.31	0.06	---	---	0.00	---	---	---	0.06
0.36	255	41.16	0.73	0.10	---	---	0.00	---	---	---	0.10
0.48	340	41.28	1.18	0.13	---	---	0.00	---	---	---	0.13
0.60	425	41.40	1.76	0.16	---	---	0.00	---	---	---	0.16
0.72	510	41.52	2.43	0.18	---	---	0.00	---	---	---	0.18
0.84	595	41.64	3.30	0.19	---	---	0.00	---	---	---	0.19
0.96	680	41.76	3.95	0.21	---	---	0.00	---	---	---	0.21
1.08	765	41.88	4.50	0.22	---	---	0.00	---	---	---	0.22
1.20	850	42.00	5.04	0.24	---	---	0.00	---	---	---	0.24

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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
1.40	2,634	42.20	5.56	0.26	---	---	0.00	---	---	---	0.26
1.60	4,419	42.40	5.79	0.28	---	---	0.00	---	---	---	0.28
1.80	6,204	42.60	6.56	0.30	---	---	0.00	---	---	---	0.30
2.00	7,988	42.80	7.24	0.31	---	---	0.00	---	---	---	0.31
2.20	9,773	43.00	7.87	0.33	---	---	0.00	---	---	---	0.33
2.40	11,558	43.20	8.45	0.35	---	---	0.00	---	---	---	0.35
2.60	13,343	43.40	8.99	0.36	---	---	0.00	---	---	---	0.36
2.80	15,127	43.60	9.51	0.38	---	---	0.00	---	---	---	0.38
3.00	16,912	43.80	9.99	0.39	---	---	0.98	---	---	---	1.37
3.20	18,697	44.00	10.46	0.39	---	---	5.09	---	---	---	5.48
3.41	22,906	44.22	10.91	0.34	---	---	11.12	---	---	---	10.91
3.63	27,115	44.43	11.35	0.00	---	---	18.54	---	---	---	11.35
3.84	31,325	44.65	11.77	0.00	---	---	27.12	---	---	---	11.77
4.06	35,534	44.86	12.17	0.00	---	---	36.73	---	---	---	12.17
4.28	39,743	45.08	12.57	0.00	---	---	47.27	---	---	---	12.57
4.49	43,953	45.29	12.95	0.00	---	---	58.65	---	---	---	12.95
4.71	48,162	45.51	13.32	0.00	---	---	70.82	---	---	---	13.32
4.92	52,372	45.72	13.68	0.00	---	---	83.74	---	---	---	13.68
5.14	56,581	45.94	14.03	0.00	---	---	97.36	---	---	---	14.03
5.35	60,790	46.15	14.37	0.00	---	---	111.64	---	---	---	14.37

...End

Hydrograph Report

English

Hyd. No. 25

Proposed Design 10-Yr.

Hydrograph type	= Reservoir	Peak discharge	= 12.28 cfs
Storm frequency	= 10 yrs	Time interval	= 22 min
Inflow hyd. No.	= 8	Reservoir name	= Modified Origin
Max. Elevation	= 44.92 ft	Max. Storage	= 36,646 cuft

Storage Indication method used.

Total Volume = 111,606 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
0.37	5.40	42.28	5.66	0.27	-----	-----	-----	-----	-----	-----	0.27
0.73	7.71	43.21	8.48	0.35	-----	-----	-----	-----	-----	-----	0.35
1.10	25.70 <<	44.38	11.24	0.09	-----	-----	16.65	-----	-----	-----	11.24
1.47	13.88	44.92 <<	12.28	-----	-----	-----	39.51	-----	-----	-----	12.28 <<
1.83	10.02	44.90	12.24	-----	-----	-----	38.50	-----	-----	-----	12.24
2.20	6.42	44.64	11.76	-----	-----	-----	26.97	-----	-----	-----	11.76
2.57	4.63	44.25	10.98	0.29	-----	-----	12.24	-----	-----	-----	10.98
2.93	3.85	43.98	10.41	0.39	-----	-----	4.71	-----	-----	-----	5.09
3.30	3.60	43.90	10.23	0.39	-----	-----	3.05	-----	-----	-----	3.44
3.67	3.34	43.90	10.23	0.39	-----	-----	3.09	-----	-----	-----	3.48
4.03	0.00	43.79	9.98	0.39	-----	-----	0.95	-----	-----	-----	1.34
4.40	0.00	43.65	9.63	0.38	-----	-----	0.24	-----	-----	-----	0.62
4.77	0.00	43.58	9.44	0.38	-----	-----	-----	-----	-----	-----	0.38
5.13	0.00	43.52	9.30	0.37	-----	-----	-----	-----	-----	-----	0.37
5.50	0.00	43.47	9.16	0.37	-----	-----	-----	-----	-----	-----	0.37
5.87	0.00	43.41	9.02	0.36	-----	-----	-----	-----	-----	-----	0.36
6.23	0.00	43.36	8.88	0.36	-----	-----	-----	-----	-----	-----	0.36
6.60	0.00	43.31	8.74	0.35	-----	-----	-----	-----	-----	-----	0.35
6.97	0.00	43.25	8.60	0.35	-----	-----	-----	-----	-----	-----	0.35
7.33	0.00	43.20	8.46	0.35	-----	-----	-----	-----	-----	-----	0.35
7.70	0.00	43.15	8.31	0.34	-----	-----	-----	-----	-----	-----	0.34
8.07	0.00	43.10	8.16	0.34	-----	-----	-----	-----	-----	-----	0.34
8.43	0.00	43.05	8.02	0.33	-----	-----	-----	-----	-----	-----	0.33
8.80	0.00	43.00	7.87	0.33	-----	-----	-----	-----	-----	-----	0.33
9.17	0.00	42.95	7.72	0.33	-----	-----	-----	-----	-----	-----	0.33
9.53	0.00	42.90	7.57	0.32	-----	-----	-----	-----	-----	-----	0.32
9.90	0.00	42.86	7.42	0.32	-----	-----	-----	-----	-----	-----	0.32
10.27	0.00	42.81	7.28	0.31	-----	-----	-----	-----	-----	-----	0.31
10.63	0.00	42.76	7.12	0.31	-----	-----	-----	-----	-----	-----	0.31
11.00	0.00	42.72	6.96	0.31	-----	-----	-----	-----	-----	-----	0.31
11.37	0.00	42.67	6.81	0.30	-----	-----	-----	-----	-----	-----	0.30
11.73	0.00	42.63	6.66	0.30	-----	-----	-----	-----	-----	-----	0.30
12.10	0.00	42.58	6.50	0.30	-----	-----	-----	-----	-----	-----	0.30
12.47	0.00	42.54	6.33	0.29	-----	-----	-----	-----	-----	-----	0.29
12.83	0.00	42.50	6.17	0.29	-----	-----	-----	-----	-----	-----	0.29
13.20	0.00	42.46	6.01	0.28	-----	-----	-----	-----	-----	-----	0.28

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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
13.57	0.00	42.41	5.85	0.28	-----	-----	-----	-----	-----	-----	0.28
13.93	0.00	42.37	5.76	0.28	-----	-----	-----	-----	-----	-----	0.28
14.30	0.00	42.33	5.71	0.27	-----	-----	-----	-----	-----	-----	0.27
14.67	0.00	42.29	5.67	0.27	-----	-----	-----	-----	-----	-----	0.27
15.03	0.00	42.25	5.62	0.26	-----	-----	-----	-----	-----	-----	0.26
15.40	0.00	42.22	5.58	0.26	-----	-----	-----	-----	-----	-----	0.26
15.77	0.00	42.18	5.50	0.26	-----	-----	-----	-----	-----	-----	0.26
16.13	0.00	42.14	5.40	0.25	-----	-----	-----	-----	-----	-----	0.25
16.50	0.00	42.10	5.31	0.25	-----	-----	-----	-----	-----	-----	0.25
16.87	0.00	42.07	5.21	0.24	-----	-----	-----	-----	-----	-----	0.24
17.23	0.00	42.03	5.12	0.24	-----	-----	-----	-----	-----	-----	0.24
17.60	0.00	41.94	4.78	0.23	-----	-----	-----	-----	-----	-----	0.23
17.97	0.00	41.56	2.69	0.18	-----	-----	-----	-----	-----	-----	0.18
18.33	0.00	41.27	1.13	0.13	-----	-----	-----	-----	-----	-----	0.13

...End

Reservoir Report

English

Reservoir No. 4 - Modified Original Design

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	40.80	01	0	0
1.20	42.00	1,415	850	850
3.20	44.00	16,432	17,847	18,697
5.35	46.15	22,725	42,094	60,790

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	= 40.80	40.80	0.00	0.00
Length ft	= 152.0	5.0	0.0	0.0
Slope %	= 0.40	1.00	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	= 10.33	0.00	0.00	0.00
Crest El. ft	= 43.70	0.00	0.00	0.00
Weir Coeff.	= 3.00	0.00	0.00	0.00
Eqn. Exp.	= 1.50	0.00	0.00	0.00
Multi-Stage	= Yes	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	40.80	0.00	0.00	---	---	0.00	---	---	---	0.00
0.12	85	40.92	0.08	0.03	---	---	0.00	---	---	---	0.03
0.24	170	41.04	0.31	0.06	---	---	0.00	---	---	---	0.06
0.36	255	41.16	0.73	0.10	---	---	0.00	---	---	---	0.10
0.48	340	41.28	1.18	0.13	---	---	0.00	---	---	---	0.13
0.60	425	41.40	1.76	0.16	---	---	0.00	---	---	---	0.16
0.72	510	41.52	2.43	0.18	---	---	0.00	---	---	---	0.18
0.84	595	41.64	3.30	0.19	---	---	0.00	---	---	---	0.19
0.96	680	41.76	3.95	0.21	---	---	0.00	---	---	---	0.21
1.08	765	41.88	4.50	0.22	---	---	0.00	---	---	---	0.22
1.20	850	42.00	5.04	0.24	---	---	0.00	---	---	---	0.24

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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
1.40	2,634	42.20	5.56	0.26	---	---	0.00	---	---	---	0.26
1.60	4,419	42.40	5.79	0.28	---	---	0.00	---	---	---	0.28
1.80	6,204	42.60	6.56	0.30	---	---	0.00	---	---	---	0.30
2.00	7,988	42.80	7.24	0.31	---	---	0.00	---	---	---	0.31
2.20	9,773	43.00	7.87	0.33	---	---	0.00	---	---	---	0.33
2.40	11,558	43.20	8.45	0.35	---	---	0.00	---	---	---	0.35
2.60	13,343	43.40	8.99	0.36	---	---	0.00	---	---	---	0.36
2.80	15,127	43.60	9.51	0.38	---	---	0.00	---	---	---	0.38
3.00	16,912	43.80	9.99	0.39	---	---	0.98	---	---	---	1.37
3.20	18,697	44.00	10.46	0.39	---	---	5.09	---	---	---	5.48
3.41	22,906	44.22	10.91	0.34	---	---	11.12	---	---	---	10.91
3.63	27,115	44.43	11.35	0.00	---	---	18.54	---	---	---	11.35
3.84	31,325	44.65	11.77	0.00	---	---	27.12	---	---	---	11.77
4.06	35,534	44.86	12.17	0.00	---	---	36.73	---	---	---	12.17
4.28	39,743	45.08	12.57	0.00	---	---	47.27	---	---	---	12.57
4.49	43,953	45.29	12.95	0.00	---	---	58.65	---	---	---	12.95
4.71	48,162	45.51	13.32	0.00	---	---	70.82	---	---	---	13.32
4.92	52,372	45.72	13.68	0.00	---	---	83.74	---	---	---	13.68
5.14	56,581	45.94	14.03	0.00	---	---	97.36	---	---	---	14.03
5.35	60,790	46.15	14.37	0.00	---	---	111.64	---	---	---	14.37

...End

Hydrograph Report

English

Hyd. No. 26

Proposed Design 25-Yr

Hydrograph type	= Reservoir	Peak discharge	= 13.08 cfs
Storm frequency	= 25 yrs	Time interval	= 22 min
Inflow hyd. No.	= 9	Reservoir name	= Modified Origin
Max. Elevation	= 45.37 ft	Max. Storage	= 45,441 cuft

Storage Indication method used.

Total Volume = 128,278 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
0.37	6.20	42.34	5.73	0.27	-----	-----	-----	-----	-----	-----	0.27
0.73	8.86	43.41	9.02	0.36	-----	-----	-----	-----	-----	-----	0.36
1.10	29.54 <<	44.62	11.72	-----	-----	-----	26.06	-----	-----	-----	11.72
1.47	15.95	45.32	13.00	-----	-----	-----	60.29	-----	-----	-----	13.00
1.83	11.52	45.37 <<	13.08	-----	-----	-----	62.95	-----	-----	-----	13.08 <<
2.20	7.38	45.14	12.67	-----	-----	-----	50.45	-----	-----	-----	12.67
2.57	5.32	44.73	11.93	-----	-----	-----	31.09	-----	-----	-----	11.93
2.93	4.43	44.29	11.06	0.22	-----	-----	13.62	-----	-----	-----	11.06
3.30	4.14	44.01	10.48	0.38	-----	-----	5.38	-----	-----	-----	5.74
3.67	3.84	43.91	10.26	0.39	-----	-----	3.32	-----	-----	-----	3.71
4.03	0.00	43.81	10.01	0.39	-----	-----	1.16	-----	-----	-----	1.55
4.40	0.00	43.65	9.62	0.38	-----	-----	0.24	-----	-----	-----	0.62
4.77	0.00	43.57	9.44	0.38	-----	-----	-----	-----	-----	-----	0.38
5.13	0.00	43.52	9.30	0.37	-----	-----	-----	-----	-----	-----	0.37
5.50	0.00	43.47	9.16	0.37	-----	-----	-----	-----	-----	-----	0.37
5.87	0.00	43.41	9.02	0.36	-----	-----	-----	-----	-----	-----	0.36
6.23	0.00	43.36	8.88	0.36	-----	-----	-----	-----	-----	-----	0.36
6.60	0.00	43.31	8.74	0.35	-----	-----	-----	-----	-----	-----	0.35
6.97	0.00	43.25	8.60	0.35	-----	-----	-----	-----	-----	-----	0.35
7.33	0.00	43.20	8.46	0.35	-----	-----	-----	-----	-----	-----	0.35
7.70	0.00	43.15	8.31	0.34	-----	-----	-----	-----	-----	-----	0.34
8.07	0.00	43.10	8.16	0.34	-----	-----	-----	-----	-----	-----	0.34
8.43	0.00	43.05	8.02	0.33	-----	-----	-----	-----	-----	-----	0.33
8.80	0.00	43.00	7.87	0.33	-----	-----	-----	-----	-----	-----	0.33
9.17	0.00	42.95	7.72	0.33	-----	-----	-----	-----	-----	-----	0.33
9.53	0.00	42.90	7.57	0.32	-----	-----	-----	-----	-----	-----	0.32
9.90	0.00	42.86	7.42	0.32	-----	-----	-----	-----	-----	-----	0.32
10.27	0.00	42.81	7.28	0.31	-----	-----	-----	-----	-----	-----	0.31
10.63	0.00	42.76	7.12	0.31	-----	-----	-----	-----	-----	-----	0.31
11.00	0.00	42.72	6.96	0.31	-----	-----	-----	-----	-----	-----	0.31
11.37	0.00	42.67	6.81	0.30	-----	-----	-----	-----	-----	-----	0.30
11.73	0.00	42.63	6.66	0.30	-----	-----	-----	-----	-----	-----	0.30
12.10	0.00	42.58	6.50	0.30	-----	-----	-----	-----	-----	-----	0.30
12.47	0.00	42.54	6.33	0.29	-----	-----	-----	-----	-----	-----	0.29
12.83	0.00	42.50	6.17	0.29	-----	-----	-----	-----	-----	-----	0.29
13.20	0.00	42.46	6.01	0.28	-----	-----	-----	-----	-----	-----	0.28

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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
13.57	0.00	42.41	5.85	0.28	-----	-----	-----	-----	-----	-----	0.28
13.93	0.00	42.37	5.76	0.28	-----	-----	-----	-----	-----	-----	0.28
14.30	0.00	42.33	5.71	0.27	-----	-----	-----	-----	-----	-----	0.27
14.67	0.00	42.29	5.67	0.27	-----	-----	-----	-----	-----	-----	0.27
15.03	0.00	42.25	5.62	0.26	-----	-----	-----	-----	-----	-----	0.26
15.40	0.00	42.21	5.58	0.26	-----	-----	-----	-----	-----	-----	0.26
15.77	0.00	42.18	5.50	0.26	-----	-----	-----	-----	-----	-----	0.26
16.13	0.00	42.14	5.40	0.25	-----	-----	-----	-----	-----	-----	0.25
16.50	0.00	42.10	5.31	0.25	-----	-----	-----	-----	-----	-----	0.25
16.87	0.00	42.07	5.21	0.24	-----	-----	-----	-----	-----	-----	0.24
17.23	0.00	42.03	5.12	0.24	-----	-----	-----	-----	-----	-----	0.24
17.60	0.00	41.94	4.77	0.23	-----	-----	-----	-----	-----	-----	0.23
17.97	0.00	41.56	2.68	0.18	-----	-----	-----	-----	-----	-----	0.18

...End

Reservoir Report

English

Reservoir No. 4 - Modified Original Design

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	40.80	01	0	0
1.20	42.00	1,415	850	850
3.20	44.00	16,432	17,847	18,697
5.35	46.15	22,725	42,094	60,790

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	= 40.80	40.80	0.00	0.00
Length ft	= 152.0	5.0	0.0	0.0
Slope %	= 0.40	1.00	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	= 10.33	0.00	0.00	0.00
Crest El. ft	= 43.70	0.00	0.00	0.00
Weir Coeff.	= 3.00	0.00	0.00	0.00
Eqn. Exp.	= 1.50	0.00	0.00	0.00
Multi-Stage	= Yes	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	40.80	0.00	0.00	---	---	0.00	---	---	---	0.00
0.12	85	40.92	0.08	0.03	---	---	0.00	---	---	---	0.03
0.24	170	41.04	0.31	0.06	---	---	0.00	---	---	---	0.06
0.36	255	41.16	0.73	0.10	---	---	0.00	---	---	---	0.10
0.48	340	41.28	1.18	0.13	---	---	0.00	---	---	---	0.13
0.60	425	41.40	1.76	0.16	---	---	0.00	---	---	---	0.16
0.72	510	41.52	2.43	0.18	---	---	0.00	---	---	---	0.18
0.84	595	41.64	3.30	0.19	---	---	0.00	---	---	---	0.19
0.96	680	41.76	3.95	0.21	---	---	0.00	---	---	---	0.21
1.08	765	41.88	4.50	0.22	---	---	0.00	---	---	---	0.22
1.20	850	42.00	5.04	0.24	---	---	0.00	---	---	---	0.24

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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
1.40	2,634	42.20	5.56	0.26	---	---	0.00	---	---	---	0.26
1.60	4,419	42.40	5.79	0.28	---	---	0.00	---	---	---	0.28
1.80	6,204	42.60	6.56	0.30	---	---	0.00	---	---	---	0.30
2.00	7,988	42.80	7.24	0.31	---	---	0.00	---	---	---	0.31
2.20	9,773	43.00	7.87	0.33	---	---	0.00	---	---	---	0.33
2.40	11,558	43.20	8.45	0.35	---	---	0.00	---	---	---	0.35
2.60	13,343	43.40	8.99	0.36	---	---	0.00	---	---	---	0.36
2.80	15,127	43.60	9.51	0.38	---	---	0.00	---	---	---	0.38
3.00	16,912	43.80	9.99	0.39	---	---	0.98	---	---	---	1.37
3.20	18,697	44.00	10.46	0.39	---	---	5.09	---	---	---	5.48
3.41	22,906	44.22	10.91	0.34	---	---	11.12	---	---	---	10.91
3.63	27,115	44.43	11.35	0.00	---	---	18.54	---	---	---	11.35
3.84	31,325	44.65	11.77	0.00	---	---	27.12	---	---	---	11.77
4.06	35,534	44.86	12.17	0.00	---	---	36.73	---	---	---	12.17
4.28	39,743	45.08	12.57	0.00	---	---	47.27	---	---	---	12.57
4.49	43,953	45.29	12.95	0.00	---	---	58.65	---	---	---	12.95
4.71	48,162	45.51	13.32	0.00	---	---	70.82	---	---	---	13.32
4.92	52,372	45.72	13.68	0.00	---	---	83.74	---	---	---	13.68
5.14	56,581	45.94	14.03	0.00	---	---	97.36	---	---	---	14.03
5.35	60,790	46.15	14.37	0.00	---	---	111.64	---	---	---	14.37

...End

Hydrograph Report

English

Hyd. No. 27

Proposed Design 100-Yr

Hydrograph type	= Reservoir	Peak discharge	= 14.30 cfs
Storm frequency	= 100 yrs	Time interval	= 22 min
Inflow hyd. No.	= 10	Reservoir name	= Modified Origin
Max. Elevation	= 46.11 ft	Max. Storage	= 59,918 cuft

Storage Indication method used.

Total Volume = 154,981 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
0.37	7.49	42.44	5.94	0.28	-----	-----	-----	-----	-----	-----	0.28
0.73	10.71	43.70	9.75	0.38	-----	-----	0.48	-----	-----	-----	0.87
1.10	35.69 <<	44.98	12.39	-----	-----	-----	42.61	-----	-----	-----	12.39
1.47	19.27	45.94	14.04	-----	-----	-----	97.80	-----	-----	-----	14.04
1.83	13.92	46.11 <<	14.30	-----	-----	-----	108.68	-----	-----	-----	14.30 <<
2.20	8.92	45.92	14.00	-----	-----	-----	96.49	-----	-----	-----	14.00
2.57	6.42	45.52	13.34	-----	-----	-----	71.53	-----	-----	-----	13.34
2.93	5.35	45.04	12.51	-----	-----	-----	45.67	-----	-----	-----	12.51
3.30	5.00	44.58	11.64	-----	-----	-----	24.43	-----	-----	-----	11.64
3.67	4.64	44.18	10.83	0.35	-----	-----	10.02	-----	-----	-----	9.92
4.03	0.00	43.84	10.08	0.39	-----	-----	1.75	-----	-----	-----	2.14
4.40	0.00	43.64	9.60	0.38	-----	-----	0.18	-----	-----	-----	0.56
4.77	0.00	43.57	9.43	0.37	-----	-----	-----	-----	-----	-----	0.37
5.13	0.00	43.51	9.28	0.37	-----	-----	-----	-----	-----	-----	0.37
5.50	0.00	43.46	9.14	0.37	-----	-----	-----	-----	-----	-----	0.37
5.87	0.00	43.40	9.01	0.36	-----	-----	-----	-----	-----	-----	0.36
6.23	0.00	43.35	8.86	0.36	-----	-----	-----	-----	-----	-----	0.36
6.60	0.00	43.30	8.72	0.35	-----	-----	-----	-----	-----	-----	0.35
6.97	0.00	43.25	8.58	0.35	-----	-----	-----	-----	-----	-----	0.35
7.33	0.00	43.19	8.44	0.35	-----	-----	-----	-----	-----	-----	0.35
7.70	0.00	43.14	8.29	0.34	-----	-----	-----	-----	-----	-----	0.34
8.07	0.00	43.09	8.14	0.34	-----	-----	-----	-----	-----	-----	0.34
8.43	0.00	43.04	8.00	0.33	-----	-----	-----	-----	-----	-----	0.33
8.80	0.00	42.99	7.86	0.33	-----	-----	-----	-----	-----	-----	0.33
9.17	0.00	42.95	7.70	0.33	-----	-----	-----	-----	-----	-----	0.33
9.53	0.00	42.90	7.55	0.32	-----	-----	-----	-----	-----	-----	0.32
9.90	0.00	42.85	7.40	0.32	-----	-----	-----	-----	-----	-----	0.32
10.27	0.00	42.80	7.26	0.31	-----	-----	-----	-----	-----	-----	0.31
10.63	0.00	42.76	7.10	0.31	-----	-----	-----	-----	-----	-----	0.31
11.00	0.00	42.71	6.94	0.31	-----	-----	-----	-----	-----	-----	0.31
11.37	0.00	42.67	6.79	0.30	-----	-----	-----	-----	-----	-----	0.30
11.73	0.00	42.62	6.64	0.30	-----	-----	-----	-----	-----	-----	0.30
12.10	0.00	42.58	6.48	0.29	-----	-----	-----	-----	-----	-----	0.29
12.47	0.00	42.54	6.31	0.29	-----	-----	-----	-----	-----	-----	0.29
12.83	0.00	42.49	6.15	0.29	-----	-----	-----	-----	-----	-----	0.29
13.20	0.00	42.45	5.99	0.28	-----	-----	-----	-----	-----	-----	0.28

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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
13.57	0.00	42.41	5.83	0.28	-----	-----	-----	-----	-----	-----	0.28
13.93	0.00	42.37	5.75	0.28	-----	-----	-----	-----	-----	-----	0.28
14.30	0.00	42.33	5.71	0.27	-----	-----	-----	-----	-----	-----	0.27
14.67	0.00	42.29	5.66	0.27	-----	-----	-----	-----	-----	-----	0.27
15.03	0.00	42.25	5.62	0.26	-----	-----	-----	-----	-----	-----	0.26
15.40	0.00	42.21	5.57	0.26	-----	-----	-----	-----	-----	-----	0.26
15.77	0.00	42.17	5.49	0.26	-----	-----	-----	-----	-----	-----	0.26
16.13	0.00	42.13	5.39	0.25	-----	-----	-----	-----	-----	-----	0.25
16.50	0.00	42.10	5.30	0.25	-----	-----	-----	-----	-----	-----	0.25
16.87	0.00	42.06	5.20	0.24	-----	-----	-----	-----	-----	-----	0.24
17.23	0.00	42.03	5.11	0.24	-----	-----	-----	-----	-----	-----	0.24
17.60	0.00	41.89	4.55	0.22	-----	-----	-----	-----	-----	-----	0.22
17.97	0.00	41.52	2.41	0.18	-----	-----	-----	-----	-----	-----	0.18

...End

Reservoir Report

English

Reservoir No. 4 - Modified Original Design

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	40.80	01	0	0
1.20	42.00	1,415	850	850
3.20	44.00	16,432	17,847	18,697
5.35	46.15	22,725	42,094	60,790

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	= 40.80	40.80	0.00	0.00
Length ft	= 152.0	5.0	0.0	0.0
Slope %	= 0.40	1.00	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	= 10.33	0.00	0.00	0.00
Crest El. ft	= 43.70	0.00	0.00	0.00
Weir Coeff.	= 3.00	0.00	0.00	0.00
Eqn. Exp.	= 1.50	0.00	0.00	0.00
Multi-Stage	= Yes	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	40.80	0.00	0.00	---	---	0.00	---	---	---	0.00
0.12	85	40.92	0.08	0.03	---	---	0.00	---	---	---	0.03
0.24	170	41.04	0.31	0.06	---	---	0.00	---	---	---	0.06
0.36	255	41.16	0.73	0.10	---	---	0.00	---	---	---	0.10
0.48	340	41.28	1.18	0.13	---	---	0.00	---	---	---	0.13
0.60	425	41.40	1.76	0.16	---	---	0.00	---	---	---	0.16
0.72	510	41.52	2.43	0.18	---	---	0.00	---	---	---	0.18
0.84	595	41.64	3.30	0.19	---	---	0.00	---	---	---	0.19
0.96	680	41.76	3.95	0.21	---	---	0.00	---	---	---	0.21
1.08	765	41.88	4.50	0.22	---	---	0.00	---	---	---	0.22
1.20	850	42.00	5.04	0.24	---	---	0.00	---	---	---	0.24

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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
1.40	2,634	42.20	5.56	0.26	---	---	0.00	---	---	---	0.26
1.60	4,419	42.40	5.79	0.28	---	---	0.00	---	---	---	0.28
1.80	6,204	42.60	6.56	0.30	---	---	0.00	---	---	---	0.30
2.00	7,988	42.80	7.24	0.31	---	---	0.00	---	---	---	0.31
2.20	9,773	43.00	7.87	0.33	---	---	0.00	---	---	---	0.33
2.40	11,558	43.20	8.45	0.35	---	---	0.00	---	---	---	0.35
2.60	13,343	43.40	8.99	0.36	---	---	0.00	---	---	---	0.36
2.80	15,127	43.60	9.51	0.38	---	---	0.00	---	---	---	0.38
3.00	16,912	43.80	9.99	0.39	---	---	0.98	---	---	---	1.37
3.20	18,697	44.00	10.46	0.39	---	---	5.09	---	---	---	5.48
3.41	22,906	44.22	10.91	0.34	---	---	11.12	---	---	---	10.91
3.63	27,115	44.43	11.35	0.00	---	---	18.54	---	---	---	11.35
3.84	31,325	44.65	11.77	0.00	---	---	27.12	---	---	---	11.77
4.06	35,534	44.86	12.17	0.00	---	---	36.73	---	---	---	12.17
4.28	39,743	45.08	12.57	0.00	---	---	47.27	---	---	---	12.57
4.49	43,953	45.29	12.95	0.00	---	---	58.65	---	---	---	12.95
4.71	48,162	45.51	13.32	0.00	---	---	70.82	---	---	---	13.32
4.92	52,372	45.72	13.68	0.00	---	---	83.74	---	---	---	13.68
5.14	56,581	45.94	14.03	0.00	---	---	97.36	---	---	---	14.03
5.35	60,790	46.15	14.37	0.00	---	---	111.64	---	---	---	14.37

...End

AES BASIN CALCULATIONS

PUBLIC WORKS

Drainage Calcs

Revised Calcs
For basin #6240 sqm.
2/6/87

Lakewood Sec II

Detention Pond Design For Small Sites

mc003

Pre-development

37.36 Ac ?

$A = 1022500$ S.F. $=$ 22.5 Ac ±

$C = 0.25$ (Woodlands)

$L = 580'$ Overland Flow $\Delta Elev. = 76.4 - 70 = 6.4'$
$S = 6.4/580 = 1.1\%$
$t_c = 33$ min (fig

$L = 780'$ Channel Flow $\Delta Elev. = 70. - 47 = 23$
$S = 23/780 = 2.9\%$
$t_c = 5.5$ min. (fig 1.5.1.2)

$L = 1020'$ Channel Flow $\Delta Elev. = 47 - 39 = 8'$
$S = 8/1020 = 0.78\%$
$t_c = 11$ min (fig 1.5.1.2)

$t_c = 33 + 5.5 + 11 = 49.5$ min.

$I_2 = 1.75$ in/hr. , $Q_2 = 10.28$ cfs

$I_{10} = 3.1$ in/hr. , $Q_{10} = 18.2$ cfs

NO QUALITY, ONLY QUANTITY.

Post-development

- Composite "C" Value -

	Area	C	CA
Rdside & Grass Channel	2.7	0.2	0.54
Business Neighborhood Areas	10.35	0.6	6.21
Residential	5.1	0.4	2.04
	$\Sigma A = 18.15$		$\Sigma CA = 8.79$

WHERE IS THIS SEEM THIS SHOULD BE MORE

$C = \frac{CA}{A} = 0.48$

$L = 3000'$ $\Delta Elev. = 75' - 44' = 31'$

$t_c = 22$ min (fig 1.5.1.2)

$I_2 = \frac{130.3}{18.5+22} = 3.22$ in/hr. , $Q_2 = 28.05$ cfs

$I_{10} = \frac{189.2}{22.1+22} = 4.29$ in/hr. , $Q_{10} = 37.37$ cfs

— Critical Storm Duration for 10 Yr. Post-Dev.

$$T_c = \frac{\sqrt{2CAa(b - t_c/4)}}{q_o} - b$$

Trial 1

Given: $C = 0.48$
$A = 18.15$
$t_c = 22$ min.
$a = 189.2$
$b = 22.1$
$q_o = 10.28$ cfs (allowable peak outflow)

$$T_c = \frac{\sqrt{2(0.48)18.15(189.2)(22.1 - 22/4)}}{10.28} - 22.1$$

$T_c = 51$ min.

$t_c = 22$ min.

— Peak Inflow:

$$Q_o = CA\left[\frac{a}{b + T_c}\right] = 0.48(18.15)\left[\frac{189.2}{22.1 + 51}\right] = 22.5 \text{ cfs}$$

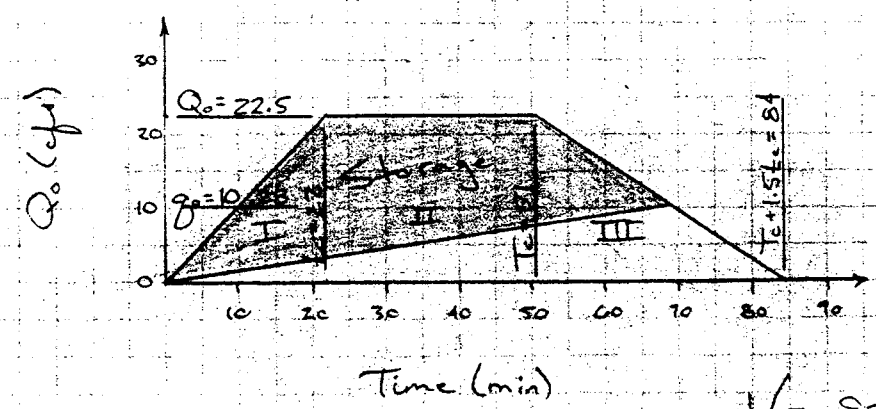
— Req'd Storage for Critical 10 Yr. Storm:

$$V = \left[Q_o T_c + \frac{Q_o t_c}{4} - \frac{q_o T_c}{2} - \frac{3 q_o t_c}{4}\right] 60$$

$$= \left[22.5(51) + \frac{22.5(22)}{4} - \frac{10.28(51)}{2} - \frac{3(10.28)22}{4}\right] 60$$

$$V = 50370 \text{ ft}^3$$

Check:



Area

I	$22.5(22)\frac{1}{2}$ =	247.5
II	$22.5(51-22)$ =	652.5
III	$22.5(84-51)\frac{1}{2}$ =	371.25
		1271.25

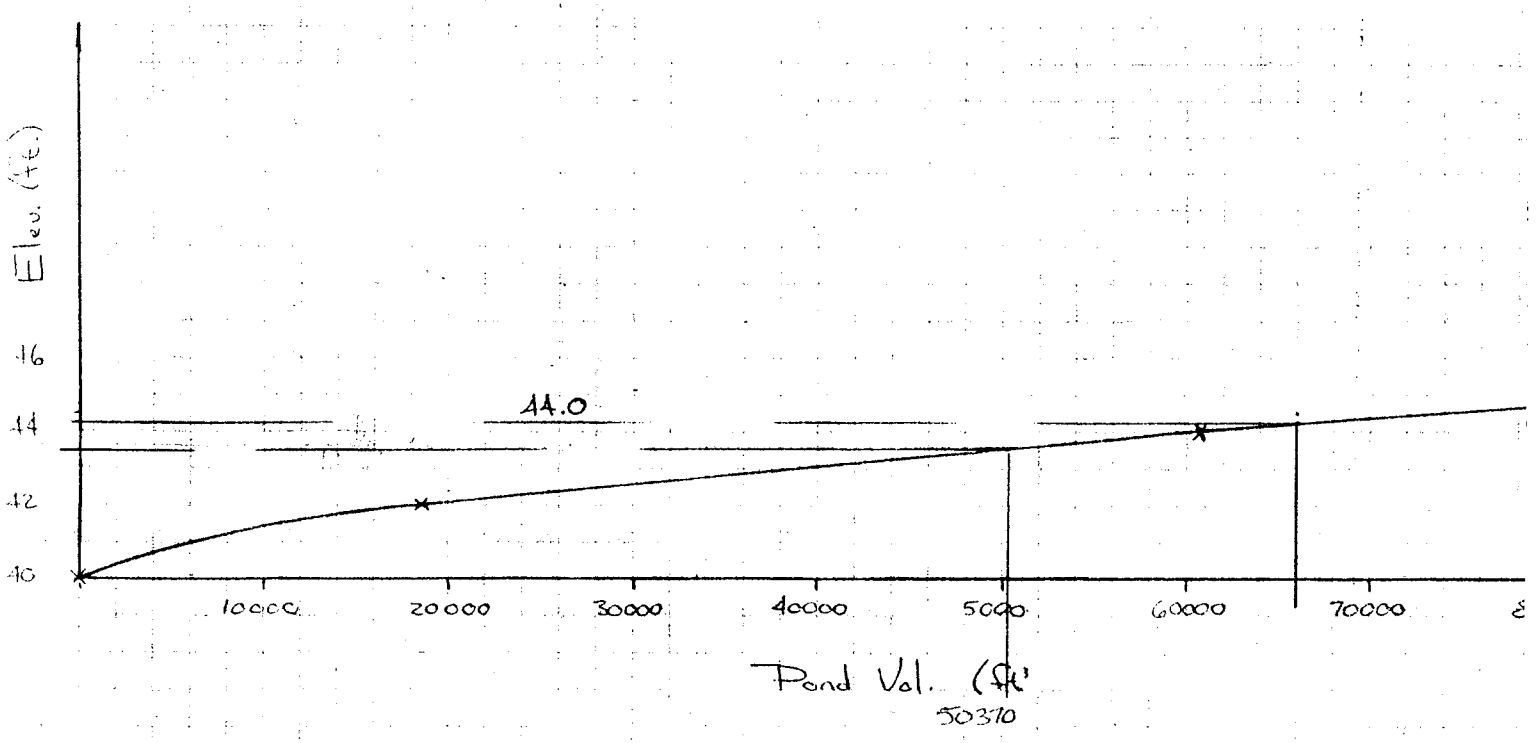
Unshaded Area
$-10.28(84)\frac{1}{2}$ = − 431.76
839.49

$V = 839.5(60) = 50370 \text{ ft}^3$

Checks

3

Elev. (ft)	Area (ft^2)	Avg. Area (ft^2)	Depth (ft)	Incremental Vol. (ft^3)	Σ Vol. (ft^3)
40	0				0
		9250	2	18500	
42	18500				18500
		21125	2	42250	
44	23750				60750
		27000	2	54000	
46	30250				114750



Critical Storm Duration for 25 yr. Post-Dev.

Pre-development

$A = 23.5\ Ac =$
$C = 0.25$

$t_c = 49.5$ min.

$I_2 = 1.75$ in/hr. , $Q_2 = 10.28$ cfs
$I_{10} = 3.1$ in/hr , $Q_{10} = 18.2$ cfs
$I_{25} = 3.75$ in/hr. , $Q_{25} = 22.0$ cfs

Post-development

$A = 18.15\ Ac =$
$C = 0.48$

$t_c = 22$ min. (Fig. 1.5.12.)

$I_2 = 3.22$ in/hr , $Q_2 = 28.05$ cfs
$I_{10} = 4.29$ in/hr. , $Q_{10} = 37.37$ cfs
$I_{25} = 5.5$ in/hr. , $Q_{25} = 47.92$ cfs (chart)

$I = \frac{a}{b+T}$

Outlet Structure:

Try $30'-\left(\frac{12}{15}\right)$" RCP @ 2.5% Inv. In = 40.00'
Inv. Out = 39.25'

Determine outflow by assuming inlet control. (Chart 2)

Pond Surf. Elev. (ft.)	HW (ft)	HW/D 12" ⇐ D ⇒ 15"		Q (cfs) 12" ⇐ D ⇒ 15"	
43.0	3.0	3.0	2.4	7.5	11
43.5	3.5	3.5	2.8	8.5	12
44.0	4.0	4.0	3.2	9.0	13
44.5	4.5	4.5	3.6	9.5	14
45.0	5.0	5.0	4.0	10.0	15

25 yr. Storm $Q_{in} = 47.9$ cfs

Try Elev. 43.0 $q_o = 7.5$ cfs

Storage = 39000 ft³
$V_o = 75(t_c)(Q_{in} - q_o) = 75(22)(47.9-7.5) = 666000$ ft³ (Low)

Try Elev. 44.0 $q_o = 9.0$ cfs

Storage = 60000 ft³
$V_o = 75(22)(47.9-9.0) = 64200$ ft³ (Low)

Try Elev. 44.25 $q_o = 9.25$ cfs

Storage = 66000 ft³
$V_o = 75(22)(47.9-9.25) = 63750$ ft³ (Close Enough)

25 yr. Storm Elev. = 44.25 ft. $Q = 9.25$ cfs < 10.28 cfs Good

Use 12" RCP

- Req'd Sediment Storage Vol.

$(23.5\ Ac)(67\ yd^3/Ac.)(27\ ft^3/yd^3) = 42500\ ft^3$

A temporary riser structure is to be place at the enterance of the culvert to elevation 43.0 ft.

Conclusion :

Detention Pond for Sec. II is designed to detain a 25 yr. storm event and release it at a rate 2 yr. pre-development rate. The 25 yr. detention pond elevation is at 44.25 ft. and is released through a 12 inch RCP. The emergency spillway has an invert at 44.25 ft and is designed to operate in excess of the 25 yr. storm event.

43.5 D1-1

For Public Works

LAKEWOOD, SECTION II

Pre-development Calc's to Existing 18" Culvert Under Rt. 31

2/12/87

D.A. = 34.18 Ac. ±

Composite "C" Value

Watershed	A	C	CA
A	9.18	0.3	2.75
Lakewood Area	25.6	0.25	6.4
	34.78		9.15

$C = 9.11/34.78 = 0.26$

WHERE

L = 850' Overland Flow
ΔElev = 28.3'
S = 3.3%
t_{c_1} = 27 min (fig 1.5.1.1)

L = 1720' Roadside Channel Flow
ΔElev = 10'
S = 0.58%
t_{c_2} = 17 min (fig 1.5.1.2)

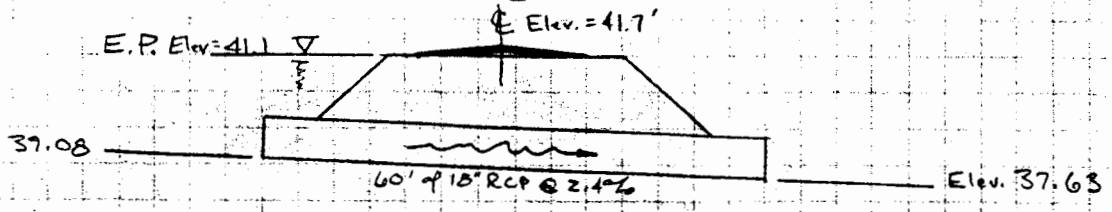
$T_c = t_{c_1} + t_{c_2}$ = 44 min

I_2 = 1.8 in/hr , Q_2 = 16.3 cfs

I_{10} = 3.4 in/hr. , Q_{10} = 30.7 cfs

Upon field inspection it is discovered that the culvert outlet is presently half filled with earth and a proper swale leaving the culvert does not exist. By redefining the swale and flushing the pipe the hydraulic performance of the culvert can be improved. Thus, the stormwater from the culvert will flow away from a roadway fill via a swale which will then transition to sheet flow following the natural drainage pattern to Powhatan Creek.

Assume W.S. @ shoulder elev. (Worst condition)



Check Capacity of 18" RCP Culvert Under Rt 31

Known:
- Dia = 18"
- Length = 60'
- Inv. In = 39.08'
- Inv. Out = 37.63
- Slope = 2.4%

- Q_{cap} = 15 cfs
- V = 8.47 fps
- d_c = 1.45 ft
- $h_o = \frac{d_c + D}{2}$
- $HW = H + h_o - LS_o$

Inlet Control

Assume: HW = 41.1 − 39.08 = 2.02', HW/D = 1.35
Groove end w/ headwall

Q = 10 cfs (Chart 2)

Outlet Control

Downstream obstructions establishing a tailwater surface equal to or greater than the top of the culvert outlet do not exist. Therefore TW ≤ D. Assume flow at Qcap, 15 cfs

V = 8.47, A = 1.77 S.F, d_c = 1.45 ft, W_p = 4.14 S.F (by Seeley Pg. 18-73, Fig. B)
R = 0.377, $H = \left[1 + 0.5 + \frac{29(0.015)^2(60)}{0.927^{1.33}}\right]\frac{8.47^2}{64.4} = 3.02$ → HW = 3.02 + 1.475 − 1.44 = 3.

(39.08) + (3.05)
Inv. In Elev. + HW = 42.13' is well above the road surface elevation and highly unlik
Assume Tw = D = h_o = 1.5' > d_c, H = 2.02 − 1.5 + 1.44 = 1.96' then from Chart
Q = 11.5 cfs > 10 cfs

Conclude: Inlet Controls

Conclusion:

Presently the 18" culvert recieves a Q_{TOTAL} = 30.7 cfs from a 34.78 Ac. ± watershed during a 10 yr. storm event. The watershed is 27% residential and 73% woodlands! Based on field data and the assumption that headwater equals 1.35 times the diameter of the entrande culvert it is determined that the culvert operates under inlet controled conditions at a capacity of Qcap = 10 cfs. Therefore the 18 inch culvert is inadequate to function properly within a 10yr. or 2yr. storm event.

Drainage Calcs

#6240 SEH 2/6/87

Lakewood Sec. II

Detention Pond Design For Small Sites

Pre-development

$A = 1022500$ S.F. $= 23.5$ Ac ±

$C = 0.25$ (Woodlands)

$L = 580'$ Overland Flow — $\Delta Elev. = 76.4 - 70 = 6.4'$, $S = 6.4/580 = 1.1\%$, $t_{c_1} = 33$ min (fig.

$L = 780'$ Channel Flow — $\Delta Elev. = 70 - 47 = 23$, $S = 23/780 = 2.9\%$, $t_{c_2} = 5.5$ min. (fig 1.5.1.2)

$L = 1020'$ Channel Flow — $\Delta Elev. = 47 - 39 = 8'$, $S = 8/1020 = 0.78\%$, $t_{c_3} = 11$ min (fig 1.5.1.2)

$t_c = 33 + 5.5 + 11 = 49.5$ min.

$I_2 = 1.75$ in/hr., $Q_2 = 10.28$ cfs ✓

$I_{10} = 3.1$ in/hr., $Q_{10} = 18.2$ cfs

23.5
13.15

Post-development

- Composite "C" Value -

	Area	C	CA
Roadside & Grass Channel	2.7	0.2	0.54
Business Neighborhood Areas	10.35	0.6	6.21
Residential	5.1	0.4 ✓	2.04
	$\Sigma A = 18.15$		$\Sigma CA = 8.79$

$C = \frac{CA}{A} = 0.48$

$L = 3000'$ $\Delta Elev. = 75' - 44' = 31'$

$t_c = 22$ min (fig. 1.5.1.2)

$I_2 = \frac{130.3}{18.5+22} = 3.22$ in/hr., $Q_2 = 28.05$ cfs

$I_{10} = \frac{189.2}{22.1+22} = 4.29$ in/hr., $Q_{10} = 37.37$ cfs

— Critical Storm Duration for 10 Yr. Post-Dev.

$$T_c = \sqrt{\frac{2CAa(b - t_c/4)}{q_o}} - b$$

Trial 1

Given: $C = 0.48$
$A = 18.15$
$t_c = 22$ min.
$a = 189.2$
$b = 22.1$
$q_o = 10.28$ cfs (allowable peak outflow)

$$T_c = \sqrt{\frac{2(0.48)18.15(189.2)(22.1 - 22/4)}{10.28}} - 22.1$$

$T_c = 51$ min.

$t_c = 22$ min.

— Peak Inflow:

$$Q_o = CA\left[\frac{a}{b + T_c}\right] = 0.48(18.15)\left[\frac{189.2}{22.1 + 51}\right] = 22.5 \text{ cfs}$$

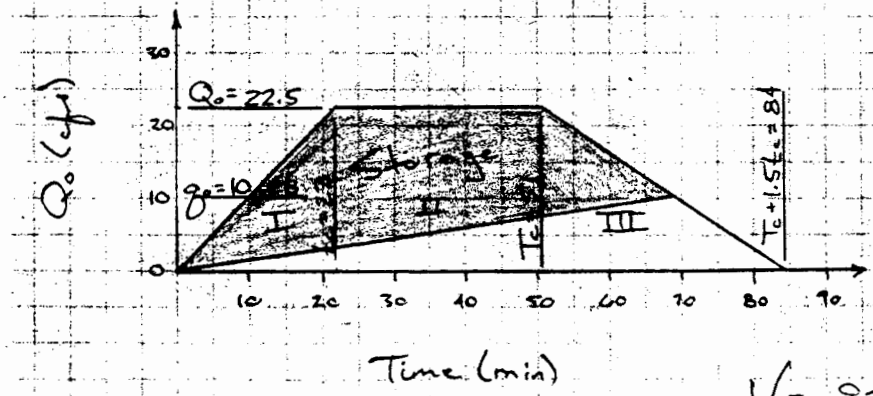
— Req'd Storage for Critical 10 Yr. Storm:

$$V = \left[Q_o T_c + \frac{Q_o t_c}{4} - \frac{q_o T_c}{2} - \frac{3 q_o t_c}{4}\right] 60$$

$$= \left[22.5(51) + \frac{22.5(22)}{4} - \frac{10.28(51)}{2} - \frac{3(10.28)22}{4}\right] 60$$

$$V = 50370 \text{ ft}^3$$

Check:

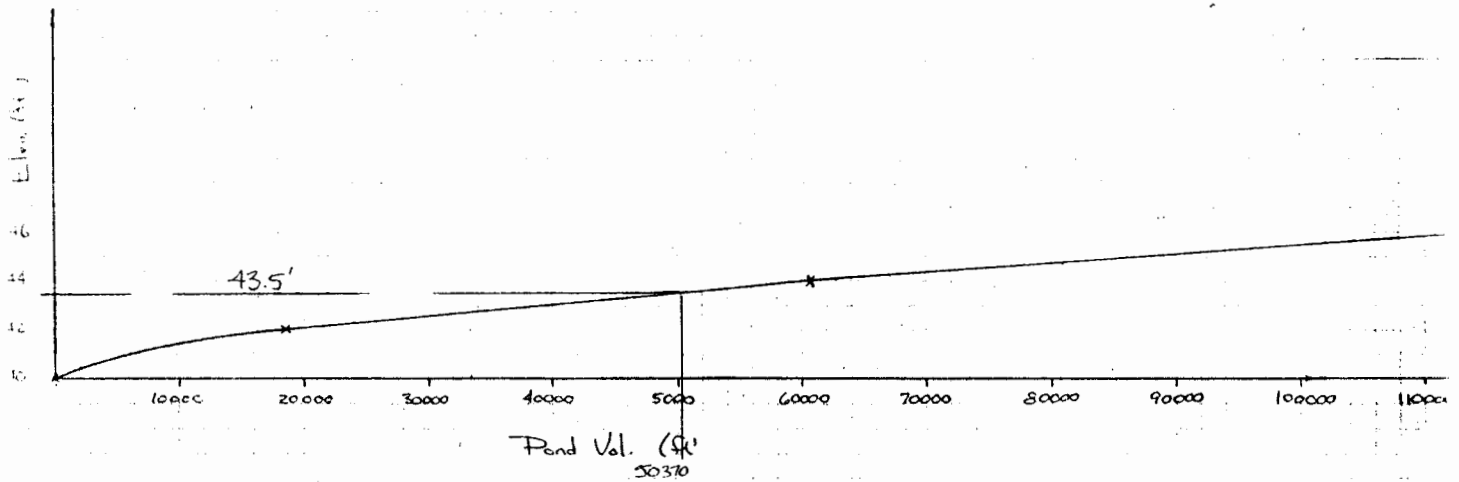


		Area
I	$22.5(22)\frac{1}{2}$ =	247.5
II	$22.5(51-22)$ =	652.5
III	$22.5(84-51)\frac{1}{2}$ =	371.25
		1271.25
Unshaded Area	$-10.28(84)\frac{1}{2}$ =	− 431.76
		839.49

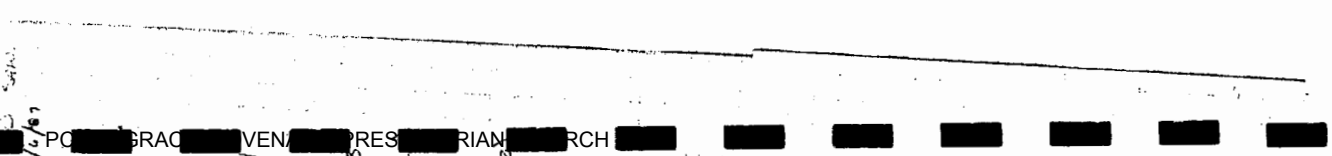
$V = 839.5(60) = 50370 \text{ ft}^3$

Checks

Elevation (ft)	Area (ft²)	Avg. Area (ft²)	Depth (ft)	Incremental Vol. (ft³)	Σ Vol. (ft³)
40	0				0
		9250	2	18500	
42	18500				18500
		21125	2	42250	
44	23750				60750
		27000	2	54000	
46	30250				114750



D



- Req'd Sediment Storage Vol.

$(23.5\ Ac \times 67\ ft^3/Ac.) = 1574.5\ ft^3$

→ Turned up pipe to be 42,511 (y) for 18 ac
or 33,100

— Determine Pipe Size to Pass Q_2 Pre-dev.

Given: Pond Elev. = 43.5'
T_W = 1.5' (Assumed)
Q_2 = 14.34 cfs (pre-dev.)
HW = 43.5 - 40.0 = 3.5'

$HW = H + h_o - LS_o$

where: $h_o = T_W = 1.5'$
$LS_o = 30(0.025) = 0.75'$

$H = 3.5 - (1.5 - 0.75) = 2.75'$

$$H = \left[1 + K_e + \frac{29n^2L}{R^{1.33}}\right]\frac{V^2}{2g}$$

where: $K_e = 0.5$
$n = 0.015$ for RCP
$L = 30$
$R = A/W_p$

Try 18" = Dia

A = 1.77 ft²
WP = 4.71 ft
R = 0.376

$$2.75 = \left[1 + 0.5 + \frac{29(0.015)^2\,30}{0.376^{1.33}}\right]\frac{V^2}{2(32.2)}$$

$$V = \sqrt{2.75(29.02)} = 8.93\ fps$$

$\therefore Q = 1.77(8.93) = 15.81\ cfs > 10.28\ cfs$

NG

Try 15 ...

$A = 1.23\ ft^2$
$WP = 3.93\ ft$
$R = 0.313$

$$2.75 = \left[1 + 0.5 + \frac{29(0.015)^2 30}{0.313^{1.33}}\right]\frac{V^2}{64.4}$$

$$V = \sqrt{2.75(26.64)} = 8.56\ fps$$

$$\therefore Q = 1.23(8.56) = 10.50\ cfs$$ Close Enough

Trial 2

$q_o = 10.50\ cfs$

- Critical Storm Duration for 10 Yr. Post-Dev.:

$$T_c = \sqrt{\frac{2(0.48)\,18.15\,(189.2)(22.1 - 22/4)}{10.50}} - 22.1$$

$T_c = 50.0\ min$

$t_c = 22\ min.$

- Peak Inflow:

$$Q_o = 0.48(18.15)\left[\frac{189.2}{22.1 + 50.0}\right] = 22.9\ cfs$$

- Req'd Storage for Critical 10 Yr. Storm:

$$V = \left[22.9(50.0) + \frac{22.9(22)}{4} - \frac{10.50(50.0)}{2} - \frac{3(10.50)(22)}{4}\right]60$$

$V = 50112\ ft^3$ → Pond Elev. = 43.5'

Conclusion: Detention Pond for Sec. II is designed to detain a 10 Yr. storm and release it at a 2yr. pre-development rate. The 10yr. detention pond elevation is at 43.5 ft and is released through a 15 in RCP pipe. The emergency spillway has an invert at 43.5 ft and is designed to operate in excess of 10 yr. storm events.

Sizing of Culvert Under Lakewood Dr. (Post Dev.) and Level Way

Composite "C" Value

Watershed	A	C	CA
A	9.18	0.3	2.75
B	0.5	0.45	0.23
Level Way to Rt 31	0.36	0.66	0.24
Rt 615 to Lakewood Dr	0.52	0.56	0.29
	10.56		3.51

$C = 3.51/10.56 = 0.33$

$A = 10.56$ Ac

$L = 850$ Overland Flow @ $S = 3.3\%$
$t_c = 27$ min.

$L = 1720$ Channel Flow @ $S = 0.58\%$
$t_c = 17$ min.

$T_c = 44$ min.

$I_2 = 1.8$ in/hr., $Q_2 = 6.27$ cfs

$I_{10} = 3.4$ in/hr., $Q_{10} = 11.85$ cfs

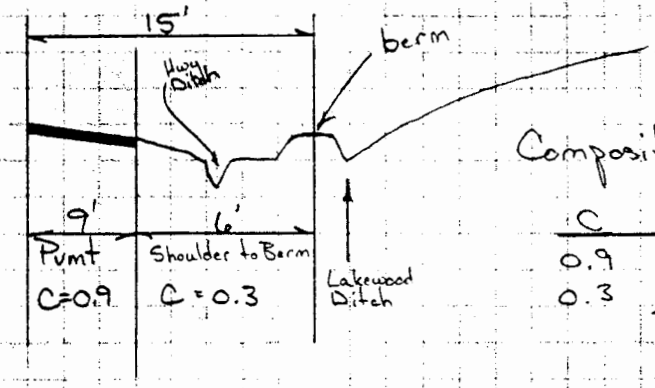
Use 3 - 14" x 23" Elliptical Pipe @ 0.2%
(Designated Equivalent = 18" Round)

$Q_{cap} = 4.3$ cfs

$3 \times Q_{cap} = 12.9$ cfs > 11.85 cfs

Good

℄ of Rt 615 to Crest of Berm (From Level Way to Rt 31)



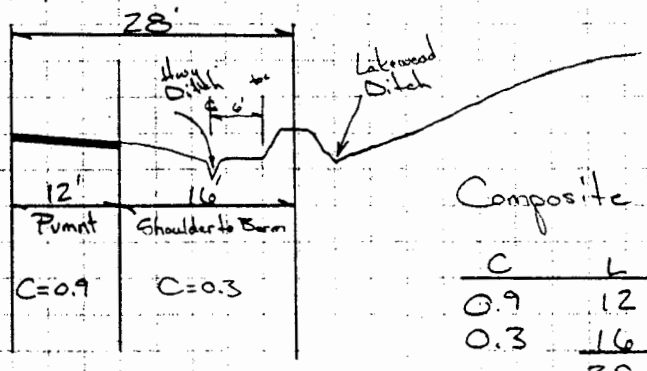
Composite "C" Value for ROW

C	L	CL
0.9	9	8.1
0.3	6	1.8
	15	9.9

$C = 9.9/15 = 0.66$

$A = 15'(1050') = 15750\ S.F. = 0.36\ Ac.$

℄ of Rt 31 to Crest of Berm (From Rt. 615 to Lakewood Dr.)



Composite "C" Value

C	L	CL
0.9	12	10.8
0.3	16	4.8
	28	15.6

$C = 15.6/28 = 0.56$

$A = 28'(810') = 22680\ S.F.\pm = 0.52\ Ac.\pm$

Sizing of Culvert at Level Way & Rt 615

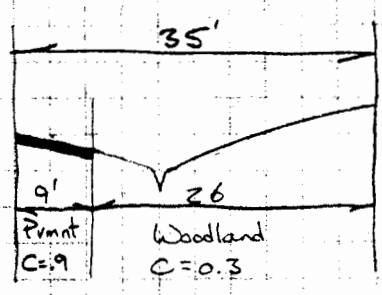
$A = 0.5\ Ac$

$C = 0.45$

$L = 390'$

$\Delta Elev. = 76 - 72.8 = 3.2'$

$S = 3.2/390 = 0.82\%$



Composite "C" Value

C	L	CL
0.9	9	8.1
0.3	26	7.8
	35	15.9

$C = 15.9/35 = 0.45$

$t_c = 21$ min

$I_2 = 3.0$ in/hr. , $Q = 0.68$ cfs

$I_{10} = 5.6$ in/hr. , $Q = 1.26$ cfs

Use a 15" RCP @ 2.1% $Q_{cap} = 8.5$ cfs **Good** ✓

Watershed A

$A = 9.18\ Ac \pm$

$C = 0.3$ (Residential)

Overland Flow $L = 850'$ $C = 0.3$ (Residential)

$\Delta Elev. = 78.4 - 50.1 = 28.3$

$S = 28.3/850 = 3.3\%$

$t_c = 27$ min.

SUBSURFACE EXPLORATION
AND GEOTECHNICAL ENGINEERING ANALYSIS

PROPOSED GRACE COVENANT PRESBYTERIAN CHURCH
IRONBOUND AND JAMESTOWN ROADS
JAMES CITY COUNTY, VIRGINIA

for

MAGOON & ASSOCIATES

Mr. Robert A. Magoon, Jr.

April 22, 2002

ECS Project No. 07:5669

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

April 22, 2002

Mr. Robert A. Magoon, Jr.
Magoon & Associates
1317 Jamestown Road, Suite 103
Williamsburg, Virginia 23185

ECS Project No. 07:5669

Re: Subsurface Exploration and Geotechnical Engineering Analysis
Proposed Grace Covenant Presbyterian Church
Ironbound and Jamestown Roads
James City County, Virginia

Dear Mr. Magoon:

Engineering Consulting Services, Ltd. has completed a subsurface exploration and engineering evaluation of the above referenced project. This report presents the results of our subsurface exploration and an engineering evaluation of the proposed church building and parking lot. The recommendations presented herein are based upon six (6) soil test borings performed in the proposed building and parking lot areas.

Introduction

The project site is located on the north side of Jamestown Road in James City County, Virginia. The site is bordered to the north by the Lakewood Subdivision, to the east by Lakewood Drive, and to the west by Ironbound Road. At the time of our site reconnaissance, the site was wooded and sloped from the rear of the lot towards Jamestown Road. Site elevations appeared to vary between 10 to 15 feet.

Proposed for construction is a new 12,000 SF one-story church building. The building will consist of a worship/fellowship hall, classrooms, and office spaces. We have assumed that the building will be constructed of either wood- and/or light-gauge steel-framing with masonry block bearing walls and a truss roof. Parking for about 92 vehicles will be located on the east side of the building. Additionally, there are plans for a future worship hall that will be located off of the south central section of the new building, and future parking to accommodate an additional 71 vehicles. We have not been provided with structural loads at the writing of this report. Therefore, we have assumed that maximum loads are not expected to exceed about 3 kips per linear foot for wall loads, and 75 kips for column loads. We have assumed the floor loads for the concrete slabs-on-grade should not exceed about 200 pounds per square foot (psf). We have also assumed finished floor grades will be with 2 feet (+/-) of existing surface grades.

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 project. We accomplished these purposes by drilling soil borings to explore the subsurface soil and groundwater conditions, performing a site reconnaissance to observe general topography, and analyzing field data to develop appropriate geotechnical engineering recommendations regarding the proposed construction. A Boring Location Diagram is included in Attachment 1.

Field Exploration Procedures:

The soil test borings were performed with an ATV-mounted auger drill rig utilizing continuous flight and hollow stem augers to advance the borehole. Drilling fluid was not used in this process.

Representative soil samples were obtained by means of the split-barrel sampling procedure in accordance with ASTM Specification D-1586. In this procedure, a 2-inch outside diameter split-barrel sampler is driven into the soil a distance of 24 inches by a 140-pound hammer falling 30 inches. After a 6-inch seating interval, the number of blows required to drive the sampler through the next 12-inch interval is termed the Standard Penetration Test (SPT) value and is indicated for each sample on the boring log. This value can be used as a qualitative indication of the in-place relative density and relative consistency of cohesionless soils and cohesive soils, respectively. This indication is qualitative, since many factors can significantly affect the standard penetration resistance value and prevent a direct correlation between drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies.

Field logs of the soils encountered in the borings were maintained by the drill crew. After recovery, each sample was removed from the sampler and visually classified. Representative portions of each sample were sealed in glass jars and delivered to our laboratory in Williamsburg, Virginia, for further visual examination and laboratory testing.

Laboratory Analysis and Subsurface Conditions:

Experienced personnel from our office classified each splitspoon soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS). Select samples were also subjected to natural moisture content, gradation analysis, and Atterberg Limits testing. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. 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. A brief explanation of the USCS and Reference Notes for Boring Logs are provided in Attachment 4 of this report.

Our subsurface exploration and site reconnaissance determined that the surface of the site is generally covered with about 1 to 3 inches of topsoil material. Underlying the surficial topsoil,

we encountered very loose density Clayey SAND (SC) in Boring B-6 that extended to a depth of 4 feet below site grades. The Standard Penetration Test (SPT) result or N-value recorded within this layer was 2 blows-per-foot (BPF).

Underlying the topsoil in the other five borings and the coarse-grained layer in B-6, we encountered Sandy CLAY (CL) that extended to depths of about 12 feet below site grades in Borings B-1 and B-2, and to the depths of the remaining borings at 10 and 15 feet below site grades (boring termination). The near-surface soils were of very soft to soft consistency to depths of about 2 to 4 feet below the ground surface. The Clays below these depths were of medium stiff to very stiff consistency. The Standard Penetration Test (SPT) results or N-values recorded within these fine-grained deposits ranged between 2 and 28 BPF.

Underlying this stratum, we encountered medium dense to very dense density Silty SAND (SM) with gravel extending to the depth of Borings B-1 and B-2 at 20 feet. SPT N-values recorded within this stratum ranged from 16 to 68 BPF. More detailed subsurface conditions are provided on the boring logs included in Attachment 2 of this report.

We did not encounter the groundwater during drilling of the borings. It is noted that groundwater levels are influenced by seasonal conditions and periods of significant precipitation or prolonged drought. Additionally, a perched water table could be encountered due to the near-surface fine-grained layers. If groundwater is encountered during the construction of excavations, it should be pumped from sumps excavated adjacent to the construction excavations.

Foundations:

Shallow spread footings are considered suitable for support of the proposed structure. Footings may be sized for a net allowable bearing pressure of 3000 psf for maximum column and wall loads up to 75 kips and 3 kips/linear foot, respectively. The base of the footings should be a minimum of 20 inches wide for wall footings and 30 inches wide for column footings to minimize potential failure of the bearing soils by local or punching shear action. We recommend that the footings bear in stable original, undisturbed subgrade or on flowable fill (extending to stable original, undisturbed subgrade) as discussed below.

The fine-grained soils encountered in the test borings are considered to have a moderate to high shrink-swell potential. Also, the surficial soils to depths of 2 to 4 feet appeared to be of very soft to soft consistency. To reduce the potential effects of both seasonal volume changes of the clay soils and differential settlement due to consolidation of the softer surficial soils, we recommend the footings be founded at a depth of least 36 inches below the existing ground surface. Additional undercuts of 12 inches may be necessary to remove these very soft soils if encountered at these depths. The spread footings may be stepped down to the cut grade, or the undercut area may be backfilled with flowable fill, to re-establish desired footing elevations at the minimum recommended embedment depth of 18 inches below final site grades for frost protection considerations.

The footings should be evaluated as an independent system which are not rigidly connected to the floor slab-on-grade. In addition, we recommend that all continuous (strip type) footings be adequately reinforced and be of sufficient thickness so as to better distribute the foundation structural loading and to span soft zones or other inconsistencies in the subgrade bearing soils.

The net allowable soil bearing pressure refers to that pressure which may be transmitted to the foundation bearing soils in excess of the final minimum surrounding overburden pressure. The bearing capacity at the final footing elevations should be verified in the field by an experienced Geotechnical Engineer to assure that the in-situ bearing capacity at the base of each footing excavation meets or exceeds the design bearing pressure.

We recommend that all topsoil, rootmatting, uncontrolled fill (if encountered) and any soft or unstable subgrade be removed from below all footings. At this time it is unknown what volume of unsuitable material and/or debris may be encountered, therefore, a unit price for over-excavation, and importation and placement of select fill should be provided in the foundation contract.

The net allowable soil bearing pressure refers to that pressure which may be transmitted to the foundation bearing soils in excess of the final minimum surrounding overburden pressure. Based on footings designed and constructed herein utilizing a net allowable bearing pressure of 3000 psf, the total long term settlement for the building is estimated to not exceed one inch, with differential settlements along equal lengths of wall estimated to not exceed one-half inch.

Seismic Design

We have evaluated the seismic site coefficient (S) in accordance with BOCA 1610.3.1 (1999). We recommend a site coefficient (S) value of 1.2 be used for Soil Type S_2 for seismic design at this site. Alternatively, we consider the soils to match Site-Class Type D based on the FEMA Document No. 302, "NEHRP Provisions for Seismic Regulations for New Buildings and Other Structures, 1997", Section 4.1.2.2, and ANSI/ASCE 7-95, "Minimum Design Loads for Buildings and Other Structures", Section 9.1.4.2.

Floor Slab Design

For the design and construction of the floor slabs-on-grade for the proposed building, it is recommended that all topsoil, rootmatting, unsuitable or unstable uncontrolled fill (if encountered) and any other soft or unsuitable materials be removed from below the bottom of the floor slab. The stripped area should be observed by an experienced Geotechnical Engineer during the time of construction in order to aid in locating any such unsuitable materials which should be removed. In an effort to densify the loose surficial subgrade soils, the stripped area should be proofrolled with a smooth drum roller with a minimum of two passes in two perpendicular directions, provided in-situ moisture contents are within $\pm$3% of optimum in order to facilitate compaction.

Topsoil depths were observed to be between 1 and 3 inches; however, clearing and grubbing operations on wooded sites typically disturbs the surficial soils below the depth of the topsoil. We recommend an initial site stripping depth of twelve (12) inches be considered for project planning purposes. Also, we encountered very soft to soft consistency clayey soils to depths of about 2 to 4 feet below site grades. Additional undercuts of 18 to 24 inches may be necessary to remove these saturated, unsuitable soils from beneath new slabs-on-grade if the proofrolling cannot sufficiently compact the existing surficial soils.

Engineered fill (select) material required to raise the building site to the design floor slab subgrade elevation should consist of an approved inorganic material classified as CL, SC, SM, SM-SP, or SP and be free of debris. On-site soils are expected to meet this criterion. This material should be placed in horizontal lifts not exceeding 8 inches in loose thickness, moisture conditioned to within ±3% of the optimum moisture content, and compacted to a minimum of 95% of the maximum density obtained in accordance with ASTM Specification D-698, Standard Proctor method. Select fill should extend a minimum of 5 feet beyond building limits at finish subgrade elevation and then slope no greater than 2 horizontal to 1 vertical.

We recommend the slabs-on-grade be directly supported by a minimum of 4 inches of a well graded, clean granular material (porous fill) having a maximum aggregate size of 1.5 inch and no more than 15% passing the #200 Sieve (GM, GW, GP, SM, SW, SP). VDOT No. 57 stone and VDOT Grade A Fine Aggregate meet the criteria for porous fill. This granular layer will facilitate the fine grading of the subgrade, provide more uniform bearing conditions, and help minimize the rise of water to the bottom of the slab via capillary action. The slab should also be directly underlain by a suitable polyethylene vapor retarder to minimize moisture intrusion into the slab. Provided the design and construction recommendations discussed herein are followed, the slab may be designed assuming a Modulus of Subgrade Reaction, K_S, of 150 psi per inch.

Exterior Pavements

For the construction of new exterior pavements, we recommend that any topsoil, uncontrolled fill (if encountered), and any otherwise soft 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.

Topsoil depths were observed to be between 1 and 3 inches; however, clearing and grubbing operations on wooded sites typically disturbs the surficial soils below the depth of the topsoil. We recommend an initial site stripping depth of twelve (12) inches be considered for project planning purposes. Also, we encountered very soft to soft consistency clays and very loose density sands to depths of about 2 to 4 feet below site grades. Additional undercuts of 18 to 24 inches may be necessary to remove saturated, unsuitable soils from beneath new pavement sections if the proofrolling cannot sufficiently compact the existing surficial soils. If the depth of undercut extends into large areas, the use of geotextiles or fabrics may be recommended to reduce the volume of undercut. The use of geotextiles or fabrics should be evaluated at the time

of construction.

An important consideration with the design and construction of 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.

The subgrades in the parking lot areas consisted of Sandy CLAY (CL) and Clayey SAND (SC) soils based on the information obtained in the test borings. We were not requested to collect a sample of the subgrade soils for CBR testing. However, we have performed CBR testing on similar soils on nearby sites. We recommend a design CBR value of 5 be utilized for pavement design. Also, these soils are expected to have a Resiliency Factor (RF) of 2.0. The resulting Soil Support Value (SSV=RF X Design CBR) is 10. The following pavement sections based on daily vehicles, weekly delivery and trash trucks, VDOT Vaswani design methods and our experience in the project area, are recommended for this project:

- **Flexible Pavement - Light Duty Section (Automobile Parking Areas-Up to 500 VPD):**

Asphalt Surface	- 2.0 inches Asphalt Concrete Surface Mix, Type SM-12.5.
Aggregate Subbase	- 8.0 inches untreated Aggregate Base Material, Type I, Size 21A/B.
Subbase	- Variable Select Material (Sand); If Required.
Subgrade	- Stable and compacted to a dry density of at least 95% of the soil's Standard Proctor maximum dry density (ASTM D-698) to a depth of 8.0 inches below subgrade elevation. Compaction testing may be waived by the Geotechnical Engineer based on the results of the proofrolling operations.

- **Flexible Pavement - Heavy Duty Section (Main Drives Lanes - Up to 900 VPD):**

Asphalt Surface	- 1.5 inches Asphalt Concrete Surface Mix, Type SM-9.5.
Asphalt Base	- 3.0 inches Asphalt Concrete Base Mix, Type BM-25.
Aggregate Subbase	- 6.0 inches untreated Aggregate Base Material, Type I, Size 21A/B.
Subbase	- Variable Select Material (Sand); If Required.
Subgrade	- Stable and compacted to a dry density of at least 95% of the soil's Standard Proctor maximum dry density (ASTM D698) to a depth of 8.0 inches below subgrade

water is encountered, we expect that dewatering in shallow trenches could be accomplished by pumping from sumps adjacent to the construction excavations. The specifications should, however, alert the contractor to the potential presence of subsurface water, and it should be incumbent on the contractor to provide the means by which to satisfactorily dewater the site.

General Comments

This report has been prepared in order to aid in the evaluation of this site and to assist the Contractor, Architect and Engineer in the design and planning of the project. The report scope is limited to the specific project and location described, and the project description represents our understanding of the significant aspects relevant to soil and foundation characteristics.

We have appreciated being of service to you during the design phase of this project and look forward to its successful construction. 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 contact our office.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.

Michael J. Galli, P.E.
Geotechincal Engineer

Gary R. Witsman, P.E.
Principal Engineer

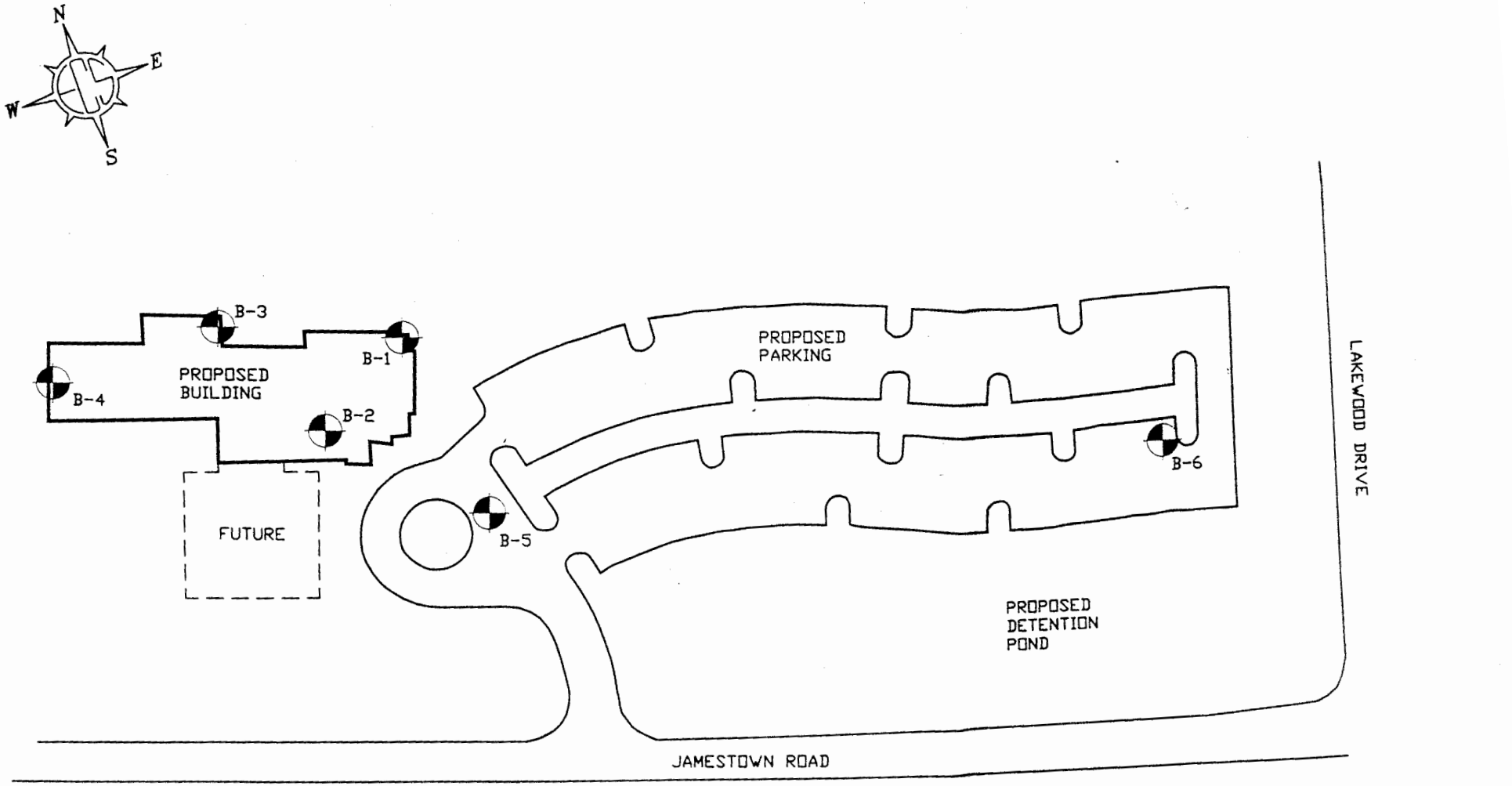
COMMONWEALTH OF VIRGINIA
MICHAEL J. GALLI
No. 030684
PROFESSIONAL ENGINEER

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

Copies: (3) Magoon & Associates (Mr. Robert A. Magoon, Jr.)

I:letters/mike/5669rpt.doc

ECS LTD



SCALE (IN FEET)

40 80

80 0

LEGEND:

⊕ –APPROX. BORING LOCATION

REVISIONS

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BORING LOCATION DIAGRAM
GRACE COVENANT PRESBYTERIAN CH

MAGOON & ASSOCIATES

CJB	MJG	04-16-02	SHOWN	07:5669	1 OF

CLIENT: MAGOON & ASSOCIATES

JOB # 07:5669 | BORING # B-1 | SHEET 1 OF 1

PROJECT NAME: GRACE COVENANT PRESBYTERIAN CHURCH

ARCHITECT-ENGINEER: MAGOON & ASSOCIATES

SITE LOCATION: IRONBOUND AND JAMESTOWN ROADS, 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	WATER LEVELS ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
					ENGLISH UNITS		
					SURFACE ELEVATION		
0	1	SS	24	24	Fine Sandy CLAY, Tan and Orangish Brown, Moist, Very Soft to Soft, (CL)		2
	2	SS	24	24			5
5	3	SS	24	24	Fine Sandy CLAY, Orangish Brown, Light Gray and Tan, Moist, Very Stiff, (CL)		21
	4	SS	24	24	Fine to Medium Sandy CLAY, Trace Coarse Sand, Orangish Brown, Reddish Brown and Light Gray, Moist, Very Stiff, (CL)		22
	5	SS	24	24			23
10					Fine to Coarse Silty SAND, With Clay and Gravel, Tan and White, Moist, Very Dense, (SM-SC)		
	6	SS	24	24			64
15							
	7	SS	24	24			68
20					END OF BORING @ 20.0'		
25							
30							

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

▽WL DRY (WS OR WD)	BORING STARTED 04-08-02	TOPSOIL DEPTH 2"
▽WL(AB) ▽WL(AC)	BORING COMPLETED 04-08-02	CAVE IN DEPTH ● 19.5'
▽WL	RIG ATV FOREMAN SDS	DRILLING METHOD HSA

CLIENT: MAGOON & ASSOCIATES

JOB #: 07:5669 | BORING #: B-2 | SHEET: 1 OF 1

PROJECT NAME: GRACE COVENANT PRESBYTERIAN CHURCH

ARCHITECT-ENGINEER: MAGOON & ASSOCIATES

SITE LOCATION: IRONBOUND AND JAMESTOWN ROADS, JAMES CITY COUNTY, VIRGINIA

ENGLISH UNITS

SURFACE ELEVATION

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	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Fine Sandy CLAY, Orangish Brown, Moist, Very Soft to Medium Stiff, (CL)			2
	2	SS	24	24				6
5	3	SS	24	24	Fine Sandy CLAY, Orangish Brown, Tan and Light Gray, Moist, Very Stiff, (CL)			21
	4	SS	24	24	Fine to Medium Sandy CLAY, Orangish Brown, Reddish Brown and Light Gray, Moist, Very Stiff, (CL)			19
	5	SS	24	24				18
10					Fine to Coarse Silty SAND, With Clay and Fine Gravel, Tan and White, Moist, Medium Dense, (SM-SC)			
	6	SS	24	24				16
15					Fine to Coarse Silty SAND, With Clay and Fine Gravel, Tan, White Medium Brown, Moist, Very Dense, (SM-SC)			
	7	SS	24	24				62
20					END OF BORING @ 20.0'			
25								
30								

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

▽WL DRY (WS OR WD)	BORING STARTED 04-08-02	TOPSOIL DEPTH 2"
▽WL(AB) ▽WL(AC)	BORING COMPLETED 04-08-02	CAVE IN DEPTH ● 18'
▽WL	RIG ATV FOREMAN SDS	DRILLING METHOD HSA

CLIENT: MAGOON & ASSOCIATES

JOB #: 07:5669 | BORING #: B-3 | SHEET: 1 OF 1

PROJECT NAME: GRACE COVENANT PRESBYTERIAN CHURCH

ARCHITECT-ENGINEER: MAGOON & ASSOCIATES

SITE LOCATION: IRONBOUND AND JAMESTOWN ROADS, 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 CLAY, Trace Roots, Orangish Brown, Moist, Soft to Medium Stiff, (CL)		4
	2	SS	24	24			6
5	3	SS	24	24	Fine Sandy CLAY, Orangish Brown and Reddish Brown, Moist, Very Stiff, (CL)		16
	4	SS	24	24	Fine to Medium Sandy CLAY, Orangish Brown, Reddish Brown and Light Gray, Moist, Stiff to Very Stiff, (CL)		15
10	5	SS	24	24			16
	6	SS	24	24			25
15					END OF BORING @ 15.0'		
20							
25							
30							

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

▽WL DRY (WS OR WD)	BORING STARTED 04-08-02	TOPSOIL DEPTH 3"
▽WL(AB) ▽WL(AC)	BORING COMPLETED 04-08-02	CAVE IN DEPTH ●
▽WL	RIG ATV FOREMAN SDS	DRILLING METHOD HSA

MAGOON & ASSOCIATES | 07:5669 | B-4 | 1 OF 1

PROJECT NAME GRACE COVENANT PRESBYTERIAN CHURCH

ARCHITECT-ENGINEER MAGOON & ASSOCIATES

SITE LOCATION IRONBOUND AND JAMESTOWN ROADS, JAMES CITY COUNTY, VIRGINIA

ENGLISH UNITS

SURFACE ELEVATION

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	WATER LEVELS ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Fine Sandy CLAY, With Roots, Tan, Moist, Very Soft, (CL)		1
	2	SS	24	24	Fine Sandy CLAY, Orangish Brown, Reddish Brown and Light Gray, Moist, Medium Stiff, (CL)		8
5	3	SS	24	24	Fine to Medium Sandy CLAY, Orangish Brown and Tan, Moist, Very Stiff, (CL)		16
	4	SS	24	24			13
	5	SS	24	24	Fine to Medium Sandy CLAY, Trace Coarse Sand, Orangish Brown, Reddish Brown and Light Gray, Moist, Stiff to Very Stiff, (CL)		21
10							
	6	SS	24	24	Fine to Coarse Sandy CLAY, With Fine Gravel, Reddish Brown and Orangish Brown, Moist, Very Stiff, (CL)		28
15					END OF BORING @ 15.0'		
20							
25							
30							

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

▽WL DRY (WS OR WD)	BORING STARTED 04-08-02	TOPSOIL DEPTH 3"
▽WL(AB) ▽WL(AC)	BORING COMPLETED 04-08-02	CAVE IN DEPTH ● 14.5'
▽WL	RIG ATV FOREMAN SDS	DRILLING METHOD HSA

CLIENT MAGOON & ASSOCIATES

JOB # 07:5669 | BORING # B-5 | SHEET 1 OF 1

PROJECT NAME GRACE COVENANT PRESBYTERIAN CHURCH

ARCHITECT–ENGINEER MAGOON & ASSOCIATES

SITE LOCATION IRONBOUND AND JAMESTOWN ROADS, JAMES CITY COUNTY, VIRGINIA

ECS LTD

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS / SURFACE ELEVATION)	WATER LEVELS ELEVATION (FT)	CALIBRATED PENETROMETER TONS/FT.² (1 2 3 4 6+) / PLASTIC LIMIT % (X) / WATER CONTENT % (●) / LIQUID LIMIT % (Δ) (10 20 30 40 50+) / STANDARD PENETRATION BLOWS/FT. (⊗) (10 20 30 40 50+)
0	1	SS	24	24	Fine Sandy CLAY, With Roots from 0 to 2 feet, Orangish Brown and Tan, Moist, Very Soft, (CL)		1
	2	SS	24	24			3
5	3	SS	24	24	**Fine to Medium Sandy CLAY,** Trace Coarse Sand, Orangish Brown, Light Gray and Reddish Brown, Moist, Very Stiff, (CL)		16
	4	SS	24	24			20
	5	SS	24	24	Fine to Coarse Sandy CLAY, Orangish Brown and Light Gray, Moist, Very Stiff, (CL)		23
10					Fine to Coarse Sandy CLAY, With Fine Gravel, Orangish Brown, Reddish Brown and Light Gray, Moist, Very Stiff, (CL)		
					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

L DRY (WS OR WD)	BORING STARTED 04-08-02	TOPSOIL DEPTH 2"
L(AB) ▼WL(AC)	BORING COMPLETED 04-08-02	CAVE IN DEPTH ●
	RIG ATV FOREMAN SDS	DRILLING METHOD HSA

CLIENT MAGOON & ASSOCIATES

JOB # 07:5669 | BORING # B-6 | SHEET 1 OF 1

PROJECT NAME GRACE COVENANT PRESBYTERIAN CHURCH

ARCHITECT-ENGINEER MAGOON & ASSOCIATES

SITE LOCATION IRONBOUND AND JAMESTOWN ROADS, 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	WATER LEVELS ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
					ENGLISH UNITS		
					SURFACE ELEVATION		
0	1	SS	24	24	Clayey Fine to Medium SAND, With Roots, Tan, Moist, Very Loose, (SC)		2
	2	SS	24	24			2
5	3	SS	24	24	Fine to Coarse Sandy CLAY, With Fine Gravel, Orangish Brown, Reddish Brown and Light Gray, Moist, Medium Stiff to Stiff, (CL)		10
	4	SS	24	24			13
	5	SS	24	24			14
10					END OF BORING @ 10.0'		
15							
20							
25							
0							

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

DRY (WS OR WD)	BORING STARTED 04-08-02	TOPSOIL DEPTH 1"
AB) ▼WL(AC)	BORING COMPLETED 04-08-02	CAVE IN DEPTH ●
	RIG ATV FOREMAN SDS	DRILLING METHOD HSA

LABORATORY TEST SUMMARY

PROJECT: Grace Covenant Presbyterian Church
LOCATION: James City County, Virginia

ECS Job No.: 07:5669
DATE: 04/22/02

Sample Number	Depth (ft)	Natural Moisture (%)	Percent Passing # 200 Sieve	Atterberg Limits			USCS Symbol
				LL	PL	PI	
HA-1	2-4	19.9	*	*	*	*	CL
HA-1	4-6	18.6	68.6	45	11	34	CL
HA-1	6-8	20.3	*	*	*	*	CL
HA-1	8-10	14.3	*	*	*	*	CL
HA-4	2-4	18.5	66.3	49	19	30	CL
HA-4	4-6	20.1	*	*	*	*	CL
HA-4	6-8	19.4	*	*	*	*	CL
HA-4	8-10	15.8	*	*	*	*	CL
HA-6	0-2	8.4	31.4	*	*	*	SC
HA-6	2-4	10.9	36.3	*	*	*	SC

Notes: 1) * Denotes test not performed.
2) NP = Non-Plastic

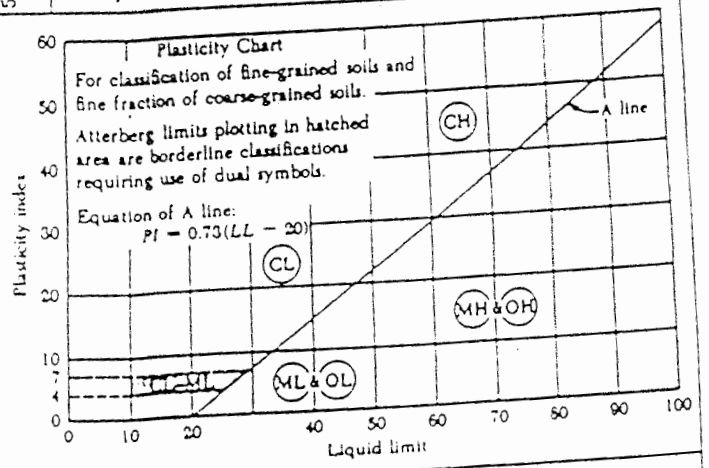
UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

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
PM - Pressuremeter
DC - Dutch Cone Penetrometer

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

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

II. Correlation of Penetration Resistances to Soil Properties:

Relative Density-Sands, Silts

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

Consistency of Cohesive Soils

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

III. Unified Soil Classification Symbols:

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

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

IV. Water Level Measurement Symbols:

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

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

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

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

September 26, 2002

Mr. Robert A. Magoon, Jr.
Magoon & Associates
1317 Jamestown Road, Suite 103
Williamsburg, Virginia 23185

ECS Project No. 07:5669

Re: Report Addendum No. 1
Proposed Grace Covenant Presbyterian Church
Ironbound and Jamestown Roads
James City County, Virginia

Dear Mr. Magoon:

Engineering Consulting Services, Ltd. completed a subsurface exploration and engineering evaluation of the above referenced project and a report was issued on April 22, 2002. This report presented the results of our subsurface exploration and a geotechnical engineering evaluation for the proposed church building and parking lot.

Our report recommended the footings be evaluated as an independent system not rigidly connected to the floor slab. However, we now understand a turn-down slab is proposed with the turn-downs bearing directly on the footings. We have been requested to re-evaluate our footing and floor slab recommendations as discussed in our recent telephone conversation.

We have reviewed the section details for the Typical Exterior Wall Footing, Typical Interior Wall Footing, and Typical Thickened Slab Sections from the project drawings dated June 25, 2002. These details show a 4-inch thick continuous slab with 8-inch turn-downs or thickened slab sections bearing on the top of the footings. We consider the proposed footing and floor slab design acceptable with respect to the soil conditions revealed by our subsurface exploration.

General Comments

This report addendum has been prepared in order to aid in the evaluation of this site and to assist the Contractor, Architect and Engineer in the design and planning of the project. The addendum is limited to the specific project and location described, and the project description represents our understanding of the significant aspects relevant to soil and foundation characteristics.

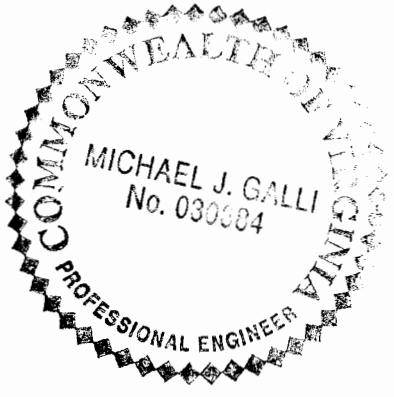
We have appreciated being of service to you during the design phase of this project and look forward to its successful construction. If you should have any questions regarding the information and recommendations contained in this report or if we can be of any further assistance, please contact our office.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.

Michael J. Galli, P.E.
Geotechincal Engineer

Maureen E Mallory for
Gary R. Witsman, P.E.
Principal Engineer



Copies: (2) Magoon & Associates (Mr. Robert A. Magoon, Jr.)
(1) James City County (Mr. Bo Bohannon)

I:letters/mike/5669-Add1.doc

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

SP-66-02
GRACE COVENANT
PRESBYTERIAN
CHVRCH

July 16, 2002

Mr. Bob Magoon
Magoon & Associates
1317 Jamestown Road
Suite 103
Williamsburg, Virginia 23185

ECS Project No. 07:5669-A

Re: Subsurface Exploration and Engineering Services
Infiltration Study
Proposed Grace Covenant Presbyterian Church
Ironbound and Jamestown Road
James City County, Virginia

Dear Mr. Magoon,

Engineering Consulting Services, Ltd. has completed an additional subsurface exploration and engineering analysis of the above referenced project at your request. This report presents the results of our subsurface exploration and engineering analysis for the Grace Covenant Presbyterian Church BMP No. 2. ECS, Ltd. previously completed a subsurface exploration and geotechnical analysis for the above referenced church building and a report was issued dated April 22, 2002.

Introduction

Our previous evaluation was performed for the proposed church building to be located on the north side of Jamestown Road near the intersection with Ironbound Road in James City County, Virginia. The infiltration pond is proposed to be located at the west end of the property, along Ironbound Road. This report addresses additional analyses requested for a proposed SWM Infiltration Pond (BMP No. 2). We understand the proposed BMP No. 2 area was a former borrow pit. It is now serving as an infiltration area for runoff from the existing property. The site is heavily wooded.

The purposes of this exploration were to obtain general site characteristics and to explore the soil and groundwater conditions to determine if soils encountered at the bottom of the existing borrow pit, BMP No. 2, has suitable characteristics to utilize infiltration techniques as part of the stormwater management design for this project. We accomplished these purposes by conducting hand auger probes to explore the subsurface soil and groundwater conditions, performing a site reconnaissance to observe general topography, and analyzing field data to develop appropriate

geotechnical engineering recommendations regarding the proposed construction.

Field Exploration Procedures:

Personnel from our office attempted four (4) hand auger probes within the planned area. The auger is screwed into the ground generally in 6-inch intervals and soil can be extracted for visual inspection. This method cannot determine the exact consistency or density of in-place soils. It is used to determine the general soil types but can provide a relative determination of the consistency or density of in-place soils by the ease of which the auger turns and advances.

The soil samples were classified on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS) and the USDA Classification System. After recovery, each sample was removed from the sampler and visually classified. Representative portions of each sample were sealed in glass jars and delivered to our laboratory in Chesapeake, Virginia, for further visual examination and classification.

Subsurface Conditions:

Engineering personnel from our office classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS) and the USDA Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions.

Our subsurface exploration and site reconnaissance in the proposed infiltration area determined that the surface of the site is generally covered with about 2 to 6 inches of topsoil/forest litter. Underlying the topsoil/forest litter, we encountered Fine to Coarse Poorly Graded SAND (SP-SM) with Silt and large gravel. We were only able to extend the hand auger 12 inches below the existing site grades before auger refusal was encountered due to the large gravel. Initially, we were requested to perform a single hand auger probe. However, after we encountered auger refusal, we attempted other hand auger probes at different locations within the BMP area with similar results. We attempted four (4) hand auger probes in the proposed area. Additionally, we utilized a two-person gas powered auger to attempt to extend below the aforementioned depths. Again we were unable to extend the auger below a depth of about 12 inches below existing site grades due to the presence of the gravel.

We did not encounter groundwater during the drilling of the hand auger probes. Groundwater levels can fluctuate up to about 36 inches due to seasonal conditions or periods of heavy precipitation.

Based on a visual classification of the coarse-grained soils encountered to the depths explored, we believe the surficial soils classify as Loamy Sand and Sandy Loam in accordance with USDA textural soil classification. The soils of this stratum have a Hydrologic Soil Group designation, A to B, which have recommended minimum infiltration rates (f) between 1.02 to 2.41 inches/hour.

Typically, soils with the Hydrologic Soil Group designations of A and B are considered to be suitable for Best Management Practices (BMP) that may utilize on-site infiltration in their designs. Some soils designated as C type soils are considered suitable for infiltration practices but these soils would need to be evaluated on a case specific basis. Soils with group designations of D are generally not considered suitable for infiltration practices.

It should be noted that this field testing was limited to test locations within the proposed BMP No. 2 area and only to a depth of about 12 inches below site grades before refusal was encountered. In this regard, subsurface conditions below the depths explored and at other areas throughout the project site were not investigated. It is also noted that the subsurface conditions discussed herein pertain to the specific site area explored.

General Comments

This report has been prepared in order to aid in the evaluation of this site and to assist the Architect and Engineer in the design and planning of the project. The report scope is limited to the specific project and location described, and the project description represents our understanding of the significant aspects relevant to soil characteristics.

We have appreciated being of service to you during the design phase of this project and look forward to its successful construction. 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 contact our office.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.

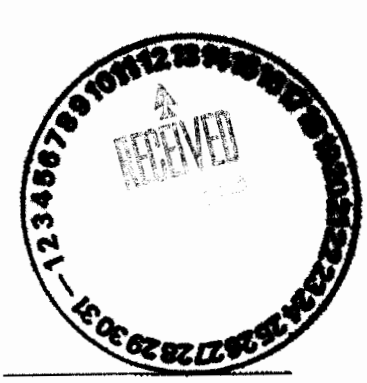
Michael J. Galli, P.E.
Geotechnical Engineer

Gary R. Witsman, P.E.
Principal Engineer

I:letters/mjg/5669-A.doc

Copy: (1) LandMark Design Group (Mr. C.J. Bodner)
(2) JCC Environmental Division (Mr. Scott Thomas)

LANDMARK DESIGN GROUP
FACSIMILE



TO: SCOTT THOMAS FACSIMILE NUMBER: _____

COMPANY: JAMES CITY COUNTY ENVIRONMENTAL TELEPHONE NUMBER: _____

FROM: DICK PHILLIPS NUMBER OF PAGES: 2 (including cover)

DATE: MARCH 8, 2004

SUBJECT: GRACE COVENANT

LMDG JOB NO.: _____

ORIGINAL: ☐ WILL ☑ WILL NOT BE MAILED

MESSAGE:

SCOTT:

THIS IS THE SKETCH WHICH I GAVE TO THE OWNER BACK IN DECEMBER BASED UPON OUR SITE VISIT & DISCUSSION 12/16/03.

THE SKETCH SHOWS THE EXTENSION OF THE HIGH SIDE SLOPE TO REDUCE TO EROSION POTENTIAL ~ IT REDUCES THE SURFACE OF THE INFILTRATION TRENCH BY ABOUT 50%!

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

Subject GRACE COVENENT

Computed _____ Checked _____

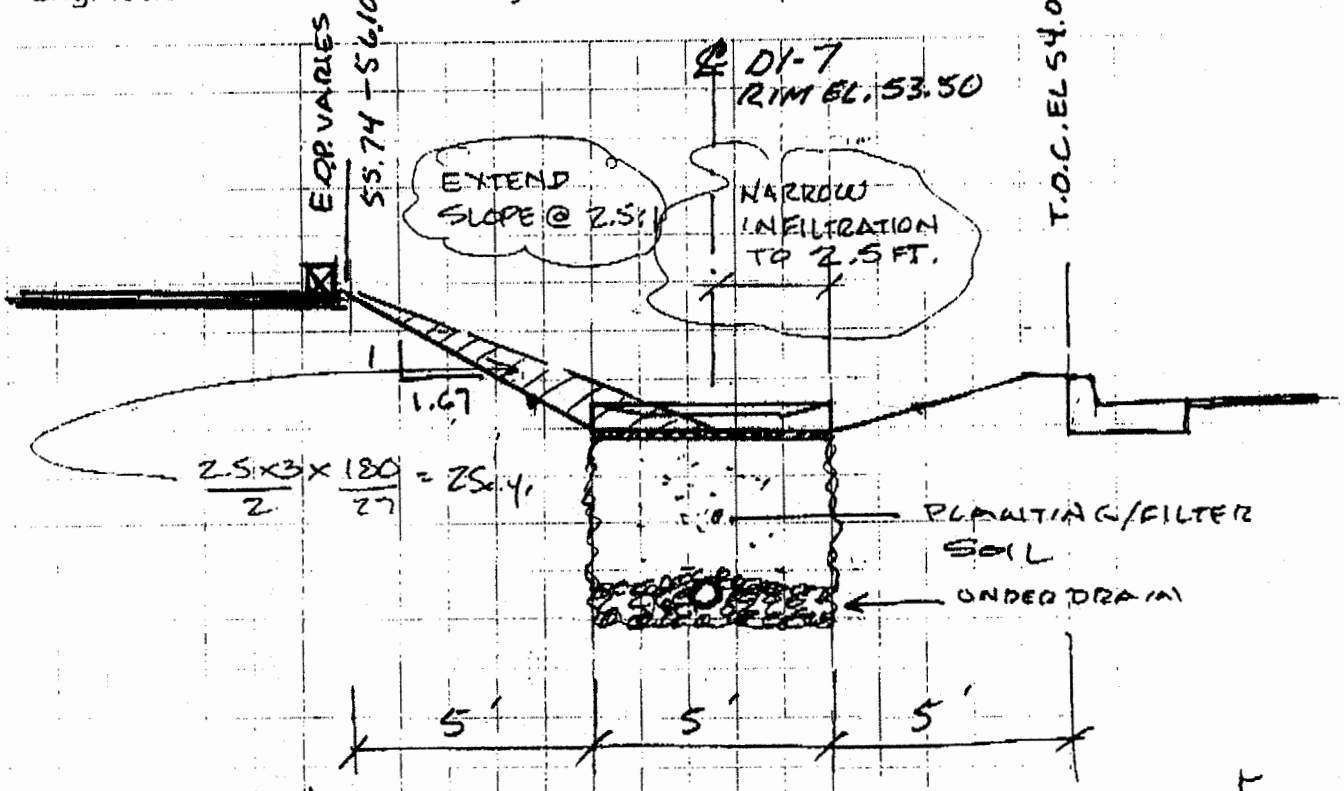
LANDMARK DESIGN GROUP

Project # _____

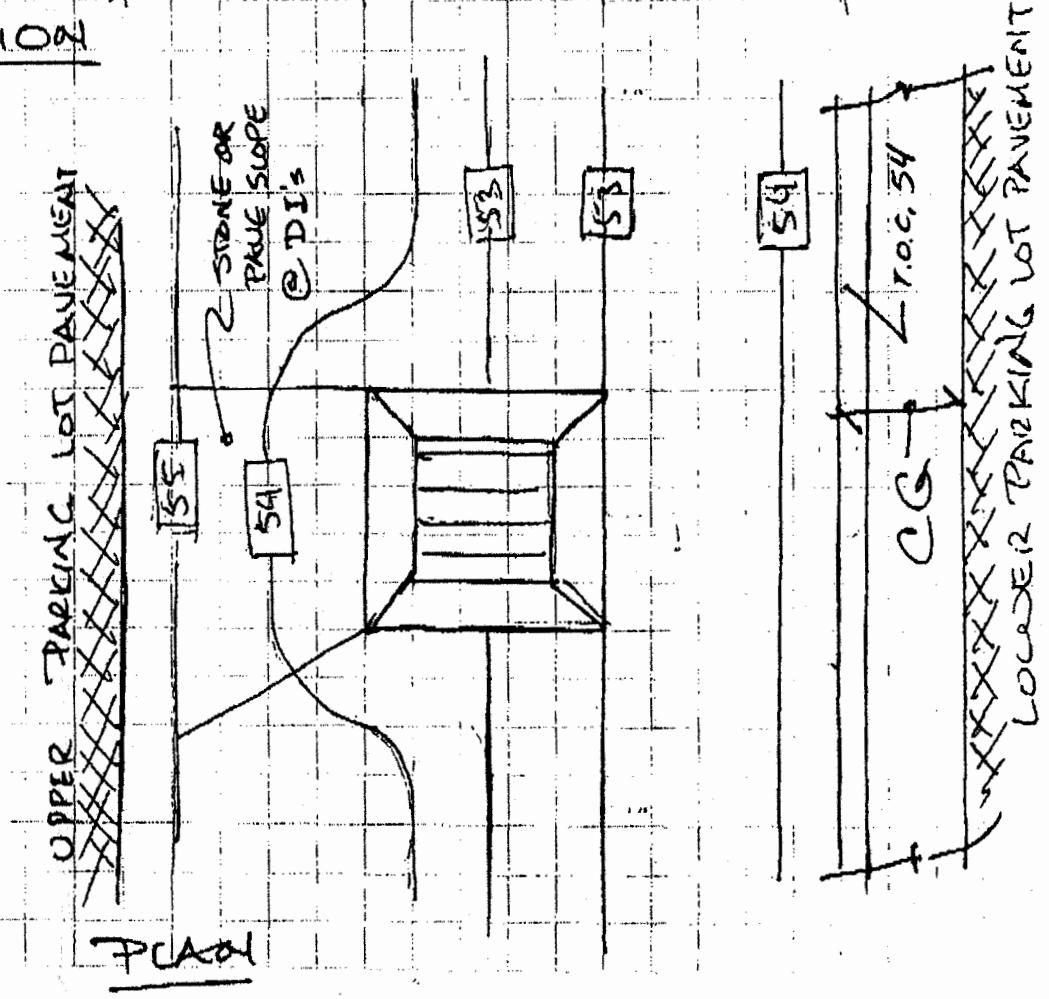
Client _____

Date _____ Sheet # _____

Engineers • Planners • Surveyors • Landscape Architects • Environmental Consultants



SECTION



PLAN

LANDMARK DESIGN GROUP

March 12, 2004

Scott Thomas, P.E.
James City County
Environmental Davison
P.O. Box 8784
Williamsburg, VA 23187

Re: Grace Covenant Presbyterian Church
Bioretention Basin

Dear Scott:

Pursuant to our recent discussions relating to the above referenced bioretention basin, please find attached a copy of the revised site plan reflecting our thoughts for correction. Per our discussions, we are installing 4 x 4 salt treated posts on approximately 15-foot centers in an effort to retain runoff and allow for limited infiltration. The surface of the proposed sand to gravel mixture will provide a minimal positive slope towards the two drainage structures, eliminating the standing water that exists today. We have discussed this option with the owner and at this time would like your thoughts relating to this modification.

If you have questions or would like to discuss this matter in detail, please do not hesitate to call.

Sincerely,

The LandMark Design Group, Inc.

Ronnie Orsborne
Vice President

Copy: Bob Magoon, Magoon & Associates
File 2001201

SP-66-02; AMENDED SP-121-02
APPROVED
James City County
Environmental Division
By: David A Thomas
Date: 03-15-04

" Ensure record drawings "asbuilts" reflect modifications to this BMP facility."

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

ENVIRONMENTAL – STORMWATER
TRANSMITTAL

PROTECTING RESOURCES
PRIDE
IN DELICATE ENVIRONMENTS

James City County
Jamestown 1607

COUNTY PLAN NO: SP-66-02

BMP ID CODE: PC 184 GRACE COVENANT PRESBYTERIAN CHURCH

WATERSHED: Powhatan ULTIMATELY DRAINS TO POWHATAN

- ☒ **ENTIRE RECORD FILE**
- ☒ **ASBUILTS**
- ☒ **CONSTRUCTION CERTIFICATION**
- ☒ **COMPUTATIONS**
- ☐ **OTHER:** Existing BMP MC 003 is just downstream

BIORETENTION BASIN

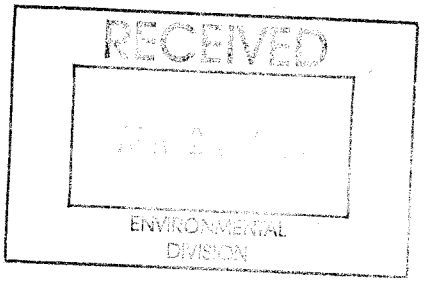
NAME: Scott J. Thomas

SIGNATURE: Scott J. Thomas

DATE: 9/24/08

E.T. GRESHAM

CONSTRUCTION • CRANE & RIGGING • INDUSTRIAL SERVICES



April 24, 2008

Mr. Greg Johnson
Inspector-Environmental Division
James City County

RE: Grace Covenant Presbyterian Church, Williamsburg

Dear Greg,

On September 1, 2003, E.T. Gresham Company substantially completed a new church facility at Grace Covenant Presbyterian Church.

Per your request, attached please find the following paperwork for the above referenced project:

1. Stormwater Management / BMP Facilities Record Drawing Certification (Landmark Design Group)
2. C.A. Barrs site and BMP certification letter
3. Final Report of Special Inspections (McKinney and Company)
4. E.T. Gresham Company warranty statement
5. Code Compliance Inspection Reports

The above is transmitted per your email request of the same, dated 4/16/08.

The project team, including the project manager, superintendent and project assistant, is no longer employed with E.T. Gresham Company and we can find no trace of the final paperwork for the BMP. Our site contractor, C.A. Barrs, has sent written verification (attached) the work was installed properly, but they have no engineer to sign/stamp the construction certification.

I hope the attached documents are sufficient to waive the "engineer stamped" construction certification, which is the only outstanding item needed to release our bond.

Thank you for all your help.

Sincerely,
E.T. GRESHAM COMPANY, Inc.

Cindy Taylor-Hudson
Manager, Construction Administration

Copy: Richard Wells Gresham, AIA

Mailing Address:
P. O. Box 1077
Norfolk, VA 23501-1077

Street Address:
1038 West 26th Street
Norfolk, VA 23517

757- 627-4583
FAX: 757-622-2864
1-800-617-4583
e-mail: mail@etgresham.com

ET.GRESHAM COMPANY, Inc.
Achieving Quality

Cindy Taylor Hudson

From: Farrell, Peter [PFarrell@landmarkdg.com]
Sent: Wednesday, December 05, 2007 10:57 AM
To: Cindy Taylor Hudson
Subject: RE: Grace Covenant Presbyterian Church As Builts

Cindy,

The Record Drawings will be delivered to Greg Johnson at James City County Environmental Division today.

Peter Farrell, L.S.
Director of Surveys
Senior Associate
LandMark Design Group
4029 Ironbound Rd.
Suite 100
Williamsburg, VA 23188
Ph 757-253-2975
Fax 757-229-0049
e-mail - pfarrell@landmarkdg.com

From: Cindy Taylor Hudson [mailto:Cthudson@etgresham.com]
Sent: Friday, November 09, 2007 10:37 AM
To: Farrell, Peter
Cc: Chester Kramer; Dick Gresham
Subject: Grace Covenant Prebsyterian Church As Builts

Peter,

Per our conversation this morning, please review the site plans and forward your proposal to furnish certified As built drawings to Greg at James City County so he can release our bond on the referenced project.

Thank you so much for your help.

Cindy Taylor-Hudson

Manager, Construction Administration

757.627.4583 ph./757.622.2864 fx.

www.etgresham.com

E.T. GRESHAM COMPANY, Inc.

Achieving Quality

1038 W. 26th Street

Norfolk, VA 23517

12/5/2007

C.A. BARRS
CONTRACTOR, INC.

April 24, 2008

E.T. Gresham Company, Inc.
Ms. Cindy Taylor-Hudson
P O Box 1077
Norfolk, Virginia 23501-1077
Phone – 757-627-4583
Fax – 757-622-2864

Re: **GRACE COVENANT PRESBYTERIAN CHURCH**

Dear Cindy:

C. A. Barrs Contractor, Inc. hereby certifies that all work was properly installed and completed in accordance with the approved site plans and specifications.

If you have any questions or require additional information, please do not hesitate to contact us.

Sincerely,

C. A. Barrs Contractor, Inc.

Robin L. Field
Contract Administrator

Yorktown Materials
P.O. Box 1741
Yorktown, Virginia 23692-1741

Mr. Gary Milstead

E. T Gresham Company Inc.
P.O. Box 1077
Norfolk, Virginia 23501-1077

31 July 2003

Dear Mr. Milstead

This letter is to certify that the Yorktown Materials BioSoils being used at the Grace Covenant Presbyterian Church project is prepared in accordance to Appendix "E" of the James City County Group D BMP Manual for planting soil layer mix.

Sincerely,

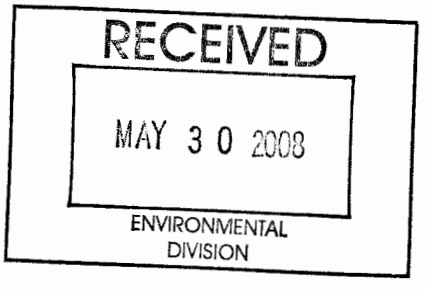
Don Boyd
General Manager
Yorktown Materials

C.A. Barrs Contractor, Inc.
7601 George Washington Memorial Hwy.
Yorktown, VA 23692
Tel: (757) 898-7282
Fax: (757) 898-1282

TRANSMITTAL

DATE: **May 28, 2008**

TO: **Greg Johnson, Inspector – Environmental Division**
Scott Thomas, Director – Environmental Division
James City County
101 East Mounts Bay Road
P.O. Box 8784
Williamsburg, VA 23187-8784



FROM: **Stacy Keating/Bob Magoon**
Magoon & Associates
4808Courthouse Street, Ste. 208
Williamsburg, VA 23188
Phone: (757) 253-8675
Fax: (757) 253-8739
E-mail: stacy@magoonassociates.com
Web site: www.magoonassociates.com

CC: **Cindy Taylor-Hudson**
E.T. Gresham

RE: **Grace Covenant Presbyterian Church**
ECS Geotechnical Report and Additional Letters

If you need any additional information or have any questions please do not hesitate to call.

Stacy Keating

E.T. GRESHAM

CONSTRUCTION • CRANE & RIGGING • INDUSTRIAL SERVICES

April 24, 2008

Mr. Greg Johnson
Inspector-Environmental Division
James City County

RE: Grace Covenant Presbyterian Church, Williamsburg

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Sincerely,
E.T. GRESHAM COMPANY, Inc.

Cindy Taylor-Hudson
Manager, Construction Administration

Copy: Richard Wells Gresham, AIA

Mailing Address:
P. O. Box 1077
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757- 627-4583
FAX: 757-622-2864
1-800-617-4583
e-mail: mail@etgresham.com

ET.GRESHAM COMPANY, Inc.
Achieving Quality

Cindy Taylor Hudson

From: Farrell, Peter [PFarrell@landmarkdg.com]
Sent: Wednesday, December 05, 2007 10:57 AM
To: Cindy Taylor Hudson
Subject: RE: Grace Covenant Presbyterian Church As Builts

Cindy,

The Record Drawings will be delivered to Greg Johnson at James City County Environmental Division today.

Peter Farrell, L.S.
Director of Surveys
Senior Associate
LandMark Design Group
4029 Ironbound Rd.
Suite 100
Williamsburg, VA 23188
Ph 757-253-2975
Fax 757-229-0049
e-mail - pfarrell@landmarkdg.com

From: Cindy Taylor Hudson [mailto:Cthudson@etgresham.com]
Sent: Friday, November 09, 2007 10:37 AM
To: Farrell, Peter
Cc: Chester Kramer; Dick Gresham
Subject: Grace Covenant Prebsyterian Church As Builts

Peter,

Per our conversation this morning, please review the site plans and forward your proposal to furnish certified As built drawings to Greg at James City County so he can release our bond on the referenced project.

Thank you so much for your help.

Cindy Taylor-Hudson

Manager, Construction Administration

757.627.4583 ph./757.622.2864 fx.

www.etgresham.com

E.T. GRESHAM COMPANY, Inc.

Achieving Quality

1038 W. 26th Street

Norfolk, VA 23517

12/5/2007

Joe Buchite - FYI

LANDMARK DESIGN GROUP

RECEIVED
2004

March 12, 2004

Scott Thomas, P.E.
James City County
Environmental Davison
P.O. Box 8784
Williamsburg, VA 23187

Re: Grace Covenant Presbyterian Church
Bioretention Basin

Dear Scott:

Pursuant to our recent discussions relating to the above referenced bioretention basin, please find attached a copy of the revised site plan reflecting our thoughts for correction. Per our discussions, we are installing 4 x 4 salt treated posts on approximately 15-foot centers in an effort to retain runoff and allow for limited infiltration. The surface of the proposed sand to gravel mixture will provide a minimal positive slope towards the two drainage structures, eliminating the standing water that exists today. We have discussed this option with the owner and at this time would like your thoughts relating to this modification.

If you have questions or would like to discuss this matter in detail, please do not hesitate to call.

Sincerely,

The LandMark Design Group, Inc.

Ronnie Orsborne
Vice President

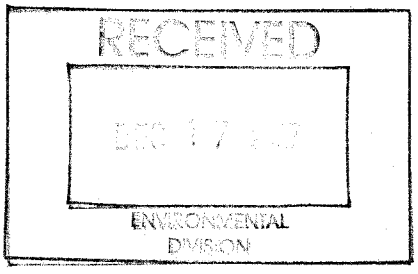
Copy: Bob Magoon, Magoon & Associates
File 2001201

SP-66-02; AMENDED SP-121-02
APPROVED
James City County
Environmental Division
By:
Date: 03-15-04

"Ensure record drawings "asbuilts" reflect modifications to this BMP facility."

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

LANDMARK DESIGN GROUP
TRANSMITTAL



To: GREG JOHNSON

Company: JAMES CITY COUNTY, ENVIRONMENTAL

From: Peter Farrell, L.S.

Date: 12/17/07

Subject: Grace Covenant Presbyterian Church Storm Sewer Record Drawings
LMDG Job No.: 2007193-000.00

Attached please find:
- ☒ Certification
- ☐ Plans
- ☐ Specifications
- ☐ Drawings
- ☐ Report
- ☐ Letter

Transmitted as checked below:
- X For your use
- ☐ As requested

For review and comment
- ☐ For approval
- ☐ Approved
- ☐

Copies	Date	Drawing No.	Description
1	12/17/07	NA	RECORD DRAWING CERTIFICATION

Greg, Landmark Design Group did not monitor the construction of the BMP so this certification is only for the Record Drawings.

Copies
1. File: _____
2. _____
3. _____

Enclosures
- ☐
- ☐
- ☐

LandMark Design Group, Inc.

By: AST

**Acknowledgment by Recipient: _____ _____
Name Date

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

WATERSHED	PC	MAINTENANCE PLAN	Yes	CTRL STRUC DESC	DI-7
BMP ID NO	184	SITE AREA acre	7.28	CTRL STRUC SIZE inches	
PLAN NO	SP-66-02	LAND USE	Church	OTLT BARRL DESC	
TAX PARCEL		old BMP TYP		OTLT BARRL SIZE inch	
PIN NO		JCC BMP CODE	D1 Bioretention		
CONSTRUCTION DATE		POINT VALUE	8	EMERG SPILLWAY	No
PROJECT NAME	Grace Covenant Presbyterian Church			DESIGN HW ELEV	
FACILITY LOCATION	1677 Jamestown Road			PERM POOL ELEV	
CITY-STATE	Williamsburg, Va. 23188	SVC DRAIN AREA acres		2-YR OUTFLOW cfs	0.00
CURRENT OWNER	Grace Covenant Presbyterian Church			10-YR OUTFLOW cfs	0.00
OWNER ADDRESS	108 Ingram Road			REC DRAWING	No
OWNER ADDRESS 2		SERVICE AREA DESCRI			
CITY-STATE-ZIP CODE	Williamsburg, Va. 23185	IMPERV AREA acres	0.00	CONSTR CERTIF	No
OWNER PHONE		RECV STREAM			
MAINT AGREEMENT	Yes	EXT DET-WQ-CTRL	No	LAST INSP DATE	
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft		INTERNAL RATING	
		CHAN PROT CTRL	No	MISC/COMMENTS	
		CHAN PROT VOL acre-ft		Preliminary data. Need AB & CC.	
		SW/FLOOD CONTROL	No		
		GEOTECH REPORT	No		

Get Last BMP No

Return to Menu

James City County, Virginia
Environmental Division
Stormwater Management Program

Stormwater Management Design Plan
Staff "Quick" Review

Plan No. SP - 66 - 02 Date/Time: 6/7/02 9:00AM
Project Name: GRACE Covenant Presbyterian Church (Jamestown Road)
Rough Location: 1677 Jamestown Road
ADC Map: Sheet 9 Grid: F - 2 ☑ First Review
Flood Map / Zone: 510201- 00 35B Zone: X ☐ ___ Review
Description: Outside 500-year
Drainage Area: ☐ Onsite ☐ Offsite
Submitted:

Y	N			
☑	☐	~~Demolition~~ Ex Cond Plan (if applicable)	Sheets: C-2	
☑	☐	Site, Geometric or Layout Plan	Sheets: C-3, C-4	
☑	☐	Grading Plan	Sheets: C-3, C-4	
☑	☐	Storm Drainage Plan	Sheets: C-3, C-4	LANDSCAPE PLAN L-1, L-2
☑	☐	E&SC Plan	Sheets: C-3, C-4	
☐	☑	Profiles (Storm)	Sheets: NO	
☐	☑	Environmental Inventory	Sheets: ~~C-5, C-6, C-7~~	
☑	☐	Note & Detail Sheets	Sheets: C-5, C-6, C-7	
☑	☐	Drainage Map(s)	Report May 9 2002	
☑	☐	Soils Map/Narrative	IN NARRATIVE. NO MAP	
☐	☐	E&SC/SWM Design Plan Checklist (Required).		
☐	☐	E&SC/Stormwater Management / Drainage Narratives.		
☐	☐	E&SC/Stormwater Management Design Report with Calculations (Attachment).		
☐	☐	Geotechnical Report (Attachment).		
☐	☐	Waivers, Variances, or Exceptions (Attachments in Writing).		
		☐ VESCH ☐ CBP Ord (RPA, Steep Slope Policy) ☐ JCC BMP Manual		
☐	☐	Other (List):		

JCC GIS Database: Zoning: L - B Tax Parcel/GPIN: ___
Receiving Water: ___ Site Acreage: ___ acres / s.f.
Other Approvals (SUP, etc.): SUP-26-01 1/14/02
Site Plan Information: Owner: GRACE COVENANT PRESBYTERIAN CHURCH
Zoning: L - B Description: LIMITED BUSINESS
Site Area: 7.29 acres / s.f
Disturbed Area: 2.95 acres / s.f. (40.47%)
☐ Disturbance > 5 acres, VPDES Notice of Intent required.
Impervious Cover: 1.18 Ac. acres / s.f. (16.19 %)
☑ Less than or equal to 60 percent. Meets CBPO requirements.
☐ More than 60 percent. Does Not Meet CBPO requirements.
Open / Green Space: ? acres / s.f. (. %)

Site Development Plan:

☐ Residential, Lots, etc.	☑ Commercial (B / O / R)	☐ Govern./Institutional	☐ Industrial
☑ Roadways or Entrances	☑ Parking or Loading	☑ Water	☑ Sanitary Sewer
☑ Landscaping	☑ SWM/BMP facilities	☑ Manmade Drainage	☐ Parks, Amenities
☐ Pump/Lift Station	☐ Dams (regulated)	☐ Other,	

Description: 10,757SF Building, 87 park SP (4 H.C.); Future Bldg + Parking.

Community Character Corridor.

No MAR!

Soils Information: Site: _____ Hydric: ☐ Yes ☐ No
Soil Survey Sheet DA: _____ HSG: _____
_____ BMP: _____ Hydric: ☐ Yes ☐ No
Description of Soils at BMP: _____

BMP Control: ☐ None ☑ Onsite ☐ Offsite ☐ Previously Approved ☐ Manufactured BMP
BMP Types: 1- Name: BMP#1 ORY (JCC BMP Type F - 2), Points 4 (ROAD)
2- Name: BMP#2 INFIL (JCC BMP Type C - 3), Points 8 (Borrow Pit)
3- Name: _____ (JCC BMP Type _____ - _____), Points _____

Onsite Drainage: ☐ Reinforced Concrete Pipe CL3 ☐ Corrugated Metal Pipe ☐ Aluminum Type Pipe
☐ Corrugated Polyethylene Pipe ☐ PVC Type Pipe ☑ Open Channel Type
☐ Storm Drain ☐ Culverts Type: _____
☐ Inlets ☐ 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

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

Site Stormwater Management / BMP Control (Add sheets if necessary for Multiple Onsite Facilities): 2 BMPs

☐ Yes ☐ No	# BMP #1			
Predev (Present)	DA = 13.86 ac.	C/CN = 0.38	Tc = 22.0	min / hrs.
2-year	16.4	cfs		
10-year	22.85	cfs		
100-year	31.73	cfs		
PostDev w/o Detention (Inflow)	DA = 13.86 ac.	C/CN = 0.43	Tc = 22.0	min / hrs.
1-year	~~18.45~~ 15.36			
2-year	~~25.70~~ 18.45	cfs		
10-year	~~35.69~~ 25.70	cfs		
100-year	35.69	cfs		
PostDev with Detention (Routed)	DA = ac.	C/CN =	Tc =	min / hrs.
2-year	11.28	cfs	at El. 44.4	
10-year	12.28	cfs	at El. 44.92	
100-year (DHW)	14.3	cfs	at El. 46.11	

Downstream Tailwater Assumption for Pond Routing: ? 0.00 ft.
Routed Peak Discharges (Outflows) from BMP meet Predevelopment Allowables: ☑ Yes ☐ No
Appears to Meet VESCH / E&SC Ordinance / CBP Ordinance Requirements: ☐ Yes ☐ No

BMP #1 PRIOR TO DEV 42.03
1-YR ~~6.94~~ 7.66 CFS @ EL ~~42.55~~ 42.25
2-YR ~~7.66~~ CFS @ EL ~~42.25~~ 42.25
10-YR 9.27 @ EL 42.83
100-YR 11.3 @ EL 43.71

SCPV ?

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

☐ Check if None ☐ Provided: BMP # 1 Type: EXT DRY DET F-2

Y N * See Below for Pertinent WQv /Stream CPv Design Information.

☐	☐	Top of Facility (Dam Crest)	El. 46.0	
☐	☐	Design High Water (100-year)	El. 46.11	
☐	☑	Emergency Spillway (ES) Crest	El. _____	BW: _____ SS: _____
☐	☐	FreeBoard	_____	1 ft. or > with Emerg. Spillway.
		☐ Acceptable ☑ Not Acceptable.	_____	2 ft. or > w/o Emerg. Spillway.
☐	☐	Principal Spillway (Riser) Crest	El. 43.5	Size/Type: _____
☐	☐	Principal Spillway Crest 1 ft. below Crest of Emergency Spillway.		☐ Yes ☑ No ☐ N/A
☑	☐	Stage-Storage Curve or Data		
☑	☐	Outlet Rating Curve or Table (Composite Structure)		
☑	☐	Extended Detention for WQ Provided (Min. 24 hours)		☑ Yes ☐ No ☐ N/A
☐	☑	1-year, 24 hour detention criteria for Stream Channel Protection.		☐ Yes ☑ No ☐ N/A
☐	☐	1-year design storm	El. _____	or Volume _____
☐	☐	Normal/Permanent Pool	El. _____	☐ N/A
☐	☐	Orifice/Weir #1 (Highest El.)	El. _____	Type: _____
☐	☐	Orifice/Weir #2	El. _____	Type: _____
☐	☐	Orifice/Weir #3	El. _____	Type: _____
☐	☐	Orifice/Weir #4	El. _____	Type: _____
☐	☐	Orifice/Weir #5 (Lowest El.)	El. _____	Type: _____
☐	☐	Low Flow Orifice (ExDet, CPv)	El. _____	Type: _____
☐	☐	Pond Drain w/ Valve (24 hr.)	El. _____	Type: _____
☐	☐	Pond Bottom (Positive Drain)	El. _____	Riser Height: _____
☐	☐	Steps or Access Provided (for over 4 ft. depth)		☐ N/A
☐	☐	Riser Base	Bottom El. _____	Type: _____
☐	☐	Core Trench	☐ N/A	
☐	☐	Anti-Seep Collars or other Acceptable Seepage Control Method.		☐ N/A
☐	☐	Principal Spillway Anti-Vortex/Trash Rack Device		Type: _____
☐	☐	Low Flow Orifice Trash Rack.		Type: _____
☐	☐	Outlet Barrel:	Type/Class: _____	Size: _____
			Inv. U/S: _____	Inv D/S: _____
			Slope: _____ _____	Length: _____ (ft.)
☐	☐	Flared End Section/Wingwalls. Matches Outlet Barrel material type, over 48 inch with fence.		
☐	☐	Outlet Protection.		
		☐ Standard Riprap Outlet Protection (OP)		Type: _____
		☐ Special Dissipator Structure (SDS)		Type: _____
☐	☐	BMP Cleanout Elevation		El. _____ or Depth _____
☐	☐	Adequate Channel Downstream of BMP:		☐ 1-year, 24-hour; or ☐ MS # 19 criteria.

Sketch or Notes, If Necessary:

* WQv / Stream CPv Design Summary	
Imperv. Area	
WQTV (Per JCC Man)	
WQ Vol. Required	
WQ Vol. Provided	
1-yr SCPv Required	
1-yr SCPv Provided	
Ext Det Orifice Size	

Sediment Trap & Basins

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

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

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

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

E&SC Plan Comments: _____

Plan Review Steps & Components:

Y	N	
☑	☐	First "Look-Thru". Quick look through plan for familiarity and completeness.
☑	☐	Existing Utilities - Miss Utility (1-800-552-7001) or other methods.
☐	☑	Responsible Land-Disturber Certification; Disturbed Area Estimate.
☑	☐	Worksheet for BMP Point System. 10 point (New Dev) or Pollutant Load method (Redevelopment).
☑	☐	FEMA Special Flood Hazard Areas. Check location relative to property site and/or development area.
☑	☐	Check JCC Tax Parcel Maps for RPA / RMA locations and Tax Parcel number.
☑	☐	Stormwater hotspot, general layout and/or BMP separation distances (if any) are satisfactory.
☐	☑	Environmental Inventory - Chesapeake Bay Ordinance requirements satisfactory.
☑	☐	Highlight/check impacts to any Environmental Sensitive Areas (wetlands, RPA, floodplain, steep slopes, etc.).
☐	☑	Offsite borrow, waste areas and onsite stockpiles areas addressed.
☑	☐	Review existing topography to determine adequacy of perimeter E&SC plan (Phase I).
☑	☐	Current version of Standard JCC Erosion & Sediment Control Notes on plan.
☑	☐	Virginia E&SC Regulations. Minimum Standards # 1 thru # 19 appear satisfied.
☑	☐	Check for Offsite Work; Grading Plan conflicts such as excessive cut-fill slopes, deep excavations, etc.
☑	☐	Review adequacy of onsite E&SC plan (Phase II).
☑	☐	Review layout to check for conflicts (utilities, buildings, parking, buffers, etc.).
☑	☐	Storm Drainage - culverts, inlets, channels, storm drains. (pipe data, cover, conflicts, specs or reference to VDOT).
☑	☐	Proper Outlet Protection or Energy Dissipator information, details and computations.
☑	☐	Review Sequence of Construction (for E&SC and SWM/BMP installation). PUT ON PLAN
☑	☐	Review E&SC Narrative (preferred to be on plan); SWM Narrative (Report).
☑	☐	Review for any Lot-to-Lot or adjacent property uncontrolled drainage problems.
☐	☑ NA	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 JCC E&SC/SWM Design Plan Checklist.
☑	☐	Review plan based on Virginia Erosion and Sediment Control Handbook (VESCH).
☑	☐	Review E&SC Plan Design Report and computations (Attached report).
☑	☐	Review plan based on JCC BMP manual for BMP type selected for project.
☑	☐	Review plan based on Virginia Stormwater Management Handbook (VSMH) for BMP type.
☑	☐	Review SWM Design Report and computations (Attached Report).
☑	☐	Review for potential mosquito-vector issues with BMP type and location.
☑	☐	Review plan based on JCC Stormwater Conveyance System Design/Construction Guidelines.
☑	☐	Review plan based on General Knowledge and Experience for Design/Construction.
☐	☑	Review plan based on other BMP design/construction references. List:
☑	☐	Review BMP for Buffer/Setback Requirements (Min 25 ft. from DHW) and Access.
☑	☐	Review BMP Benching (aquatic, safety) & Pondscape Plan (deep pool, shallow water, shoreline fringes, etc.).
☐	☑	Review Maintenance Plan for SWM / BMP facility. Detailed and specific guidance for long-term maintenance.
☐	☑	Well-defined, adequate channels downstream of uncontrolled or SWM/BMP areas. (MS # 19 or 1-year criteria).
☐	☑	Adequate conversion plan for TSB to use as permanent BMP.
☐	☑	Geotechnical. Information per Appendix E (infiltration) or to substantiate use of other BMPs (soils-wet pond, etc).
☑	☐	Provisions on plan requiring Record Drawing and Construction Certification of SWM facilities.
☐	☑	Drainage, Maintenance and Open Space Easements (if provided) appear satisfactory.
☐	☑	Wetland Permit required prior to issuance of a Land-Disturbance Permit or Final Approval.
☐	☑	Inclusion of H&H and SWM / BMP data into any JCC databases.
☐	☐	Other: _____

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:***

Additional Notes & Comments: Typical ESC/Drainage/SWM comments

(Note: THIS FORM FOR COUNTY USE ONLY.)

☑ 1st Rev ☐ 2nd Rev ☐ 3rd Rev

Signature	Date 6-11-02
Signature	Date
Signature	Date

1ST SUBMISSION
BMP POINT CALCULATION

NO NEW COMP SUBMITTED.

BMP POINT CALCULATIONS
FOR
GRACE COVENANT CHURCH

LMDG File No. 2001201-000.03

- Per boundary of site, the site area is 7.288 acres.

- Per meeting of March 8, 2002, with Scott Thomas (JCC Environmental Division), the existing borrow pit can be counted as an infiltration basin for the project. The borrow pit accepts drainage from 0.969 acres of the site, and 0.128 acres of off-site. Thus, the total drainage area served by the existing borrow pit is 1.097 acres.

BMP #2

BMP Points = $\frac{1.097}{7.288}$ x 8 = **1.20 BMP points**

C-3
0.5" / AC.
8 pts.

- The existing dry detention basin (Part of the subdivision design) will be modified to become an extended dry detention basin. This basin will be designed to serve a site drainage area of 6.235 acres. In addition, this basin serves an off-site drainage area of 7.626 acres. Thus, the total drainage area served by this basin is 13.861 acres.

BMP #1

BMP Points = $\frac{13.861}{7.288}$ x 4 = **7.61 BMP points**

F-2
4 pts
1.0" / AC.

BMP #1 TO BE MODIFIED
DRY DET →
EXT DRY DET.

- A total of 3.566 acres of open space will remain in its natural state for this project.

BMP Points = $\frac{3.566}{7.288}$ x 100 x 0.10 = **4.89 BMP points**

- Total BMP Points for Site = 1.20 + 7.61 + 4.89 = **13.70 BMP points**

VEG BUFFER ALONG R/W

CCC
68,600 SF
(1.57 AC.)

$\frac{1.18}{7.288} + 8 = 1.295$ pts

$\frac{13.861}{7.288} + 4 = 7.6076$ pts

8.90 pts.

7.61
1.29
8.9

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: **MC003**

DATE VERIFIED: **September 5, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

MC-0036

ontents for Stormwater Management Facilities As-built Files

ach file is to contain:

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

PC184

COPY

COUNTY OF JAMES CITY, VIRGINIA

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF RUNOFF CONTROL FACILITY

THIS DECLARATION, made this 20th day of September, 2002, between Daniel W. CAPRIO, Susan S. TUTTLE and Richard T. GAY, JR., as TRUSTEES OF GRACE COVENANT PRESBYTERIAN CHURCH, a Virginia religious association, and all successors in interest, hereinafter referred to as the "COVENANTORS (S)," owner(s) of the following property: Parcel II as shown on a plat titled "Plat of Parcels I, II, and III, Property of Mecca Development Corporation" recorded in Plat Book 45, Page No.9; project name, Grace Covenant Presbyterian Church,; and the County of James City, Virginia ("COUNTY.")

WITNESSETH:

We, the COVENANTOR (S), with full authority to execute deeds, mortgages, other covenants, and all rights, titles and interests in the property described above, do hereby covenant with the COUNTY as follows:

1. The COVENATOR (S) shall provide maintenance for the drainage system including any runoff control facilities, conveyance systems and associated easements, hereinafter referred to as the "SYSTEM," located on and serving the above-described property to ensure that the facility that the SYSTEM is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations. The SYSTEM shall not include any elements located within any Virginia Department of Transportation rights-of-way.

2. If necessary, the COVENANTOR (S) shall levy regular or special assessments against all present or subsequent owners of property served by the SYSTEM to ensure that the SYSTEM is properly maintained.

3. The COVENANTOR (S) shall provide and maintain perpetual access from public right-of-ways to the SYSTEM for the COUNTY, its agent and its contractor.

4. The COVENANTOR(S) shall grant the COUNTY, its agent and its contractor a right of entry to the FACILITY for the purpose of inspecting, operating, installing, construction, reconstruction, maintaining or repairing the SYSTEM.

5. If, after reasonable notice by the COUNTY, the COVENANTOR(S) shall fail to maintain the SYSTEM in accordance with approved design standards and with the law and applicable executive regulations, the COUNTY may perform all necessary repair or maintenance work, and the COUNTY may

Instrument # 020022837

Revised 01/02

Recorded on October 3, 2002

asses the COVENANTOR(S) and/or all property served by the SYSTEM for the cost of the work and any applicable penalties.

6. The COVENANTOR(S) shall indemnify and save the COUNTY harmless from any and all claims for damages to persons or property arising from the installation, construction, maintenance, repair, operation or use of the SYSTEM.

7. The COVENANTOR(S) shall promptly notify the COUNTY when the COVENANTOR (S) legally transfers any of the COVENANTOR (S)' responsibilities for the SYSTEM. The COVENANTOR(S)' shall supply the COUNTY with a copy of any document of transfer, executed by both parties.

8. The covenants contained herein shall run with the land and shall bind the COVENANTOR(S) and the COVENANTOR(S)' heirs, executors, administrators, successors and assignees, and shall bind all present and subsequent owners of property served by the SYSTEM.

9. This COVENANT shall be recorded in the County Land Records.

10. Notwithstanding anything to the contrary in this Declaration, pursuant to Section 57-15.1 of the Code of Virginia of 1950, as amended, this Declaration is executed without personal liability of the individuals executing the Declaration on behalf of Grace Covenant Presbyterian Church and shall be the obligation solely of Grace Covenant Presbyterian Church and no other.

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of first above written.

COVENANTORS:

DANIEL W. CAPRIO, SUSAN S. TUTTLE AND RICHARD T. GAY, JR., AS TRUSTEES OF GRACE COVENANT PRESBYTERIAN CHURCH, a Virginia religious association

By: _____ (SEAL)
Trustee

By: _____ (SEAL)
Trustee

By: _____ (SEAL)
Trustee

STATE OF VIRGINIA,

COUNTY OF JAMES CITY, to wit:

The foregoing instrument was duly acknowledged before me this 27th day of September, 2002 by Daniel W. Caprio, Susan S. Tuttle and Richard T. Gay, Jr., as Trustees of Grace Presbyterian Church, a Virginia religious association.

Notary Public

My commission expires: 9/30/2004

Approved as to form:

Asst. County Attorney

This Declaration of Covenants prepared by:

Charles. J. Bodnar, P.E.
(Print Name)

Associate, LandMark Design Group, Inc.
(Title)

4029 Ironbound Road, Suite 100
(Address)

Williamsburg, VA 23188
(City) (State) (Zip)

Printed On 10/18/2011 By WOOLRIDGE

Consideration: 185,000.00

3001 This Deed is Exempt from Recordation Tax Pursuant to Sections 58.1-803(D), 58.1-811(A)(1) and 58.1-811(B)(2) of the Code of Virginia

DEED OF ASSUMPTION BOOK 671 PAGE 514

THIS DEED OF ASSUMPTION, made this 2nd day of February, 1993, between **SETTLERS MILL, INC.**, a Virginia Corporation, party of the first part, hereinafter called the Grantor, and Jerry L. **WOODSON**, Trustee, Ralph C. **CRAFT**, Trustee and Robert D. **HOPPER**, Trustee, as the Trustees of **GRACE COVENANT PRESBYTERIAN CHURCH**, a Virginia Religious Association, party of the second part, hereinafter called the Grantee;

WITNESSETH: That for and in consideration of the sum of Ten Dollars ($10.00) cash in hand paid by the Grantee to the Grantor, and other good and valuable consideration, receipt whereof is hereby acknowledged, the Grantor does hereby GRANT, BARGAIN, SELL and CONVEY with GENERAL WARRANTY and with ENGLISH COVENANTS OF TITLE unto the Grantee, the following described property, to-wit:

All that piece or parcel of real estate situate, lying and being in James City County, Virginia, containing 7.2883 acres, more or less, and being designated as Parcel II, as shown on that certain plat entitled "Plat of Parcels I, II and III, property of Mecca Development Corporation" dated March 10, 1987, and made by AES, a professional corporation, Engineering, Planning and Surveying, a copy of which is recorded in the Clerk's Office of the Circuit Court of James City County, Virginia, in Plat Book 45, Page 9.

Being the same property as that conveyed unto the Grantor herein by Deed dated July 20, 1992 and recorded in James City County Deed Book 575, Page 802.

Subject to all restrictions and easements of record or apparent on the ground.

And further subject to the following additional restriction which the Grantees acknowledge shall run with the land and be binding on their heirs, successors and assigns of the owner of the property described above:

An area seventy-five feet (75') in width along the entire length of the northern boundary of the property shall be maintained as a natural "Buffer Strip". No building or other structure or parking area may be erected or maintained within the Buffer Strip. No soil may be disturbed, nor may any trees or foliage be removed except for windfall and deadfall and as expressly provided below in the Developable Area.

1-6

RETURNED TO KNICELY & COTORCEANU ATTORNEYS WILLIAMSBURG 3/17/94

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The following provisions shall apply only within the portion of the Buffer Strip which is south of a line which parallels the northern boundary of the property fifty feet (50') south of it ("Developable Area"):

> **Landscaping alterations may be made, including the removal of underbrush and the addition of new landscape material. In the Developable Area no existing tree with a diameter of its trunk greater than six inches (6") at a distance three feet (3') above the ground shall be removed.**

The provisions of this restrictive covenant are not intended to and shall not preclude the passive park use and enjoyment of the Buffer Strip by the owner of the property and nothing herein shall grant any right of use of or enjoyment of the Buffer Strip to any person other than the owner of the property, its guests and invitees.

PROVIDED, HOWEVER, that this conveyance is made subject to and the Grantee assumes:

A DEED OF TRUST made by Settlers Mill, Inc., a Virginia Corporation to W. J. Farinholt, John J. Dusewicz and David W. Holland, Trustees, dated August 6, 1992 and recorded in the aforesaid Clerk's Office in Deed Book 575, Page 811, to secure the payment of the principal sum of $139,000.00 and the Grantee herein, as is evidenced by their joining in the execution of this Deed, hereby assumes the payment of the unpaid balance of the debt secured by said Deed of Trust, which the Grantor covenants to be $ 127,334.02 after the January 12, 1994 payment, which has been made, and the Grantee covenants to the Grantor that they will discharge the debt so secured by said Deed of Trust according to the terms and provisions of said Deed of Trust and that they will forever save the Grantor harmless from the covenants and undertakings of said Deed of Trust.

Peninsula Trust Bank has joined in this Deed of Assumption solely for the purpose of indicating its consent to the assumption of the above described indebtedness of the Grantor by the Grantee. It is explicitly understood that the Grantor is not released from liability on the indebtedness described above and that the consent by Peninsula Trust Bank to this assumption does not constitute a waiver or consent to any future assumption.

WITNESS the following signatures and seals:

SETTLERS MILL, INC.

By _____ (SEAL)
Larry R. McCardle, President

GRACE COVENANT PRESBYTERIAN CHURCH

By _____ (SEAL)
Jerry L. Woodson, Trustee

By _____ (SEAL)
Ralph C. Craft, Trustee

By _____ (SEAL)
Robert D. Hopper, Trustee

PENINSULA TRUST BANK

By _____ (SEAL)

Printed On 10/18/2011 By WOOLRIDGE

STATE OF VIRGINIA

CITY/COUNTY OF James City County, to-wit:

The foregoing Deed of Assumption was acknowledged before me by Larry R. McCardle, President of Settlers Mill, Inc., a Virginia Corporation, as Grantor, this 17th day of February, 1994.

Martina Z. Sueltz
NOTARY PUBLIC

My commission expires: 8-31-96

STATE OF VIRGINIA

CITY/COUNTY OF James City County, to-wit:

The foregoing Deed of Assumption was acknowledged before me by Jerry L. Woodson, Trustee of Grace Covenant Presbyterian Church, a Virginia Religious Association, as Grantee, this 12th day of February, 1994.

Kathy A. Buhl
NOTARY PUBLIC

My commission expires: May 31, 1997

4 - 6

Printed On 10/18/2011 By WOOLRIDGE

STATE OF VIRGINIA

CITY/COUNTY OF James City County, to-wit:

The foregoing Deed of Assumption was acknowledged before me by Ralph C. Craft, Trustee of Grace Covenant Presbyterian Church, a Virginia Religious Association, as Grantee, this 17th day of February, 1994.

Kathy A. Buhl
NOTARY PUBLIC

My commission expires: May 31, 1997

STATE OF VIRGINIA

CITY/COUNTY OF James City County, to-wit:

The foregoing Deed of Assumption was acknowledged before me by Robert D. Hopper, Trustee of Grace Covenant Presbyterian Church, a Virginia Religious Association, as Grantee, this 17th day of February, 1994.

Kathy A. Buhl
NOTARY PUBLIC

My commission expires: May 31, 1997

5-6

Printed On 10/18/2011 By WOOLRIDGE

STATE OF VIRGINIA

CITY/COUNTY OF James City, to-wit:

The foregoing Deed of Assumption was acknowledged before me by Lee P Koob

of Peninsula Trust Bank, this 15th day of February,

1994.

Marian B Lucas
NOTARY PUBLIC

My commission expires: 5-31-94

Virginia: City of Williamsburg and County of James City, to Wit:
In the Clerk's Office of the Circuit Court for the City of Williamsburg and County of James City the 18 day of Feb 1994
This deed was presented with the certificate annexed and admitted to record at 2:58 o'clock. The taxes imposed by Sect. 58-54 (a) and (b) of the code, have been paid.

STATE TAX	LOCAL TAX	ADDITIONAL TAX
$ Exempt	$ Exempt	$ 58.5

Teste Helene S. Ward, Clerk
By Helene S Ward
Deputy Clerk

\wp51\temp\lenlease.doc

6 - 6

BOOK 575 PAGE 802

10273

THIS DEED, dated as of the 20th day of July, 1992, by SECURITY FEDERAL SAVINGS AND LOAN ASSOCIATION (also known as SECURITY FEDERAL SAVINGS AND LOAN ASSOCIATION OF VIRGINIA), through its Receiver, RESOLUTION TRUST CORPORATION, to be indexed as Grantor, and SECURITY FEDERAL SAVINGS ASSOCIATION through its Receiver, RESOLUTION TRUST CORPORATION, hereinafter Grantor, to SETTLERS MILL, INC., a Virginia corporation, hereinafter Grantee, whose current mailing address is 1111 Old Colony Lane, Williamsburg, Virginia 23185.

W I T N E S S E T H:

WHEREAS, Security Federal Savings and Loan Association was placed into receivership by that certain order number 90-442 of the Office of Thrift Supervision dated March 1, 1990, a copy of which is attached hereto and made a part hereof as Exhibit "A"; and

WHEREAS, Security Federal Savings Association was chartered by the Office of Thrift Supervision by order number 90-443, dated March 1, 1990; and

WHEREAS, pursuant to Order Number 90-444 dated March 1, 1990, the Office of Thrift Supervision appointed the Resolution Trust Corporation as Conservator for Security Federal Savings Association, a copy of which is attached hereto and made a part hereof as Exhibit "B"; and

WHEREAS, pursuant to Order Number 90-1796 dated September 27, 1990, the Office of Thrift Supervision replaced the Resolution Trust Corporation as Conservator for Security Federal Savings Association with the Resolution Trust Corporation as Receiver for Security Federal Savings Association, a copy of which is attached hereto as Exhibit "C"; and

WHEREAS, by operation of law pursuant to 12 U.S.C. Section 1821(d)(2)(A) and Section 1441a(b)(4), the RTC as Receiver of Security Federal Savings Association succeeded to all rights, titles and privileges in the property more particularly described herein below; and

R523

Returned to Anderson Franck & Davis Attys. Wmsbg, Va. 23185 8/26/92

1-9

WHEREAS, Resolution Trust Corporation authorized and empowered certain individuals as its Attorney-in-Fact, any one of whom may act, as fully set forth in that certain Power of Attorney dated March 24, 1992, said instrument being recorded in the Clerk's Office of the Circuit Court of the County of James City, Virginia, in Deed Book 852, page 511;

NOW, THEREFORE, for and in consideration of the sum of Ten Dollars ($10.00), cash in hand paid, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Grantor does hereby grant and convey with **SPECIAL WARRANTY** to the Grantee the following described real property, to-wit:

SEE EXHIBIT D ATTACHED HERETO AND MADE A PART HEREOF.

This conveyance is made subject to recorded conditions, restrictions and easements affecting the property hereby conveyed.

WITNESS the following signature and seal:

SECURITY FEDERAL SAVINGS ASSOCIATION
through its Receiver,
RESOLUTION TRUST CORPORATION

By C. R. Johnson (SEAL)
Attorney-in-fact

STATE OF GEORGIA,
CITY/COUNTY OF Fulton, to-wit:

The foregoing instrument dated July 20, 1992, was acknowledged before me this 24th day of July, 1992, by Charles R. Johnson, acting in his/her capacity as Attorney-in-Fact for Resolution Trust Corporation.

Linda G. Brown
Notary Public

My Commission Expires:
Notary Public, Fulton County, Georgia.
My Commission Expires September 15, 1995

R523

MC003_GCPC_LAKEWOOD_DRIVE - 013

BOOK 575 PAGE 804

JOINDER

RESOLUTION TRUST CORPORATION, acting in its capacity as Receiver of SECURITY FEDERAL SAVINGS AND LOAN ASSOCIATION (also known as SECURITY FEDERAL SAVINGS AND LOAN ASSOCIATION OF VIRGINIA), predecessor-in-interest to Grantor with respect to the above-described real property, hereby conveys and quitclaims to Grantee any and all interest it may have in the real property, and joins in the conveyance of the real property to Grantee, without warranty.

SECURITY FEDERAL SAVINGS AND LOAN ASSOCIATION, through its Receiver, RESOLUTION TRUST CORPORATION

By C. R. Johnson (SEAL)

ATTORNEY-IN-FACT

STATE OF GEORGIA,
CITY/COUNTY OF Fulton, to-wit:

The foregoing instrument dated July 20, 1992, was acknowledged before me this 20th day of July, 1992, by Charles R. Johnson acting in his/her capacity as Attorney-in-Fact for Resolution Trust Corporation.

Linda G. Brown
Notary Public

My Commission Expires:

Notary Public, Fulton County, Georgia.
My Commission Expires September 15, 1995

R523

MC003_GCPC_LAKEWOOD_DRIVE - 014

A

EXHIBIT A

OFFICE OF THRIFT SUPERVISION

BOOK 575 PAGE 805

Appointment of Receiver
Security Federal Savings and Loan Association
Richmond, Virginia

Order No. 90-442
Date: March 1, 1990

RECITALS

A. Security Federal Savings and Loan Association, Richmond, Virginia ("Association") is a federally chartered savings association, the accounts of which are insured by the Federal Deposit Insurance Corporation.

B. Pursuant to § 5(d)(2)(B)(i) of the Home Owners' Loan Act of 1933 ("HOLA"), as amended by § 301 of the Financial Institutions Reform, Recovery, and Enforcement Act of 1989 ("FIRREA"), the Director of the Office of Thrift Supervision ("Director") may, without any requirement of notice, hearing or other action, appoint a conservator or receiver for a Federal savings association if the association, by resolution of its board of directors or of its members, consents to such appointment.

C. Pursuant to § 5(d)(2)(H)(ii) of HOLA, as amended by § 301 of the Financial Institutions Reform, Recovery, and Enforcement Act of 1989, the Director shall appoint only the Federal Deposit Insurance Corporation or the Resolution Trust Corporation, as appropriate, as receiver for a savings association for the purpose of liquidation or winding up the affairs of such savings association.

ORDER

1. The Director, upon consideration of the administrative record, and for the rationale set forth in the Legal Memorandum dated February 27, 1990, and the Executive Summary dated March 1, 1990, hereby finds and determines that (a) the Association is in an unsafe and unsound condition to transact business, due to having substantially insufficient capital in that the Association has negative tangible capital; and (b) the Association, by resolution of its board of directors, has consented to the appointment of a receiver; and that grounds for the appointment of a receiver for the Association therefore exist under § 5(d)(2)(A)(iii) and (B) of HOLA, as amended.

MC003_GCPC_LAKEWOOD_DRIVE - 015

OFFICE OF THRIFT SUPERVISION

BOOK 575 PAGE 806

Appointment of Receiver
Security Federal Savings and Loan Association
Richmond, Virginia

2. The Director, upon consideration of the administrative record further finds and determines with respect to the Association that the Association has suffered a pattern of consistent losses.

3. The Director hereby appoints the Resolution Trust Corporation as receiver for the Association for the purpose of liquidation, pursuant to subdivisions (A), (B), (E), and (H)(ii) of § 5(d)(2) of HOLA, as amended.

M. Danny Wall
Director

MC003_GCPC_LAKEWOOD_DRIVE - 016

EXHIBIT B

BOOK 575 PAGE 807

OFFICE OF THRIFT SUPERVISION

Appointment of Conservator for Security Federal Savings Association Richmond, Virginia

Order No. 90-444
Date: March 1, 1990

RECITAL

A. Security Federal Savings and Loan Association, Richmond, Virginia ("Association"), is a federally chartered savings association, the accounts of which are insured by the Federal Deposit Insurance Corporation.

B. The Director of the Office of Thrift Supervision ("Director"), by Order No. 90-442, dated March 1, 1990, appointed the Resolution Trust Corporation as Receiver for the Association, and on application of the Resolution Trust Corporation by Order No. 90-443, dated March 1, 1990, authorized the incorporation of and the issuance of a federal charter for Security Federal Savings Association, Richmond, Virginia ("New Federal"), a Federal savings association organized to take over the assets and liabilities of the Association.

C. Pursuant to § 5(d)(2)(B)(i) of the Home Owners' Loan Act of 1933, ("HOLA") as amended by § 301 of the Financial Institutions Reform, Recovery, and Enforcement Act of 1989 ("FIRREA"), the Director may, without any requirement of notice, hearing or other action, appoint a conservator or receiver for a Federal savings association if the association, by resolution of its board of directors or of its members, consents to such appointment.

D. Pursuant to § 5(d)(2)(H) of the HOLA, as amended, the Director, at the Director's discretion, may appoint the Federal Deposit Insurance Corporation or the Resolution Trust Corporation, as appropriate, as conservator for a savings association.

E. The Resolution Trust Corporation, which organized New Federal by application to the Director, pursuant to § 11(d)(2)(F)(i) of the Federal Deposit Insurance Act, as amended by § 212 of FIRREA, exercises the powers of the board of directors of New Federal.

MC003_GCPC_LAKEWOOD_DRIVE - 017

BOOK 575 PAGE 808

OFFICE OF THRIFT SUPERVISION

Appointment of Conservator for Security Federal Savings Association Richmond, Virginia

ORDER

1. Effective upon receipt of the consent of New Federal, by resolution of its board of directors or of its members, or by resolution of the Resolution Trust Corporation exercising the powers of a board of directors of New Federal, the Director hereby appoints the Resolution Trust Corporation as conservator for New Federal ("Conservator"), not for the purpose of liquidation, pursuant to subdivisions (B) and (H) of § 5(d)(2) of the HOLA, as amended.

2. The Resolution Trust Corporation as Conservator for New Federal shall have the powers of a conservator for a Federal savings association granted under HOLA, as amended, the Federal Deposit Insurance Act, as amended, and FIRREA.

M. Danny Wall
Director

MC003_GCPC_LAKEWOOD_DRIVE - 018

EXHIBIT C

A

OFFICE OF THRIFT SUPERVISION BOOK 575 PAGE 809

Replacement of Conservator
With a Receiver
Security Federal Savings Association
Richmond, Virginia

Order No. 90- 1796

Date: September 27, 1990

Issued Under Delegated Authority

RECITALS

A. Security Federal Savings Association, Richmond, Virginia ("Association") is a Federally-chartered savings association, the accounts of which are insured by the Federal Deposit Insurance Corporation, and for which the Resolution Trust Corporation is Conservator.

B. Pursuant to Section 5(d)(2)(H)(ii) of the Home Owners' Loan Act of 1933 ("HOLA"), as amended by Section 301 of the Financial Institutions Reform, Recovery, and Enforcement Act of 1989, the Director of the Office of Thrift Supervision ("Director"), shall appoint only the Federal Deposit Insurance Corporation or the Resolution Trust Corporation, as appropriate, as receiver for a savings association for the purpose of liquidation or winding up the affairs of such savings association.

ORDER

1. The Director, upon consideration of the administrative record, hereby replaces the Conservator for the Association with the Resolution Trust Corporation as Receiver for the Association for the purpose of liquidation, pursuant to subdivision (F) of Section 5(d)(2) of the HOLA, as amended, effective upon the surrender of possession of the Association by the Conservator to the Receiver.

Jonathan L. Fiechter
Senior Deputy Director for
Supervision

8-9

BOOK 575 PAGE 810

LEGAL DESCRIPTION

EXHIBIT D

All that piece or parcel of real estate situate, lying and being in James City County, Virginia, containing 7.2883 acres, more or less, and being designated as Parcel II, as shown on that certain plat entitled "Plat of Parcels I, II and III, property of Mecca Development Corporation" dated March 10, 1987, and made by AES, a Professional Corporation, Engineering, Planning and Surveying, a copy of which plat is recorded in the Clerk's Office of the Circuit Court of James City County, Virginia, in Plat Book 45, page 9.

IT BEING the same property conveyed to SECURITY FEDERAL SAVINGS AND LOAN ASSOCIATION OF VIRGINIA by deed from A. J. Brent, Sole Acting Trustee, dated March 1, 1990, recorded in Deed Book 468, page 335.

City of Williamsburg and County of
In the Clerk's Office of the Circuit Court for the City of Williamsburg and County of
James City the 1 day of Aug 92
This deed was presented with the certificate annexed and admitted to record
at 11:52 o'clock. The taxes imposed by Sect. 58-54 (a) and (b) of the Code
have been paid

STATE TAX	LOCAL TAX	ADDITIONAL TAX
$ 436.50	$ 145.50	$ Exempt

Teste Helene S. Ward, Clerk
By: Helene S. Ward
Deputy Clerk

9 - 1

050011774

Consideration: $60,000.00

Tax Map No.: 47-4 11-2

Prepared by:

Phillips & Bartlett, P.C.

This deed made this 26th day of May, 2005, by and between Donald G. **PONS** and Frances J. **PONS**, husband and wife, as parties of the first part, hereinafter designated as the Grantors, and Mark A. **URICK** and Heather A. **PONS**, husband and wife, as parties of the second part, hereinafter designated as the Grantees, whose mailing address is 1122 Pleasant Point Road, Surry, Virginia, 23883:

WITNESSETH: That for and in consideration of the sum of TEN DOLLARS ($10.00), cash in hand paid by the Grantees to the Grantors, and other good and valuable consideration, receipt whereof is hereby acknowledged, the Grantors do hereby GRANT, BARGAIN and SELL, and CONVEY unto the Grantees with GENERAL WARRANTY and ENGLISH COVENANTS OF TITLE, as tenants by the entirety with the right of survivorship as at common law, the following described property, to-wit:

All that certain lot, piece or parcel of land situate, lying and being in the Jamestown District of James City County, Virginia, designated and shown as Lot 2 on that certain plat of survey entitled, "PLAT OF FIVE LOTS ON JAMESTOWN ROAD OWNED BY: VENTURE INVESTMENTS, INC., JAMES CITY COUNTY, VIRGINIA", made by Rainey Engineering, Christiansburg, Virginia, dated May 15, 1991, and recorded in the Clerk's Office of the Circuit Court for the City of Williamsburg and the County of James City, Virginia, in Plat Book 55, Page 60, as amended by that certain plat of survey entitled, "PLAT SHOWING BOUNDARY LINE ADJUSTMENT LOT LINE EXTINGUISHMENT AND DRIVEWAY ACCESS ADJUSTMENT LOTS 2 & 3, SUBDIVISION OF FIVE LOTS ON JAMESTOWN ROAD OWNED BY VENTURE INTERNATIONAL INVESTMENTS, INC., JAMESTOWN DISTRICT, JAMES CITY COUNTY, VIRGINIA", made by AES Consulting Engineers, Williamsburg, Virginia, dated April 29, 1996, as corrected by that certain plat of correction recorded in the aforesaid Clerk's Office in Plat Book 64, Page 70, to which plats specific reference is here made for a more accurate description of the property hereby conveyed.

Together with all and singular the buildings and improvements thereon, the rights, privileges, tenements, hereditaments and appurtenances thereunto belonging or in anywise appertaining.

PHILLIPS & BARTLETT, P.C.
ATTORNEYS AT LAW
WILLIAMSBURG, VIRGINIA

This conveyance is subject to all conditions, restrictions, covenants and easements of record or apparent on th ground.

Being the same property as that conveyed unto the Grantors herein by deed dated February 21, 2003 from Mark Urick and Heather Pons, husband and wife, which deed is of record in the aforesaid Clerk's Office as instrument number 030005780.

WITNESS the following signatures and seals:

(SEAL)
Donald G. Pons

(SEAL)
Frances J. Pons

STATE OF VIRGINIA
CITY OF WILLIAMSBURG, to-wit:

The foregoing deed was acknowledged before me this 26th day of May, 2005, in my aforesaid jurisdiction by Donald G. Pons and Frances J. Pons.

Notary Public

My commission expires: 9/30/05.

VIRGINIA: CITY OF WILLIAMSBURG & COUNTY OF JAMES CITY
This document was admitted to record on 26 May 05
at 2:26 AM/PM. The taxes imposed by Virginia Code
Section 58.1-801, 58.1-802 & 58.1-814 have been paid.

STATE TAX	LOCAL TAX	ADDITIONAL TAX
$ 150.00	$ 50.00	$ 60.00

TESTE: BETSY B. WOOLRIDGE, CLERK
BY: Betsy B. Woolridge Clerk

PHILLIPS & BARTLETT, P.C.
ATTORNEYS AT LAW
WILLIAMSBURG, VIRGINIA

Printed On 10/18/2011 By WOOLRIDGE

>>> SELECTED SEARCH CRITERIA <<<

Jurisdiction : 095 JAMES CITY (DEEDS, MARRIAGE LICENSES, WI

10/18/2011 3:15:00 PM

	From Date	To Date
Available : Deeds and Land Records	01/02/1968	10/14/201 1

Search By:
Tax Map #= 4741100002

***** No Record Found In The Database *****

>>> End Of Print Screen <<<

SP-06-02

LAKEWOOD SECTION 2

LOT 8 | LOT 7 | LOT 6 | LOT 5 | LOT 4 | LOT 3 | LOT 2 | LOT 1

LAKEWOOD SECTION 2

S 65°37'12" E 1303.95'

SETBACK LINE

BUFFER LINE

TIMBER RETAINING WALL

PHASE ONE
F.F. 62.00

CONC. WALK

HVAC AREA

GRASS SWALE

BIORETENTION BASIN (BMP #3)

DI
RIM=~~58.60~~ 58.58
INV.=~~53.72~~ 53.86

DI
RIM=~~53.50~~ 53.38
INV.=~~48.58~~ 48.64

DI
RIM=53.50 53.38
INV.=~~48.56~~ 48.64

115-L.F. 12"RCP@2.5%

79-L.F. 12"RCP@3.47%
80-L.F. 12"RCP@3.4%

87-L.F. 12"RCP@3.47%
87-L.F. 12"RCP@2.6%

CONC. HEADWALL
TOP=~~50.96~~ 61.38
INV.12" RCP=~~58.80~~ 58.84

193-L.F. 12"RCP@4.90%
194-L.F. 12"RCP@5.6%

57-L.F. 12"RCP@5.00%
57-L.F. 12"RCP@5.5%

DI
RIM=~~54.4~~ 54.45
INV. IN=~~43.25~~(N) 46.41
INV. IN =~~49.54~~(W) 49.55
INV. OUT=~~46.25~~ 46.17

DI
RIM=~~47.50~~ 48.13
INV.=~~42.83~~
INV. IN=43.03
INV. OUT=43.00

24" RCP
INV.=~~42.25~~ 42.20

DI
RIM=~~51.74~~ 51.74
INV.=~~45.84~~
INV. IN=~~45.89~~(N.W.)
INV. IN=~~46.34~~(N.E.)
INV. OUT=45.96

53-L.F. 15"RCP@3.47%
58-L.F. 15"RCP@3.5%

ES-1
INV.=~~44.00~~ 43.96

16 LF PC-2A @ ~~12.25%~~ @ 8.6%

20-L.F.18"RCP@~~1.65%~~
18-L.F.18"RCP@0.4%

84-L.F.24"RCP@~~0.90%~~
66-L.F.18"RCP@1.2%

ES-1
INV.=~~43.16~~ 43.11

N 65°37'12" W 810.00'

GRASS SWALE

SEE DETAIL 1

CONCRETE OVER FORCE MAIN

CONCRETE OVER FORCE MAIN

EXISTING DETENTION POND (BMP #1)

CONCRETE DITCH

LANDSCAPE AREA

CONCRETE FLUME

INVERT=39.54'

J-CONCRETE ELLIPTICAL STORM PIPE(15"x22")

INV.=38.82

18" RCP

POND OUTFALL STRUCTURE
RIM=~~43.70~~ 43.20
INV. OUT=~~40.80~~ 40.16

LAKEWOOD DRIVE (VARIABLE WIDTH R/W)

S 24°22'48" W 300.00'

JAMESTOWN ROAD – STATE ROUTE 31 (110' R/W)

MC003

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

RECORD INFORMATION
(TYPICAL)

POND OUTFALL STRUCTURE
RIM=~~43.70~~ 43.20
INV. OUT=~~40.80~~ 40.16

THESE RECORD DRAWINGS ARE BASED ON AN ACTUAL FIELD SURVEY OF STORMWATER MANAGEMENT FACILITIES PERFORMED BY LANDMARK DESIGN GROUP NOVEMBER, 2007. IMPROVEMENTS SHOWN OTHER THAN STORMWATER MANAGEMENT FACILITIES, WERE TAKEN FROM THE APPROVED SITE PLAN AND WERE NOT FIELD VERIFIED.

COMMONWEALTH OF VIRGINIA
12/4/07
PETER FARRELL
LIC. No. 002036
LAND SURVEYOR

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

5544 Greenwich Road
Suite 200
Virginia Beach, VA 23462
Tel. (757) 473-2000
Fax. (757) 497-7833
Email: info@landmarkdg.com

4029 Ironbound Road
Suite 100
Williamsburg, VA 23188
Tel. (757) 229-2975
Fax. (757) 220-8616
Email: info@landmarkdg.com

STORM SEWER RECORD DRAWING
GRACE COVENANT PRESBYTERIAN CHURCH
JAMES CITY COUNTY VIRGINIA

Designed: LMDG	Date: 12/04/07
Checked: PF	Scale: 1"=30'
File Mgr./Drawn: AST	CADD File name: GRACE-STORM DWG
Project Number: 2007190-000.00	Dwg. File No.: 1820IW

Drawing Number
R-1
1 OF 2

MC003_GCPC_LAKEWOOD_DRIVE - 024

MAINTENANCE PLAN DETENTION POND BMP

THE OWNER OR ITS DESIGNATED REPRESENTATIVE WILL INSPECT THE SWM/BMP STRUCTURE AFTER EACH SIGNIFICANT RAINFALL EVENT OR THE FOLLOWING WORKING DAY IF A WEEKEND OR HOLIDAY OCCURS. A SIGNIFICANT RAINFALL FOR THIS STRUCTURE IS DEFINED AS ONE (1) INCH OR MORE OF GAUGED RAINFALL WITHIN A 24 HOUR PERIOD. ONCE PER YEAR (MORE OR LESS) A REPRESENTATIVE OF THE COUNTY MAY JOINTLY INSPECT THE STRUCTURE. APPROPRIATE ACTION, PERFORMED AT THE COST OF THE OWNER WILL BE TAKEN TO ENSURE APPROPRIATE MAINTENANCE. KEYS TO LOCKED ACCESS POINTS OR STRUCTURES SHALL BE MADE AVAILABLE TO THE COUNTY UPON REQUEST.

THE DETENTION POND SERVES A DRAINAGE AREA OF 2.2 ACRES ASSOCIATED WITH THE 7.9–ACRE GREENMOUNT INDUSTRIAL PARK LOT 2B SITE. THE FACILITY IS A 4–POINT, DRY–TYPE DETENTION FACILITY, COUNTY TYPE F–2 BMP. SOME INFILTRATION WILL OCCUR AT AN AVERAGE INFILTRATION RATE OF 1/4 INCH PER HOUR. A DRY–TYPE DETENTION POND TEMPORARILY STORES RUNOFF AND IS NORMALLY DRY DURING NON–RAINFALL PERIODS. TYPICALLY DRAW DOWN TIMES RANGE FROM 24 TO 72 HOURS FOLLOWING A STORM EVENT. PRINCIPAL STRUCTURES ASSOCIATED WITH THE BMP CONSIST OF TWO INFLOW STORM DRAINS (12 AND 18 INCH DIAMETER), A 36–INCH VERTICAL RISER, AND A 21–INCH RCP OUTLET BARREL. THERE ARE TWO OPENINGS IN THE RISER TO OFFER CONTROL FOR THE 2– AND 10– YEAR DESIGN STORM EVENTS. DURING THE 100–YEAR STORM, THE MAXIMUM WATER LEVEL SHOULD RISE TO ABOUT 12 INCHES ABOVE THE CREST OF THE RISER AND WITHIN 12 INCHES OF THE TOP OF THE DAM. IF FUNCTIONING PROPERLY, NORMAL STORM EVENTS SHOULD REACH AN ELEVATION JUST BELOW THE TOP OF THE RISER AND THE POND SHOULD DRAW DOWN IN ABOUT 24 TO 36 HOURS.

ADDITIONAL INSPECTION AND MAINTENANCE MEASURES:

1. INSPECT FOR SEDIMENT BUILDUP BY VISUAL OBSERVATION AND A PHYSICAL DETERMINATION OF SEDIMENT DEPTH WITHIN POND STORAGE AREAS. IF THE DEPTH OF SEDIMENT REACHES THE DEPTH OF 12 INCHES ABOVE THE BOTTOM OF POND, REMOVAL IS REQUIRED. AT THE SAME TIME, OR AT LEAST ONCE PER YEAR, CLEAN PRETREATMENT DEVICES, THE RISER BOTTOM AND OUTLET PIPES OF ACCUMULATED SEDIMENTS. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA.

2. PERFORM MAINTENANCE MOWING OF POND GRASSES AT LEAST TWICE EACH YEAR. GRASSES SUCH AS TALL FESCUE SHOULD BE MOWED IN EARLY SUMMER AFTER EMERGENCE OF THE HEADS ON COOL SEASON GRASSES AND IN LATE FALL TO PREVENT SEEDS OF ANNUAL WEEDS FROM MATURING. MOWING OF LEGUMES CAN BE LESS FREQUENT. TREES, SHRUBS AND WOODY VEGETATION ARE NOT BE PERMITTED TO GROW ALONG OR ON ANY PART OF THE EMBANKMENT EMBANKMENT THAT WAS CONSTRUCTED USING ENGINEERED (COMPACTED) FILLS.

3. PERFORM SOIL SAMPLING ON STABILIZED POND SOIL AREAS AT LEAST ONCE EVERY 4 YEARS. SOIL SAMPLING AND TESTING SHOULD BE PERFORMED BY QUALIFIED INDEPENDENT SOIL TESTING LABORATORY SUCH AS VPI&SU. CONTACT THE LOCAL OFFICE OF THE VIRGINIA COOPERATIVE EXTENSION FOR FURTHER INFORMATIONS. APPLY ADDITIONAL LIME AND FERTILIZER IN ACCORDANCE WITH TEST RECOMMENDATIONS.

4. IN STABILIZED POND AREAS, IF VEGETATION COVERS LESS THAN 40% OF SOIL SURFACES, LIME, FERTILIZE AND SEED IN ACCORDANCE WITH RECOMMENDATIONS FOR NEW SEEDLINGS. IF VEGETATION COVERS MORE THAN 40% BUT LESS THAN 70% OF SOIL SURFACFS, LIME, FERTILIZE AND OVER SEED IN ACCORDANCE WITH CURRENT SEEDING RECOMMENDATIONS OR REQUIREMENTS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH).

5. PERFORM QUARTERLY INSPECTIONS OF THE RISER SECTION FOR THE OBSERVANCE OF COLLECTED TRASH AND DEBRIS. IMMEDIATELY REMOVE ANY TRASH OR DEBRIS THAT PREVENTS THE MOVEMENT OF WATER. REMOVE ANY TRASH AND LITTER DOWNSTREAM AND AT STORM DRAIN OR CHANNEL INFLOW LOCATIONS TO MAINTAIN THE INTEGRITY OF THE STRUCTURE.

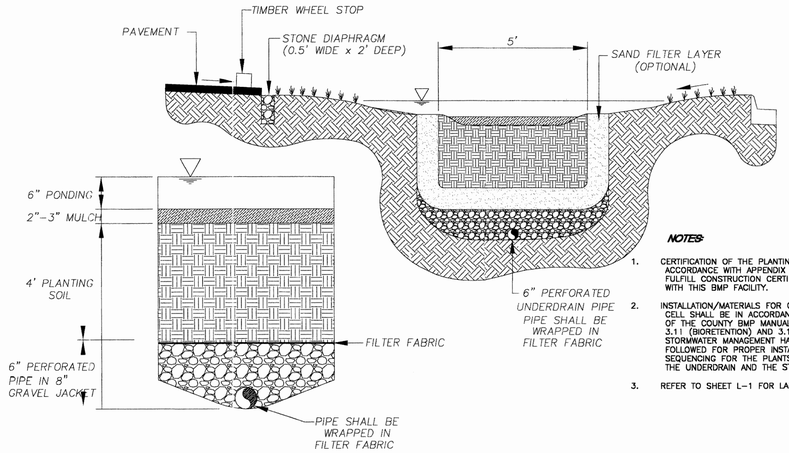
6. PERFORM ANNUAL STRUCTURAL INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE CONCRETE RISER, ANTI–VORTEX DEVICE, TRASH RACK, ORIFICES/WEIRS, OUTLET BARREL AND POND EMBANKMENT. EXPOSED METAL SURFACES SHALL BE RE–PAINTED OR RE–GALVANIZED TO MINIMIZE RUST DAMAGE OR REPLACED IF RUST DAMAGE IS IRREVERSIBLE. IF DAMAGE IS EVIDENT, FURTHER INVESTIGATION BY A QUALIFIED PROFESSIONAL MAY BE REQUIRED TO ASSESS THE INTEGRITY OF THE STRUCTURE.

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

8. PERFORM ANNUAL OBSERVATIONS OF PERIMETER AREAS SURROUNDING THE FACILITY TO ENSURE CHANGES IN LAND USE, TOPOGRAPHY OR ACCESS HAVE NOT OCCURRED AND DO NOT AFFECT THE OPERATION, MAINTENANCE, ACCESS OR SAFETY FEATURES AS PROVIDED. APPROPRIATE ACTION IS REQUIRED TO ENSURE ADEQUACY AND TO PROVIDE A CLEAR, SAFE PASSAGE FOR MAINTENANCE VEHICLES TO THE ENGINEERED EMBANKMENT AND PRINCIPAL FLOW CONTROL STRUCTURES.

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

10. THE FACILITY SHALL NOT ACCEPT ADDITIONAL DRAINAGE OR BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT OR APPROVAL BY THE ENVIRONMENTAL DIVISION OF JAMES CITY COUNTY.



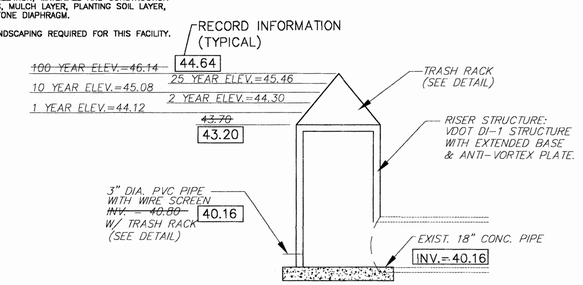
BIORETENTION BASIN SECTIONS

SCALE: NONE

NOTES:

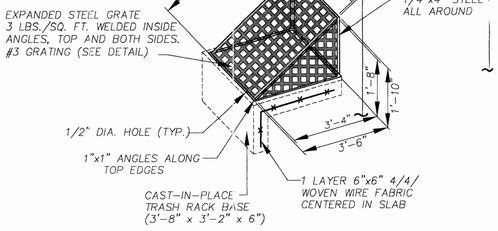
1. CERTIFICATION OF THE PLANTING SOIL LAYER WILL BE REQUIRED IN ACCORDANCE WITH APPENDIX E OF THE COUNTY BMP MANUAL TO FULFILL CONSTRUCTION CERTIFICATION REQUIREMENTS ASSOCIATED WITH THIS BMP FACILITY.
2. INSTALLATION/MATERIALS FOR CONSTRUCTION OF THE BIORETENTION CELL SHALL BE IN ACCORDANCE WITH GROUP D BMP REQUIREMENTS OF THE COUNTY BMP MANUAL, (PAGES 48–50) AND MINIMUM STANDARDS 3.11 (BIORETENTION) AND 3.13 (PAGES 3.13–12 AND 13) OF THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK. THESE REFERENCES SHOULD BE FOLLOWED FOR PROPER INSTALLATION, MATERIALS AND CONSTRUCTION SEQUENCING FOR THE PLANTS, MULCH LAYER, PLANTING SOIL LAYER, THE UNDERDRAIN AND THE STONE DIAPHRAGM.
3. REFER TO SHEET L–1 FOR LANDSCAPING REQUIRED FOR THIS FACILITY.

MC003



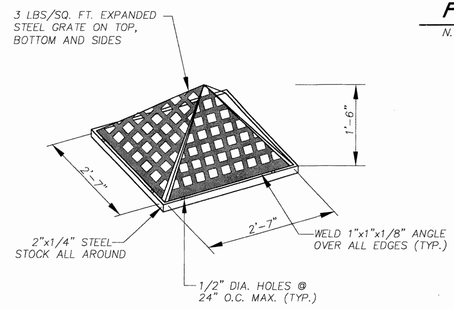
POND OUTFALL STRUCTURE

N.T.S.



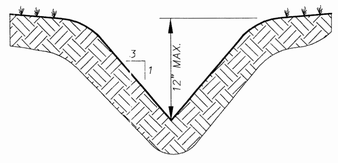
TRASH RACK DETAIL FOR LOW FLOW ORIFACE

N.T.S.



TRASH RACK DETAIL FOR DI–1

N.T.S.



TYPICAL SWALE SECTION

N.T.S.

THESE RECORD DRAWINGS ARE BASED ON AN ACTUAL FIELD SURVEY OF STORMWATER MANAGEMENT FACILITIES PERFORMED BY LANDMARK DESIGN GROUP NOVEMBER, 2007. IMPROVEMENTS SHOWN OTHER THAN STORMWATER MANAGEMENT FACILITIES, WERE TAKEN FROM THE APPROVED SITE PLAN AND WERE NOT FIELD VERIFIED.

COMMONWEALTH OF VIRGINIA
12/4/07
PETER FARRELL
LIC. No. 002036
Peter Farrell
LAND SURVEYOR

5544 Greenwich Road
Suite 200
Virginia Beach, VA 23462
(757) 497–7200
Fax (757) 497–7933
Email: lmdg@landmarkdg.com

4029 Ironbound Road
Suite 100
Williamsburg, VA 23188
(757) 229–5648
Fax (757) 229–0049
Email: lmdg@landmarkdg.com

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

STORM SEWER RECORD DRAWING
GRACE COVENANT PRESBYTERIAN CHURCH
JAMES CITY COUNTY VIRGINIA

Designed: LMDG	Date: 12/04/07
Checked: PF	Scale: AS-NOTED
File Mgr./Drawn: AST	CADD File name: GRACE-STORM.DWG
Project Number: 200793-000.00	Dwg. File No.: 19200W

Drawing Number R-2

2 OF 2

5/23/96
DB 788/1928
PB 64/23

CERTIFICATE OF SOURCE OF TITLE

TITLE TO THE LAND SHOWN HEREON IS VESTED IN VENTURE INVESTMENTS, INC. A VIRGINIA CORPORATION, BY DEED DATED MARCH 31, 1987, RECORDED IN D.B. 335, PAGE 786, ON APRIL 1, 1987 (SEE P.B. 45, PAGE 9) IN THE CLERK'S OFFICE OF THE CIRCUIT COURT OF THE CITY OF WILLIAMSBURG AND COUNTY OF JAMES CITY, VIRGINIA.

OWNER'S CERTIFICATE

THE BOUNDARY LINE ADJUSTMENT AND LOT LINE EXTINGUISHMENT SHOWN ON THIS PLAT IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE DESIRE OF THE UNDERSIGNED OWNERS, PROPRIETORS AND OR TRUSTEES.

[signature] 5-7-96
FOR VENTURE INVESTMENT, INC DATE

CERTIFICATE OF NOTARIZATION

STATE OF ~~VIRGINIA~~ TEXAS

~~CITY~~/COUNTY OF HARRIS I ~~DAVID L. TAGGART~~, A NOTARY PUBLIC IN AND FOR THE CITY/COUNTY AND STATE AFORESAID, DO HEREBY CERTIFY THAT THE PERSONS WHOSE NAMES ARE SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN THE CITY/COUNTY AFORESAID GIVEN UNDER MY NAME THIS 7th DAY OF May 19 96. MY COMMISSION EXPIRES Sept 97

Beverly Bienvenu
SIGNATURE

BEVERLY BIENVENU
Notary Public, State of Texas
My Commission Expires
SEPT 8, 1997

SURVEYOR'S CERTIFICATE

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

[signature] 4-29-96
G.T. WILSON, JR., C.L.S. DATE

CLERK'S CERTIFICATE
STATE OF VIRGINIA, COUNTY OF JAMES CITY

IN THE CLERK'S OFFICE OF THE CIRCUIT COURT FOR THE COUNTY OF JAMES CITY THE _____ DAY OF _____ 19__
THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORD AS THE LAW DIRECTS

TESTE: _____, CLERK

PLAT BOOK: _____, PAGE _____

CERTIFICATE OF APPROVAL

THIS BOUNDARY LINE ADJUSTMENT AND LOT LINE EXTINGUISHMENT IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE ADMITTED TO RECORD

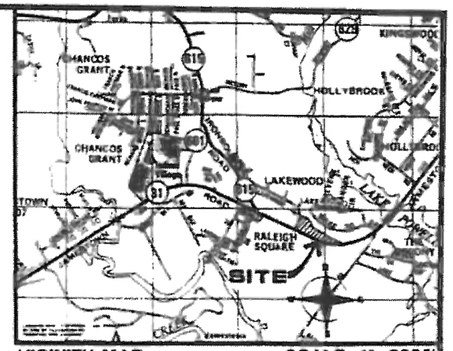
[signature] 5/9/96
VIRGINIA DEPARTMENT OF TRANSPORTATION DATE

[signature] 5/16/96
SUBDIVISION AGENT OF JAMES CITY COUNTY DATE

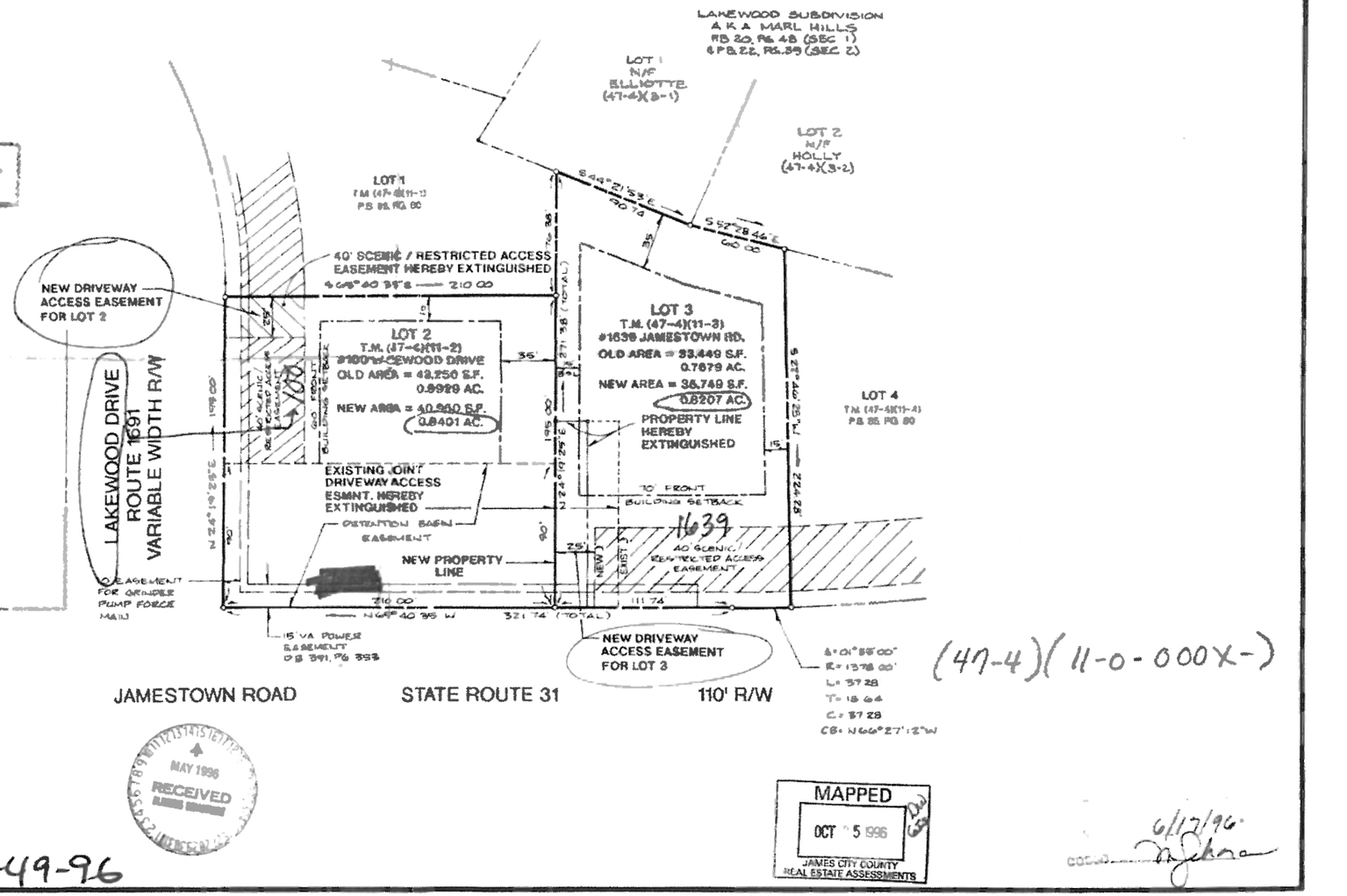
S-49-96

50 0 50
SCALE IN FEET

RECORD MERIDIAN
PLAT BOOK 55, PAGE 60



VICINITY MAP SCALE: 1"=2000'



(47-4)(11-0-000X-)

MAY 1996 RECEIVED

MAPPED
OCT 5 1996
JAMES CITY COUNTY
REAL ESTATE ASSESSMENTS

6/12/96

ES CONSULTING ENGINEERS

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

PLAT SHOWING BOUNDARY LINE ADJUSTMENT LOT LINE EXTINGUISHMENT AND DRIVEWAY ACCESS ADJUSTMENT LOTS 2 & 3, SUBDIVISION OF FIVE LOTS ON JAMESTOWN ROAD OWNED BY VENTURES INVESTMENTS, INC.

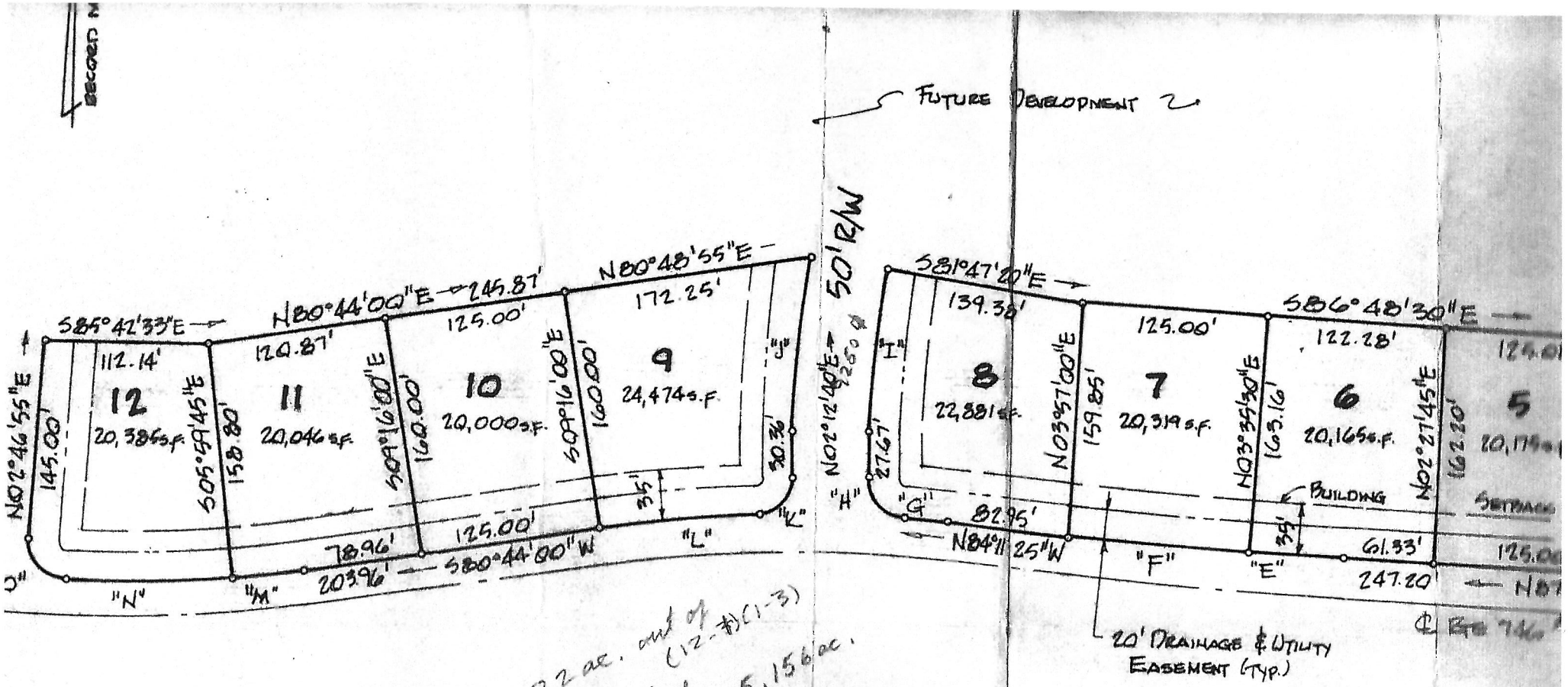
JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA

COMMONWEALTH OF VIRGINIA
4-29-96
G. T. WILSON, JR.
CERTIFICATE No. 1183
CERTIFIED LAND SURVEYOR

No.	DATE	REVISION / COMMENT / NOTE	BY

Designed CMA	Drawn CMA
Scale 1" = 50'	Date 4/29/96
Project No. 7612-2	
Drawing No. 1 OF 1	

MC003_GCPC_LAKEWOOD_DRIVE_020



22 ac. out of (12-#)(1-3)
12 lots + R/W = 5,156 ac.
Parcel 13 = 16.8990 ac.

- TYPICAL SIDE YARD - 17.5' MINIMUM
  - 35' COMBINED
- TYPICAL REAR YARD - 35' MINIMUM

#6 x 12" Spacer bar (typical)

Support Bar Size (#6 Rebar min.)

Riser Diameter

Riser

Steel or Concrete Base

Outlet

Mortared Joint

Isometric

Riser Connection Detail

SCALE IN FEET

SEDIMENT TRAP #1 (SEE SHEET 4 FOR CALCULATIONS)

DESIGNATED SPOIL PILE LOCATION

DESIGNATED SPOIL PILE LOCATION

NATURAL DRAINAGE TO RAVINE

NATURAL DRAINAGE TO SILT TRAP

GRINDER PUMP (SEE DETAILS)

LAKE DR.

WARE ROAD

B.M. P.K. NAIL & WARE RD. EL. 74.40

B.M. P.K. NAIL EL. 62.83

B.M. P.K. NAIL SET EL. 47.42

20 21 22 23 24 25 26 27 28 29

12 11 10 9 8 7 6 5 4 3 2 1

195 LF 8" @ 0.40%

300' OF 8" PVC @ 0.40%

300' OF 8" PVC @ 0.40%

300' OF 8" PVC @ 0.40%

MH #3
RIM = 75.09
IN/IN = 57.98
IN/OUT = 57.88

MH #4
RIM = 76.39
IN/IN = 59.28
IN/OUT = 59.18

MH #5
RIM = 73.68
IN/IN = 60.58
IN/OUT = 60.48

MH #6
RIM = 68.89
IN/IN = 61.88
IN/OUT = 61.78

@100' INTERVALS IN ROADSIDE DITCHES (TYP)

LIMITS OF CLEARING (TYPICAL)

END PG-2A @ 2+25.10 BOTH SIDES

ZONED R-1

ZONED LB

ZONED R-1

ZONED LB

N 65°40'35" W 100.00'

S 65°40'35" E 100.00'

S 65°40'35" E 100.00'

S 65°40'35" E 100.00'

S 53°13'36" E 130.05'

S 78°07'00" E 130.25'

S 53°2'00" E 140.51'

S 64°58'00" E 119.18'

S 62°48'36" E

S 54°55'36" E 74.61'

S 65°39'28" E 50.00'

S 65°39'19" E 50.00'

S 57°55'55" E

S 62°48'36" E 142.80'

N 65°50'00" W 102.51'

S 66°15'43" W 42.97'

N 65°40'35" W

N 65°40'35" W 100.00'

NOTE: PROVIDE A TEMPORARY DITCH LINER SUCH AS BLACK POLYETHYLENE SHEETS I.L. DITCHES TO BE INSTALLED TO RECEIVE PAVING UNTIL SUCH TIME AS THE PERMANENT LINER IS INSTALLED

5' UTILITY EASEMENT CLEARING RESTRICTED TO 2 BY 4 AND LOWER TREES. NO DRIVEWAYS OR STRUCTURES WILL BE PERMITTED WITHIN EASEMENT

PG-2A CONC "V" DITCH SS=2:1, D=1.0'

PG-2A CONC "V" DITCH SS=2:1, D=1.0'

75' TRAP SHAPED DITCH W=6', D=1.5', SS=1:1, S=1.93%

TRIPLE 108' OF 3'-9"x12" OVAL R.C.P. CL. III @ 0.20% CONTRACTOR SHALL LOCATE CULVERTS AS SHOWN & SHALL TAKE EVERY PRECAUTION TO INSTALL @ GRADE. NOTED CULVERTS SHALL BE SPACED 36" O.C. WITH LONG AXIS PLACED HORIZONTALLY. INV IN = 39.56, IN-OUT = 39.34

105' OF CON. TRAPSHAPED DITCH D=1.5', SS=1:1, S=0.2%

25' TRAPSHAPED CONC PAVED TRANSITION D=1.5', SS=1:1, S=0.2%

INV OUT = 37.63
EXTEND EXISTING 18" CULVERT TO REUSE EXIST. FLARED END SECTION

EMERGENCY SPILLWAY FOR ANY FLOW IN EXCESS OF THE 10 YEAR STORM ELEV = 43.5'

TO LOCAL CREST 300' FROM EXIST CULVERT

DETENTION POND
265' OF PG-1 TYPE D @ 0.2%
TOP OF BERM = 44.00
INV IN = 41.36
INV IN = 40.83
INV OUT = 39.56
INV OUT = 39.25
INV IN = 39.08
INV OUT = 38.98

PROVIDE END CAP & EMERGENCY SPILLWAY CONSTRUCTION ELEVATION = 43.00' SEE DETAIL

CLEARING LIMITS

BORROW PIT

STATE ROUTE 31 110' R/W

STATE ROUTE 31 110' R/W

S.F.

0.36 C

9.18 A

0.52 D

11.75 H

1.25 P

0.81 I

0.20 O

0.35 M

0.11 L

0.30 K

0.15 J

2.54 N

1.3 G

2.1 E

3.21 F

SF CD PS SCC STB ST CRS OB CE TP

AES, a professional corporation
1761 Jamestown Road, Williamsburg, Va. 23185
804-253-0040
Architecture, Engineering, Surveying, Planning

SEWER, DRAINAGE, SEDIMENT & EROSION CONTROL

LAKEWOOD SECTION II

OWNER/DEVELOPER: MECCA DEVELOPMENT CORP.

JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA

COMMONWEALTH OF VIRGINIA — PAUL C. SMALL — LICENSE NO. 04267 — CERTIFIED PROFESSIONAL ENGINEER

NO.	DATE	REVISION / COMMENT NOTE
1	2-20-86	REVISED PER JCC COMMENTS & ADDED SEDIMENT TRAP

Designed	Drawn
DAR	GSB
Scale	Date
1"=50'	DEC. 1985
Project No.	
6240	
Drawing No.	
5	

MC003_GCPC_LAKEWOOD_DRIVE - 028

S-35-87; MC003

OWNER'S CONSENT & DEDICATION

THIS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE WISHES AND DESIRES OF THE UNDERSIGNED OWNERS AND PROPRIETORS.

FEE TO THE LAND SHOWN HEREON IS VESTED IN VENTURE INVESTMENTS, INC., A VIRGINIA CORPORATION, BY DEED DATED MARCH 31, 1987 AND RECORDED IN DB 336, AT PAGE 796, IN THE CLERK'S OFFICE OF THE CIRCUIT COURT OF JAMES CITY COUNTY, VIRGINIA AND WILLIAMSBURG, AND BY A CORRECTIVE DEED DATED [illegible] AND RECORDED IN DB [illegible], AT PAGE [illegible], IN THE AFORESAID CLERK'S OFFICE.

[illegible]

STATE OF VIRGINIA

[illegible]

NOTARY CERTIFICATE

[illegible]

CERTIFICATE OF APPROVAL

THIS SUBDIVISION KNOWN AS "PLAT OF LAKEWOOD, SECTION II, LOTS 1 THRU LOT 29, PROPERTY OF VENTURE INVESTMENTS, INC., A VIRGINIA CORPORATION" IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE RECORDED.

[illegible] 6/4/87

[illegible]

ENGINEER'S & SURVEYOR'S STATEMENT

[illegible]

0 100 0
SCALE IN FEET

LOCATION MAP 1" = 2000'

SITE

N

S 38°57'25" E 71.74'

ROMEO L. HOMESTEAD
105 sq. ft.

N/F GEORGE JR & ELLEN D MOURELEDES

LAKEWOOD DRIVE 50' R/W

LAKEWOOD SEC. II LOT 30 (DB 40, PG 56)

N/F OLAN D & HELLVIA H PARR

ROUNDUP ROAD 672.45' 150' R/W

PARCEL II
VENTURE INVESTMENTS INC
12.883 AC±
DB 336, PG 79

PARCEL II
VENTURE INVESTMENTS INC.
DB 336, PG 796

ROUNDUP ROAD EASEMENT

AREA TABULATION

	LOTS	PARCEL A	TOTAL
SQ.FT.	533,472	91,524	624,996
ACRES	12.247	2.101	14.348

TOTAL AREA TRANSFERRED 624,996 14.348

GENERAL NOTES:

1. SITE IS A PORTION OF TAX PARCEL [illegible]
2. SITE IS ZONED R-1, LIMITED RESIDENTIAL
3. THIS IS A SUBDIVISION OF PARCEL [illegible] AS SHOWN ON A PLAT ENTITLED "PLAT OF PARCELS I, II & III [illegible] PROPERTY OF VENTURE INVESTMENTS CORPORATION", BY AES, A [illegible] CORPORATION, DATED JANUARY 1987, (D.B. 35, PG. 8).

JAMESTOWN ROAD SR 31 110' R/W

[illegible]

AES, a professional corporation

1761 Jamestown Road, Williamsburg, Va. 23185

804-253-0040

Engineering, Planning, Surveying

PLAT OF
LAKEWOOD SECTION II
LOT 1 thru LOT 29

OWNER/DEVELOPER:
VENTURE INVESTMENTS, INC.
A VIRGINIA CORPORATION

JAMES CITY COUNTY VIRGINIA

COMMONWEALTH OF VIRGINIA
PAUL C. DAVIS
No. 1247

No.	DATE	REVISION / COMMENT / NOTE	BY
		[illegible] PER JCC COMMENTS DATED [illegible]	

S-35-87

Designed SOW	Drawn C.A.N.
Scale 1" = 100'	Date 6/2/1987
Project No. 6240	
Drawing No. PLAT	

20 SCALE 0 10 20 30 40 50 60 70 80 90 100 110 120

25 SCALE 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

30 SCALE 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180

40 SCALE 0 20 40 60 80 100 120 140 160 180 200 220 240

50 SCALE 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

100 SCALE 0 100 200 300 400 500 600

MC003_GCPC_LAKEWOOD_DRIVE - 029

CERTIFICATE OF SOURCE OF TITLE

TITLE TO THE LAND SHOWN HEREON IS VESTED IN VENTURE INTERNATIONAL INVESTMENTS, INC., BY DEED DATED DECEMBER 1, 1993 RECORDED IN D.B. 662, PAGE 636, ON JANUARY 4, 1994 IN THE CLERK'S OFFICE OF THE CIRCUIT COURT OF THE CITY OF WILLIAMSBURG AND COUNTY OF JAMES CITY, VIRGINIA.

OWNER'S CERTIFICATE

THE BOUNDARY LINE ADJUSTMENT AND LOT LINE EXTINGUISHMENT SHOWN ON THIS PLAT IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE DESIRE OF THE UNDERSIGNED OWNERS, PROPRIETORS AND OR TRUSTEES.

VENTURE INTERNATIONAL INVESTMENT, INC. DATE

CERTIFICATE OF NOTARIZATION

STATE OF TEXAS

CITY/COUNTY OF _____ I _____ A NOTARY PUBLIC IN AND FOR THE CITY/COUNTY AND STATE AFORESAID, DO HEREBY CERTIFY THAT THE PERSONS WHOSE NAMES ARE SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN THE CITY/COUNTY AFORESAID. GIVEN UNDER MY NAME THIS ____ DAY OF _____, 19____. MY COMMISSION EXPIRES _____.

SIGNATURE

STEWART NOTARY PUBLIC STATE OF TEXAS My Comm. Exp. 3-99

SURVEYOR'S CERTIFICATE

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

RONALD W. EADS, L.S. 6-25-96 DATE

CLERK'S CERTIFICATE
STATE OF VIRGINIA, COUNTY OF JAMES CITY

IN THE CLERK'S OFFICE OF THE CIRCUIT COURT FOR THE COUNTY OF JAMES CITY THE 19th DAY OF Oct, 1996 THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORD AS THE LAW DIRECTS.

TESTE: _____, CLERK

PLAT BOOK: 64, PAGE: 70

CERTIFICATE OF APPROVAL

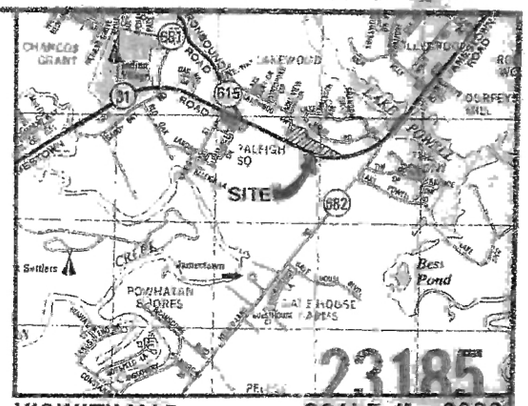
THIS BOUNDARY LINE ADJUSTMENT AND LOT LINE EXTINGUISHMENT IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE ADMITTED TO RECORD

for Mgr. 7/18/96
VIRGINIA DEPARTMENT OF TRANSPORTATION DATE

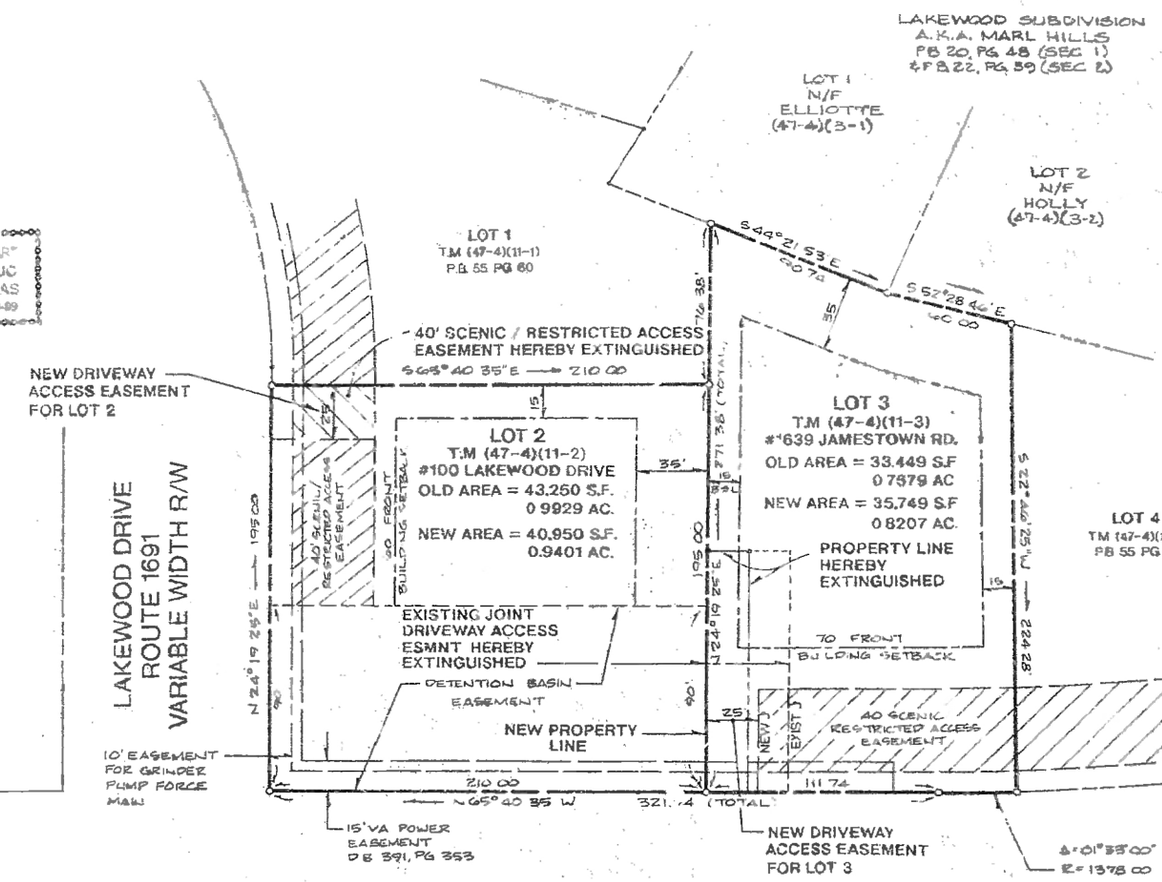
SUBDIVISION AGENT OF JAMES CITY COUNTY 7/18/96 DATE

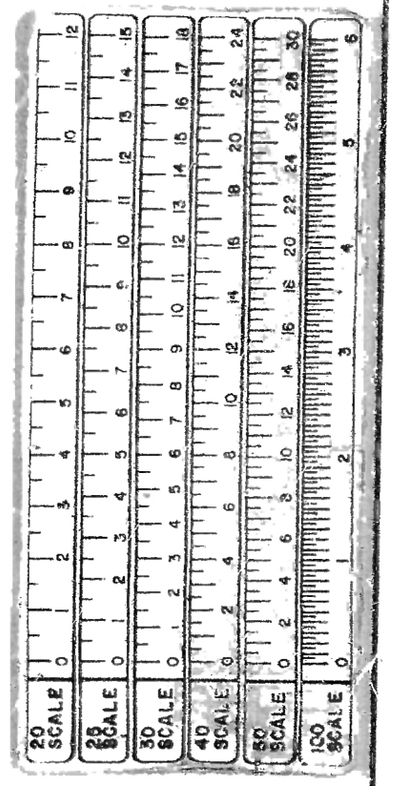
50 0 50
SCALE IN FEET

RECORD MERIDIAN N PLAT BOOK 55, PAGE 60



VICINITY MAP SCALE: 1" = 2000





NOTE:
THE PURPOSE OF THIS PLAT OF CORRECTION IS TO REVISE THE CORRECT NAME OF OWNERSHIP AND SOURCE OF TITLE FROM A PLAT PREVIOUSLY RECORDED IN PLAT BOOK 64, PAGE 23. THERE HAVE BEEN NO OTHER REVISIONS TO THE BOUNDARIES OR TO THE BODY OF SAID PLAT.

PLAT RECORDED IN 64 70

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

MC003_GCPG_LAKEWOOD_DRIVES 030

PLAT OF CORRECTION
PLAT SHOWING BOUNDARY LINE ADJUSTMENT
LOT LINE EXTINGUISHMENT AND
DRIVEWAY ACCESS ADJUSTMENT
LOTS 2 & 3, SUBDIVISION OF FIVE LOTS ON
JAMESTOWN ROAD
OWNED BY
VENTURE INTERNATIONAL INVESTMENTS, INC.
JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA

COMMONWEALTH OF VIRGINIA
6-25-96
RONALD W. EADS
No. 1948
LAND SURVEYOR

2:17 PM Recorded 19 Oct 1996
Teste: _____ Clerk

No	DATE	REVISION / COMMENT / NOTE	BY
1	6/25/96	PLAT OF CORRECTION	RWE

Designed CMA	Drawn CMA
Scale 1" = 50	Date 4/29/96
Project No 7612 - 2	
Drawing No 1 OF 1	

"A-1" CONSENT AND DEDICATION

THIS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE DUTIES AND DESIRES OF THE UNDERSIGNED OWNERS AND PROPRIETORS.

RONALD L. HUNSARLING, PRESIDENT
VENTURE INVESTMENTS INC. — DATE

STATE OF VIRGINIA

I, _____, A NOTARY PUBLIC, DO CERTIFY THAT THE PERSON WHOSE NAME IS SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN MY CITY AND STATE AFORESAID.

GIVEN UNDER MY HAND THIS ____ DAY OF _____, 19__.

MY COMMISSION EXPIRES _____ BY: _____

SURVEYOR'S CERTIFICATE

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

GIVEN UNDER MY HAND THIS 15th DAY OF May, 1991.

BY: _____ LS #1652

CLERK'S CERTIFICATE
STATE OF VIRGINIA, COUNTY OF JAMES CITY

IN THE CLERK'S OFFICE OF THE CIRCUIT COURT FOR THE COUNTY OF JAMES CITY THE 31st DAY OF March, 1992, THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORD AS THE LAW DIRECTS.

TESTE: Helen S. Reed, CLERK.

PLAT BOOK: 55, PAGE: 60

CERTIFICATE OF APPROVAL

THIS SUBDIVISION, KNOWN AS FIVE LOTS ON JAMESTOWN ROAD IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE COMMITTED TO RECORD.

DATE Jan. 23, 19 92 — Carl E. Hilbert — HIGHWAY ENGINEER

DATE Mar. 13, 1992 — _____ — HEALTH OFFICER

DATE 3/31/92 — _____ — AGENT OF GOVERNING BODY

SOURCE OF TITLE

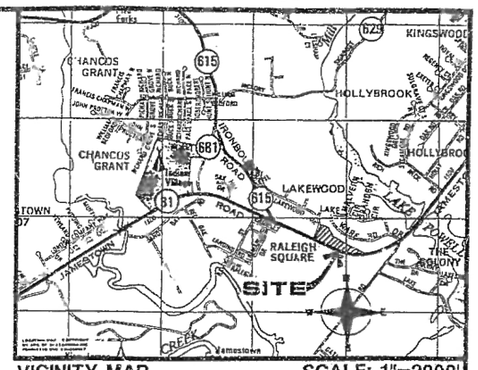
TITLE TO THE LAND SHOWN HEREON IS VESTED IN VENTURE INVESTMENTS, INC., A VIRGINIA CORPORATION, BY DEED DATED MARCH 31, 1987, RECORDED IN DB 336, AT PAGE 796 ON APRIL 1, 1987 (SEE PB 45, PAGE 9) IN THE CLERK'S OFFICE OF THE CIRCUIT COURT OF THE CITY OF WILLIAMSBURG AND COUNTY OF JAMES CITY, VIRGINIA.

AREA TABULATION

LOT NO.	S.F.	ACRES	% OF TOTAL
1	29,008	0.6659	16%
2	43,250	0.9929	23%
3	33,449	0.7679	18%
4	30,918	0.7098	17%
5	49,848	1.1444	26%
TOTAL	186,473	4.2809	100%

60 0 60
SCALE IN FEET

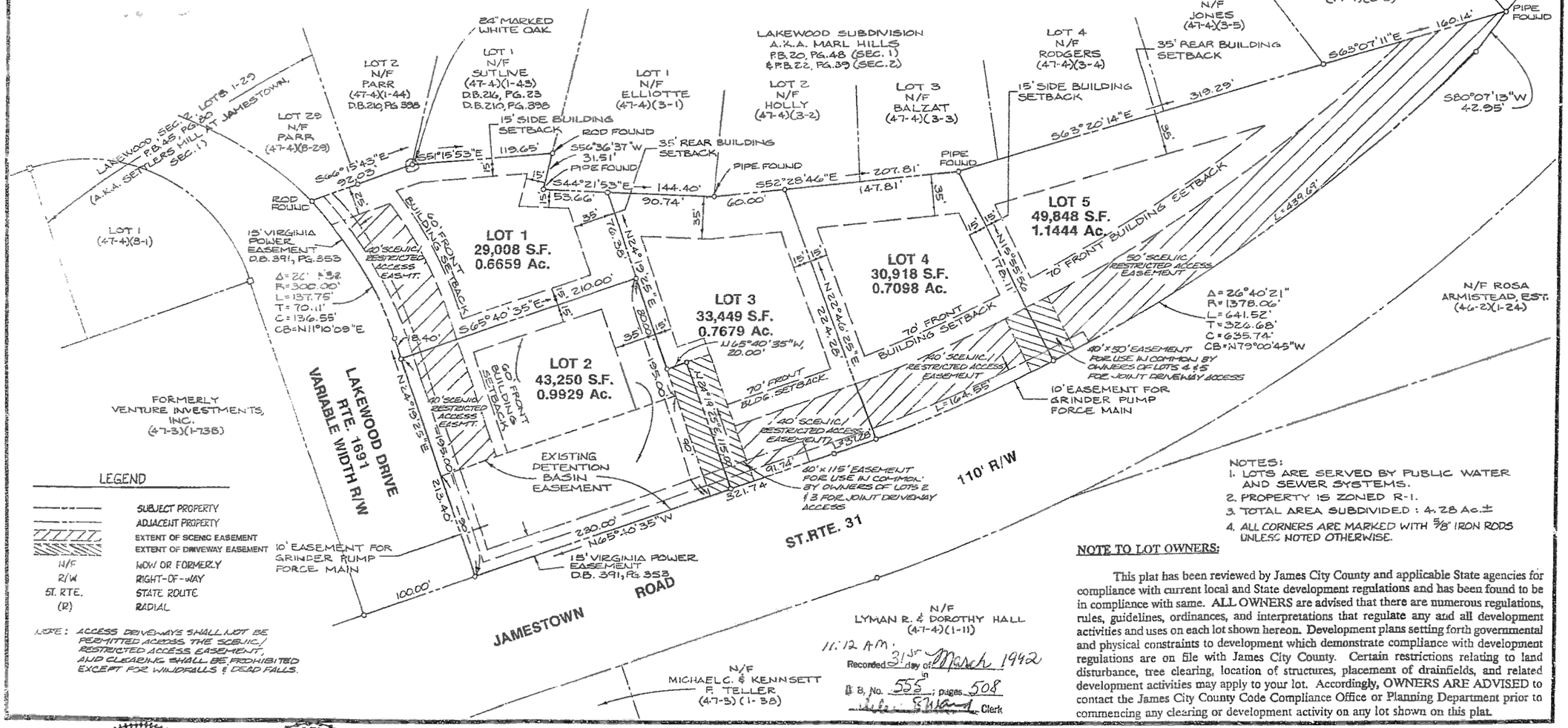
RECORD MERIDIAN PB.45 PG.9



VICINITY MAP SCALE: 1"=2000'

NOTE TO LOT OWNER(S):

LOT OWNERS ARE HEREBY ADVISED TO OBTAIN AND REVIEW THE DEVELOPMENT PLAN (SHEETS 1, 2 & 3 OF 3) DATED MAY 15, 1991 FOR THIS SUBDIVISION. SPECIFIC CONDITIONS, RESTRICTIONS AND REQUIREMENTS WHICH EFFECT THE USE OF EACH LOT ARE RECITED THEREON.



LEGEND

———	SUBJECT PROPERTY
———	ADJACENT PROPERTY
	EXTENT OF SCENIC EASEMENT
	EXTENT OF DRIVEWAY EASEMENT
N/F	NOW OR FORMERLY
R/W	RIGHT-OF-WAY
ST. RTE.	STATE ROUTE
(R)	RADIAL

NOTE: ACCESS DRIVEWAYS SHALL NOT BE PERMITTED ACROSS THE SCENIC/ RESTRICTED ACCESS EASEMENT. AND CLEARING SHALL BE PROHIBITED EXCEPT FOR WINDFALLS & DEAD FALLS.

NOTES:
1. LOTS ARE SERVED BY PUBLIC WATER AND SEWER SYSTEMS.
2. PROPERTY IS ZONED R-1.
3. TOTAL AREA SUBDIVIDED : 4.28 Ac.±
4. ALL CORNERS ARE MARKED WITH 5/8" IRON RODS UNLESS NOTED OTHERWISE.

NOTE TO LOT OWNERS:

This plat has been reviewed by James City County and applicable State agencies for compliance with current local and State development regulations and has been found to be in compliance with same. ALL OWNERS are advised that there are numerous regulations, rules, guidelines, ordinances, and interpretations that regulate any and all development activities and uses on each lot shown hereon. Development plans setting forth governmental and physical constraints to development which demonstrate compliance with development regulations are on file with James City County. Certain restrictions relating to land disturbance, tree clearing, location of structures, placement of drainfields, and related development activities may apply to your lot. Accordingly, OWNERS ARE ADVISED to contact the James City County Code Compliance Office or Planning Department prior to commencing any clearing or development activity on any lot shown on this plat.

11:12 AM
Recorded 31st day of March 1992
in P.B. No. 55, pages 58
Teste: Helen S. Reed, Clerk

COMMONWEALTH OF VIRGINIA — DON A. RAINEY — No. 1652 — LAND SURVEYOR — 4/15/91

COMMONWEALTH OF VIRGINIA — DON A. RAINEY — No. 016210 — PROFESSIONAL ENGINEER — 4/15/91

Prepared by: RAINEY ENGINEERING Christiansburg, Virginia

PLAT OF FIVE LOTS ON JAMESTOWN ROAD OWNED BY: VENTURE INVESTMENTS, INC.

JAMES CITY COUNTY, VIRGINIA

No.	DATE	REVISION / COMMENT / NOTE	BY

Designed DAR	Drawn EAW/DB
Scale 1"=60'	Date MAY 15, 1991
Project No. 90141	
Drawing No. PLAT	

FILE #7612

LOGAN SYSTEMS

MC003_GCPC_LAKEWOOD_DRIVE - 031

7/10/87 352-122 1645-80

OWNER'S CONSENT & DEDICATION

THIS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE WISHES AND DESIRES OF THE UNDERSIGNED OWNERS AND PROPRIETORS.

TITLE TO THE LAND SHOWN HEREON IS VESTED IN VENTURE INVESTMENTS, INC. A VIRGINIA CORPORATION BY DEED DATED MARCH 31ST, 1987, RECORDED IN DB 336, AT PAGE 796 ON APRIL 1, 1987 (DEB PB 45, PAGE 9) IN THE CLERK'S OFFICE OF THE CIRCUIT COURT OF THE CITY OF WILLIAMSBURG AND COUNTY OF JAMES CITY, VIRGINIA.

BY _____
STEPHEN K. RISDEN, CHIEF EXECUTIVE OFFICER

STATE OF VIRGINIA

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

GIVEN UNDER MY HAND THIS ____ DAY OF _____, 1987.

MY COMMISSION EXPIRES _____

CLERK'S CERTIFICATE
STATE OF VIRGINIA, COUNTY OF JAMES CITY

IN THE CLERK'S OFFICE OF THE CIRCUIT COURT FOR THE COUNTY OF JAMES CITY THE ____ DAY OF _____, 19__, THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORD AS THE LAW DIRECTS.

TESTE: _____, CLERK.

PLAT BOOK: ____, PAGE: ____.

CERTIFICATE OF APPROVAL

THIS SUBDIVISION KNOWN AS: PLAT OF LAKEWOOD, SECTION II, LOT 1 THRU LOT 29, PROPERTY OF VENTURE INVESTMENTS, INC. A VIRGINIA CORPORATION IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE COMMITTED TO RECORD.

DATE 6/19/87 _____ HIGHWAY DEPARTMENT

DATE 6/4/87 _____ HEALTH OFFICER

DATE 7/8/87 _____ AGENT OF GOVERNING BODY

ENGINEER'S & SURVEYOR'S STATEMENT

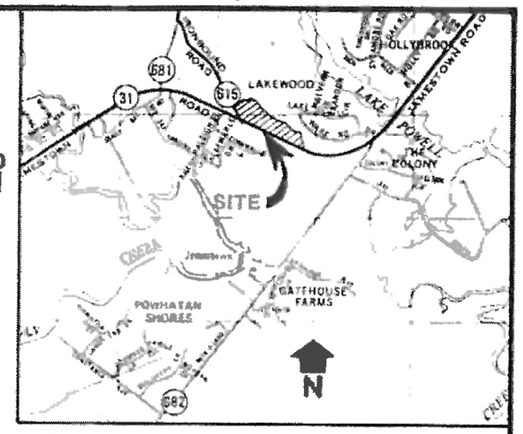
I HEREBY CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL OF THE REQUIREMENTS OF THE BOARD OF SUPERVISORS AND ORDINANCES OF THE COUNTY OF JAMES CITY, VIRGINIA, REGARDING THE PLATTING OF SUBDIVISIONS WITHIN THE COUNTY HAVE BEEN COMPLIED WITH.

GIVEN UNDER MY HAND THIS 3rd DAY OF June, 1987.

BY: _____
PAUL C. SMALL, P.E., L.L.S.

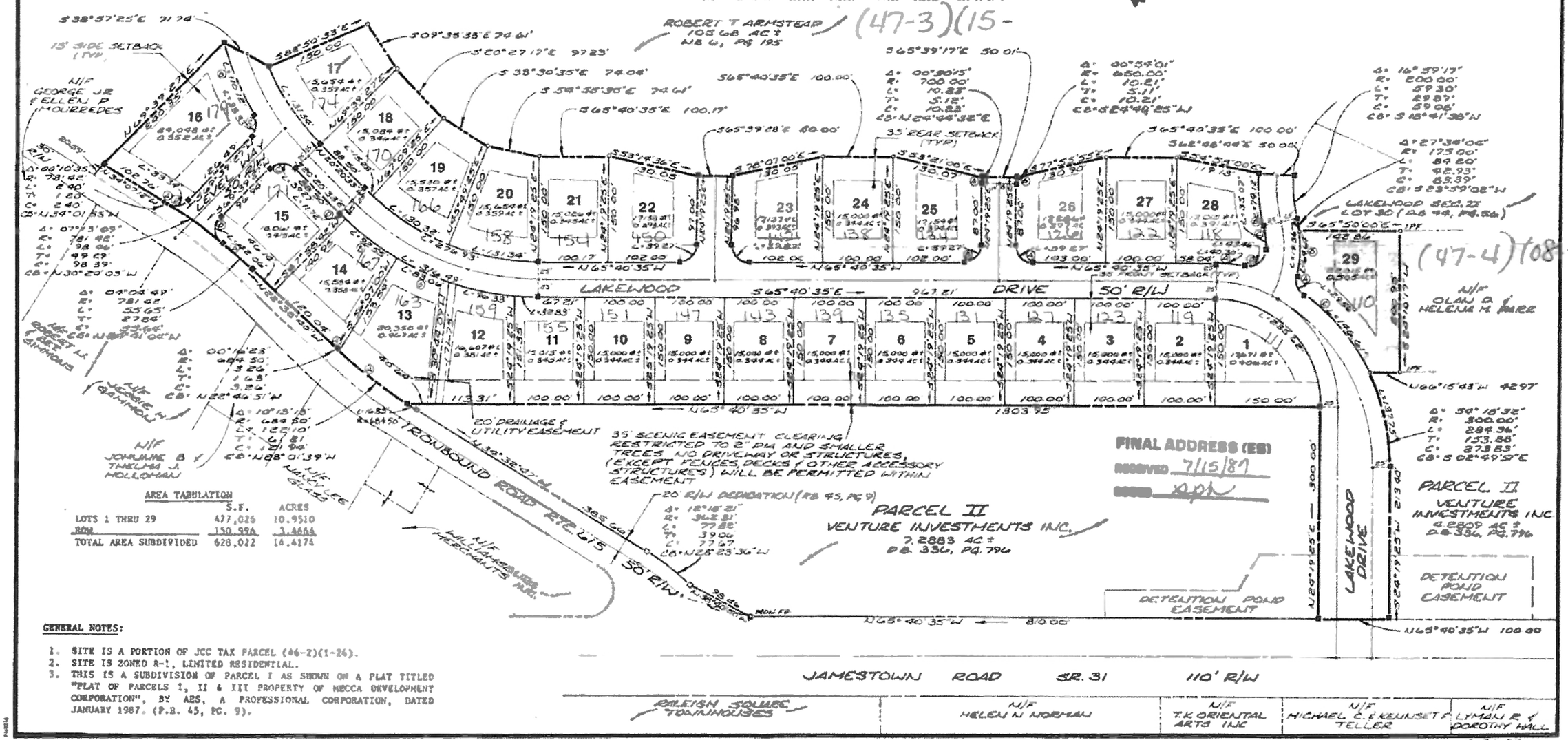
LOT CURVE TABLE

LOT NO.	DELTA	RADIUS	LENGTH	TANGENT	CHORD	CHORD BEARING
1	90°00'00"	150.00'	235.62'	150.00'	212.13'	S70°30'35"E
11	04°42'00"	400.00'	32.83'	16.42'	32.82'	S63°09'35"E
12	13°47'32"	400.00'	96.33'	48.40'	96.10'	S54°24'21"E
13A	19°11'18"	454.50'	152.20'	61.21'	121.94'	N25°01'39"W
13B	11°53'31"	400.00'	83.06'	41.66'	82.91'	N41°13'46"E
14A	80°26'23"	484.50'	3.86'	1.63'	3.26'	N22°46'51"W
14B	13°15'36"	400.00'	92.59'	46.48'	92.35'	S25°39'01"E
15A	04°06'49"	781.62'	56.65'	28.84'	56.64'	N24°41'44"W
15B	56°22'16"	25.00'	42.00'	22.99'	37.27'	N21°32'56"E
15C	90°00'00"	25.00'	39.27'	25.00'	35.36'	S65°50'33"E
15D	81°40'45"	405.00'	81.72'	5.86'	11.72'	S25°10'56"E
16A	00°10'23"	781.62'	2.40'	1.20'	2.40'	N24°01'55"W
16B	15°46'36"	400.00'	110.12'	55.41'	109.78'	S21°06'12"W
16C	76°23'36"	25.00'	33.33'	19.62'	30.92'	S31°27'43"W
16D	76°23'36"	25.00'	33.34'	19.62'	30.93'	N72°08'37"W
17	21°30'09"	350.00'	131.34'	66.45'	130.57'	N89°35'33"W
18	82°30'02"	350.00'	15.38'	7.84'	15.27'	N21°33'34"W
19	21°28'08"	350.00'	130.21'	65.72'	129.47'	N33°30'38"W
20	21°30'09"	350.00'	131.34'	66.45'	130.57'	N54°55'32"W
21	90°00'00"	25.00'	39.27'	25.00'	35.36'	S69°09'25"W
22	90°00'00"	25.00'	39.27'	25.00'	35.36'	N20°50'35"W
23A	68°38'15"	700.00'	19.23'	5.13'	10.23'	S34°44'32"W
23B	90°00'00"	25.00'	39.27'	25.00'	35.36'	S69°19'25"W
24A	90°00'00"	25.00'	39.27'	25.00'	35.36'	N20°40'35"W
24B	68°38'15"	650.00'	10.31'	5.11'	10.21'	S24°44'25"E
25A	11°32'44"	350.00'	70.52'	35.35'	70.39'	S59°54'13"W
25B	16°39'17"	250.00'	74.13'	37.30'	73.83'	S18°41'38"W
25C	16°34'31"	125.00'	35.87'	17.65'	34.98'	S18°14'11"W
25D	99°35'39"	25.00'	43.46'	29.36'	38.19'	S76°04'19"W
29A	69°45'10"	25.00'	30.56'	16.78'	28.87'	N01°53'28"E
29B	21°00'46"	175.00'	64.84'	32.69'	64.37'	N27°11'10"E
29C	22°00'00"	300.00'	146.61'	74.00'	145.15'	N63°59'07"W



LOCATION MAP 1" = 2000'

0 100 0
SCALE IN FEET



AREA TABULATION

	S.F.	ACRES
LOTS 1 THRU 29	477,026	10.9510
ROW	150,996	3.4664
TOTAL AREA SUBDIVIDED	628,022	14.4174

GENERAL NOTES:

1. SITE IS A PORTION OF JCC TAX PARCEL (46-2)(1-26).
2. SITE IS ZONED R-1, LIMITED RESIDENTIAL.
3. THIS IS A SUBDIVISION OF PARCEL I AS SHOWN ON A PLAT TITLED "PLAT OF PARCELS I, II & III PROPERTY OF MECCA DEVELOPMENT CORPORATION", BY AES, A PROFESSIONAL CORPORATION, DATED JANUARY 1987. (P.B. 45, PG. 9).

AES, a professional corporation
1761 Jamestown Road, Williamsburg, Va. 23185
804-253-0040
Engineering, Planning, Surveying

PLAT OF LAKEWOOD SECTION II
LOT 1 thru LOT 29

OWNER/DEVELOPER:
VENTURE INVESTMENTS, INC.
A VIRGINIA CORPORATION

JAMES CITY COUNTY VIRGINIA

COMMONWEALTH OF VIRGINIA
PAUL C. SMALL
No. 1247
LAND SURVEYOR

No.	DATE	REVISION / COMMENT / NOTE	BY
1	7/10/87	REVISED PER JCC COMMENTS REC'D 7/8/87	SDW

Designed SDW	Drawn C.A.H.
Scale 1" = 100'	Date 6/2/1987
Project No. 6240	
Drawing No. PLAT	

5-35-87

MC003_GCPC_LAKEWOOD_DRIVE - 032

Recorded 3/31/92 DB 555/508 PB 55/60

OWNER'S CONSENT AND DEDICATION

THIS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE WISHES AND DESIRES OF THE UNDERSIGNED OWNERS AND PROPRIETORS.

BY: ______________________ ______
RONALD L. HENSARLING, PRESIDENT DATE
VENTURE INVESTMENTS INC.

STATE OF [redacted]

I, ______________, A NOTARY PUBLIC, DO CERTIFY THAT THE PERSON WHOSE NAME IS SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN MY CITY AND STATE AFORESAID.

GIVEN UNDER MY HAND THIS ___ DAY OF ________, 19__.

MY COMMISSION EXPIRES ________ BY: ________

SURVEYOR'S STATEMENT

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

GIVEN UNDER MY HAND THIS 15 DAY OF May, 1991.

BY: ______________ LS#1652

CLERK'S CERTIFICATE
STATE OF VIRGINIA, COUNTY OF JAMES CITY

IN THE CLERK'S OFFICE OF THE CIRCUIT COURT FOR THE COUNTY OF JAMES CITY THE ______ DAY OF __________, 19__, THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORD AS THE LAW DIRECTS.

TESTE: ______________________, CLERK.

PLAT BOOK: ______, PAGE: ______

CERTIFICATE OF APPROVAL

THIS SUBDIVISION, KNOWN AS FIVE LOTS ON JAMESTOWN ROAD IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE COMMITTED TO RECORD.

DATE ________ ________ HIGHWAY ENGINEER

DATE ________ ________ HEALTH OFFICER

DATE 3/27/92 ________ AGENT OF GOVERNING BODY

SOURCE OF TITLE

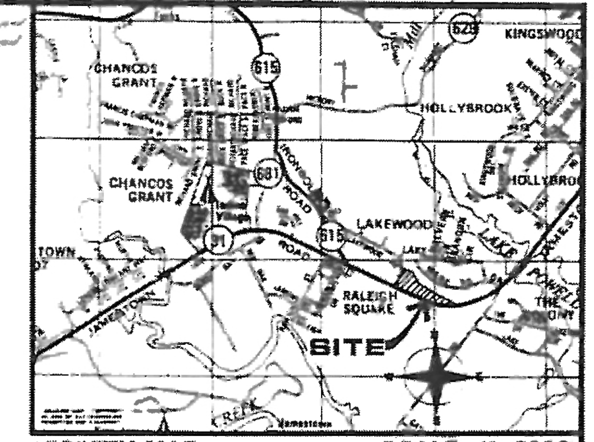
TITLE TO THE LAND SHOWN HEREON IS VESTED IN VENTURE INVESTMENTS, INC., A VIRGINIA CORPORATION, BY DEED DATED MARCH 31, 1987, RECORDED IN DB 336, AT PAGE 794 ON APRIL 1, 1987 (SEE PB 48, PAGE 9) IN THE CLERK'S OFFICE OF THE CIRCUIT COURT OF THE CITY OF WILLIAMSBURG AND COUNTY OF JAMES CITY, VIRGINIA.

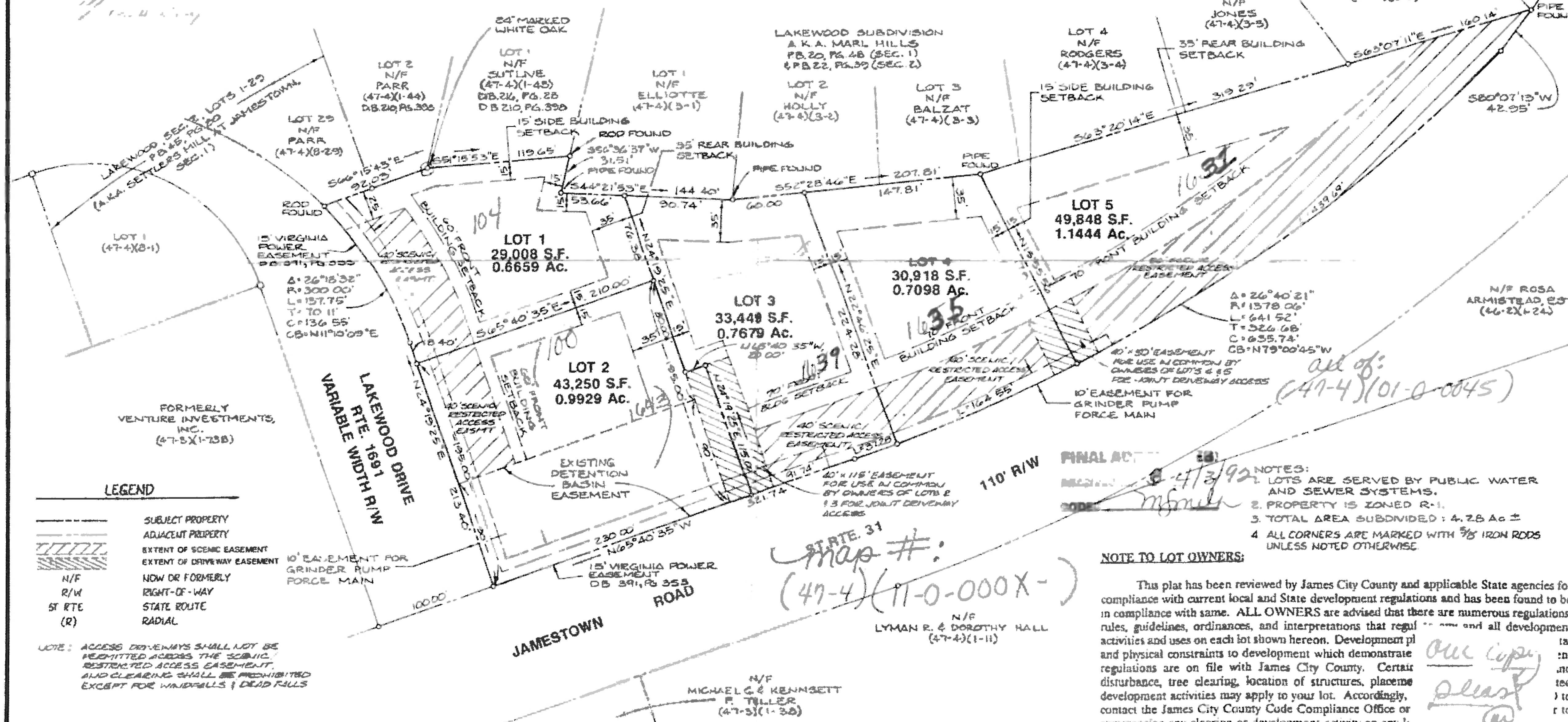
AREA TABULATION

LOT NO.	S.F.	ACRES	% OF TOTAL
1	29,008	0.6659	16%
2	43,250	0.9929	23%
3	33,449	0.7679	18%
4	30,918	0.7098	17%
5	49,848	1.1444	26%
TOTAL	186,473	4.2809	100%

NOTE TO LOT OWNER(S):

LOT OWNERS ARE HEREBY ADVISED TO OBTAIN AND REVIEW THE DEVELOPMENT PLAN (SHEETS 1, 2 & 3 OF 3) DATED MAY 15, 1991 FOR THIS SUBDIVISION. SPECIFIC CONDITIONS, RESTRICTIONS AND REQUIREMENTS WHICH EFFECT THE USE OF EACH LOT ARE RECITED THEREON.





NOTES:
1. LOTS ARE SERVED BY PUBLIC WATER AND SEWER SYSTEMS.
2. PROPERTY IS ZONED R-1.
3. TOTAL AREA SUBDIVIDED: 4.28 Ac ±
4. ALL CORNERS ARE MARKED WITH 5/8 IRON RODS UNLESS NOTED OTHERWISE.

NOTE TO LOT OWNERS:

This plat has been reviewed by James City County and applicable State agencies for compliance with current local and State development regulations and has been found to be in compliance with same. ALL OWNERS are advised that there are numerous regulations, rules, guidelines, ordinances, and interpretations that regul... and all development activities and uses on each lot shown hereon. Development pl... tal and physical constraints to development which demonstrate ...ent regulations are on file with James City County. Certai... and disturbance, tree clearing, location of structures, placeme... ted development activities may apply to your lot. Accordingly, ... to contact the James City County Code Compliance Office or ... r to commencing any clearing or development activity on any l...

S-37-91

COMMONWEALTH OF VIRGINIA DON A. RAINEY No. 1652 LAND SURVEYOR

COMMONWEALTH OF VIRGINIA DON A. RAINEY No. 016210 PROFESSIONAL ENGINEER

PLAT OF FIVE LOTS ON JAMESTOWN ROAD
OWNED BY: VENTURE INVESTMENTS, INC.
JAMES CITY COUNTY VIRGINIA

No.	DATE	REVISION / COMMENT / NOTE	BY

Designed	Drawn
DAR	EAW DB
Scale 1"=60'	Date MAY 15, 1991
Project No. 90141	
Drawing No. PLAT	

OWNER'S CONSENT & DEDICATION

THIS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE WISHES AND DESIRES OF THE UNDERSIGNED OWNERS AND PROPRIETORS.

TITLE TO THE LAND SHOWN HEREON IS VESTED IN MECCA DEVELOPMENT CORPORATION BY DEED DATED APRIL 9TH, 1986, RECORDED IN DB 301, AT PAGE 35 ON MAY 2, 1986 (SEE PB 42, PAGE 54.)

BY _____, PRESIDENT

STATE OF VIRGINIA

I, Dennis Hare, A NOTARY PUBLIC DO CERTIFY THAT THE PERSONS WHOSE NAMES ARE SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN MY CITY AND STATE AFORESAID.

GIVEN UNDER MY HAND THIS 25th DAY OF March, 1987.

MY COMMISSION EXPIRES 3/17/88 _____.

CLERK'S CERTIFICATE
STATE OF VIRGINIA, COUNTY OF JAMES CITY

IN THE CLERK'S OFFICE OF THE CIRCUIT COURT FOR THE COUNTY OF JAMES CITY THE 1st DAY OF April, 1987, THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORD AS THE LAW DIRECTS.

TESTE: _____, CLERK.

PLAT BOOK: 45, PAGE: 9.

CERTIFICATE OF APPROVAL

THIS SUBDIVISION KNOWN AS: PLAT OF PARCELS I, II, AND III ON PROPERTY OF MECCA DEVELOPMENT CORPORATION IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE COMMITTED TO RECORD.

DATE 2-20-87 _____ HIGHWAY DEPARTMENT

DATE 2-20-87 _____ HEALTH OFFICER

DATE 3/25/87 _____ AGENT OF GOVERNING BODY

ENGINEER'S & SURVEYOR'S STATEMENT

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

GIVEN UNDER MY HAND THIS 20th DAY OF February, 1987.

BY: _____
PAUL C. SMALL, P.E., C.L.S.

GENERAL NOTES:

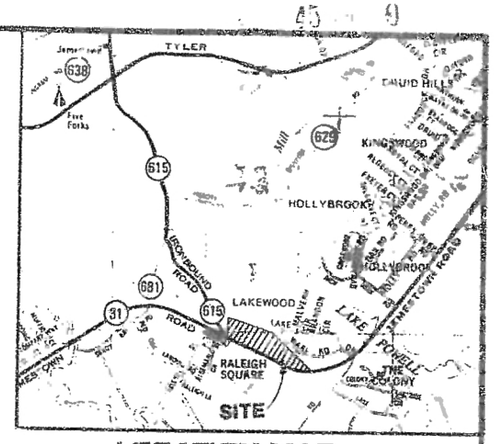
1. SITE IS A PORTION OF JCC TAX PARCEL (46-2)(1-24).
2. THIS IS A SUBDIVISION OF A PORTION OF THE PROPERTY CONVEYED TO MECCA DEVELOPMENT CORP. AS SHOWN ON A PLAT TITLED "PLAT FOR CONVEYANCE OF 27.84 ACRES+ FROM ROBERT T. ARMISTEAD, ET ALS TO MECCA DEVELOPMENT CORPORATION."

200 0 200
SCALE IN FEET

N

AREA TABULATION

	SF	ACRES
PARCEL I	628,022	14.4174
PARCEL II	317,479	7.2883
PARCEL III	186,475	4.2809
20' R/W DEDICATION	21,574	0.4953
TOTAL AREA SUBDIVIDED	1,153,550	26.4819



LOCATION MAP
SCALE: 1"=2000'

ROBERT T. ARMSTEAD ET. ALS.
(W.B.6, Pg. 195)
105.68 AC.±

PARCEL I
628,022 S.F. ±
14.4174 AC. ±
ZONED R-1
ZONED LB

PARCEL II
317,479 S.F.±
7.2883 AC.±
ZONED LB

PARCEL III
186,475 S.F.±
4.2809 AC.±
ZONED R-1

DETENTION POND EASEMENT

LAKEWOOD SUBDIVISION
A.K.A. MARL HILLS
PB. 20, Pg 48

JAMESTOWN ROAD S.R. 31 110' R/W

N/F HELEN N. NORMAN
N/F T.K. ORIENTAL ARTS, INC.
N/F MICHAEL C. & KENNSET F. TELLER
N/F LYMAN R. & DOROTHY HALL
N/F ROSA ARMISTEAD EST

CURVE TABLE

LOT NO.	DELTA	RADIUS	LENGTH	TANGENT	CHORD	CHORD BEARING
1	11°28'32"	781.42'	156.51'	78.52'	156.25'	N28°22'56"W
2	10°29'36"	684.50'	125.36'	62.86'	125.19'	N27°53'28"W
3	01°24'31"	684.50'	16.83'	8.42'	16.83'	N33°50'32"W
4	12°18'21"	362.31'	77.82'	39.06'	77.67'	N.8°23'36"W

0 1 2 3
BUSINESS RECORDS CORPORATION

Recorded 21st day of April, 1987
P. B. No. 336, pages 74
_____ Clerk

AES, a professional corporation
1761 Jamestown Road, Williamsburg, Va. 23185
804-253-0040
Engineering, Planning, Surveying

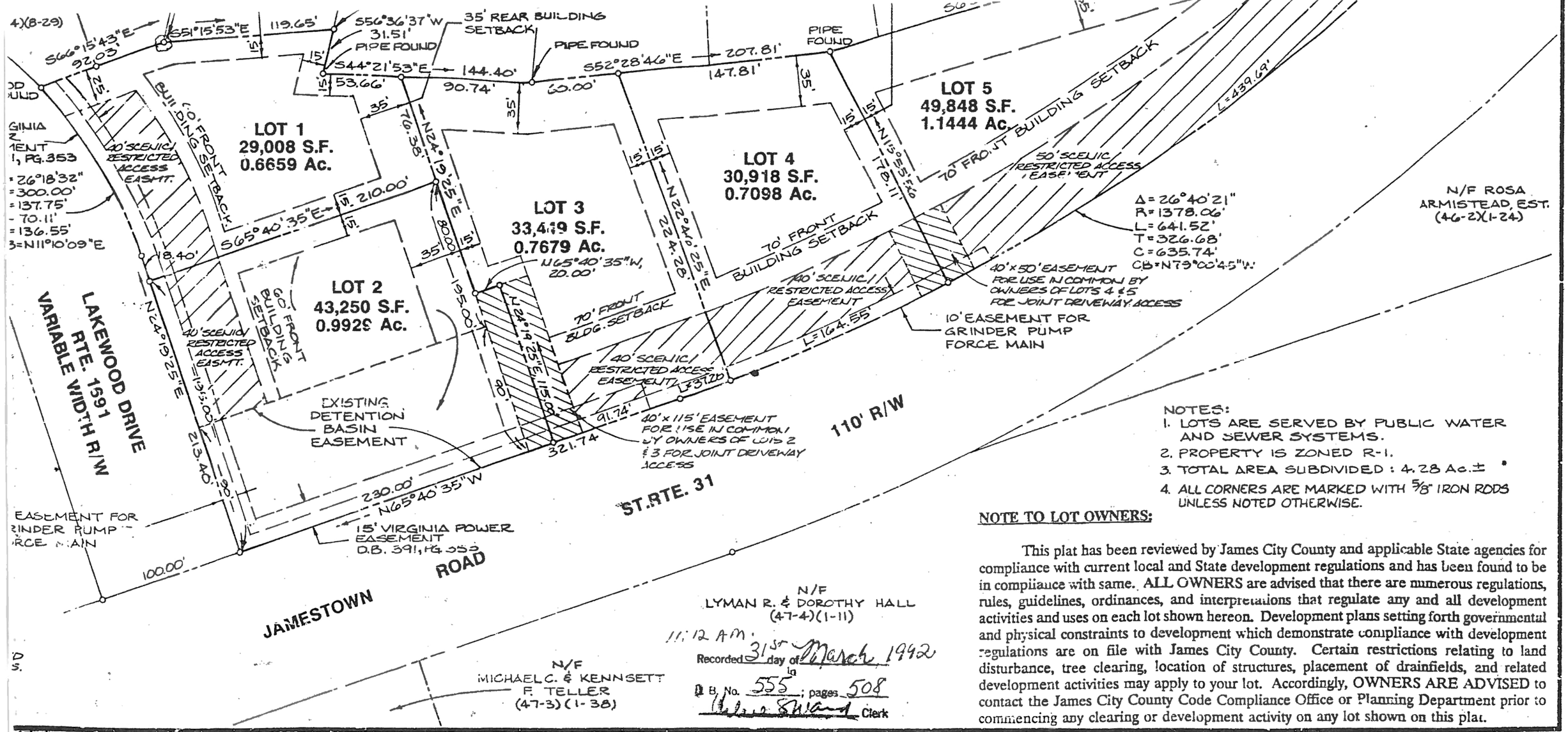
PLAT OF
PARCELS I, II & III
PROPERTY OF
MECCA DEVELOPMENT CORPORATION
JAMES CITY COUNTY VIRGINIA

COMMONWEALTH OF VIRGINIA
PAUL C. SMALL
1247
LAND SURVEYOR

No.	DATE	REVISION / COMMENT / NOTE	BY
1	3/6/87	ADDED 20' V.D.H.&T. DEDICATION	SCW

Designed SCW	Drawn CRG
Scale 1"=200'	Date JAN.1987
Project No. 6240	
Drawing No. PLAT	

MC003_GCPC_LAKEWOOD_DRIVE - 034



NOTES:
1. LOTS ARE SERVED BY PUBLIC WATER AND SEWER SYSTEMS.
2. PROPERTY IS ZONED R-1.
3. TOTAL AREA SUBDIVIDED : 4.28 Ac.±
4. ALL CORNERS ARE MARKED WITH 5/8" IRON RODS UNLESS NOTED OTHERWISE.

NOTE TO LOT OWNERS:

This plat has been reviewed by James City County and applicable State agencies for compliance with current local and State development regulations and has been found to be in compliance with same. ALL OWNERS are advised that there are numerous regulations, rules, guidelines, ordinances, and interpretations that regulate any and all development activities and uses on each lot shown hereon. Development plans setting forth governmental and physical constraints to development which demonstrate compliance with development regulations are on file with James City County. Certain restrictions relating to land disturbance, tree clearing, location of structures, placement of drainfields, and related development activities may apply to your lot. Accordingly, OWNERS ARE ADVISED to contact the James City County Code Compliance Office or Planning Department prior to commencing any clearing or development activity on any lot shown on this plat.

Recorded 31st day of March, 1992 at 11:12 AM.
D.B. No. 555; pages 508
Clerk

A. RAINEY
. 016210
4/15/91

PLAT
OF
FIVE LOTS ON
JAMESTOWN ROAD
OWNED BY: VENTURE INVESTMENTS, INC.

Y COUNTY, VIRGINIA

No.	DATE	REVISION / COMMENT / NOTE	BY

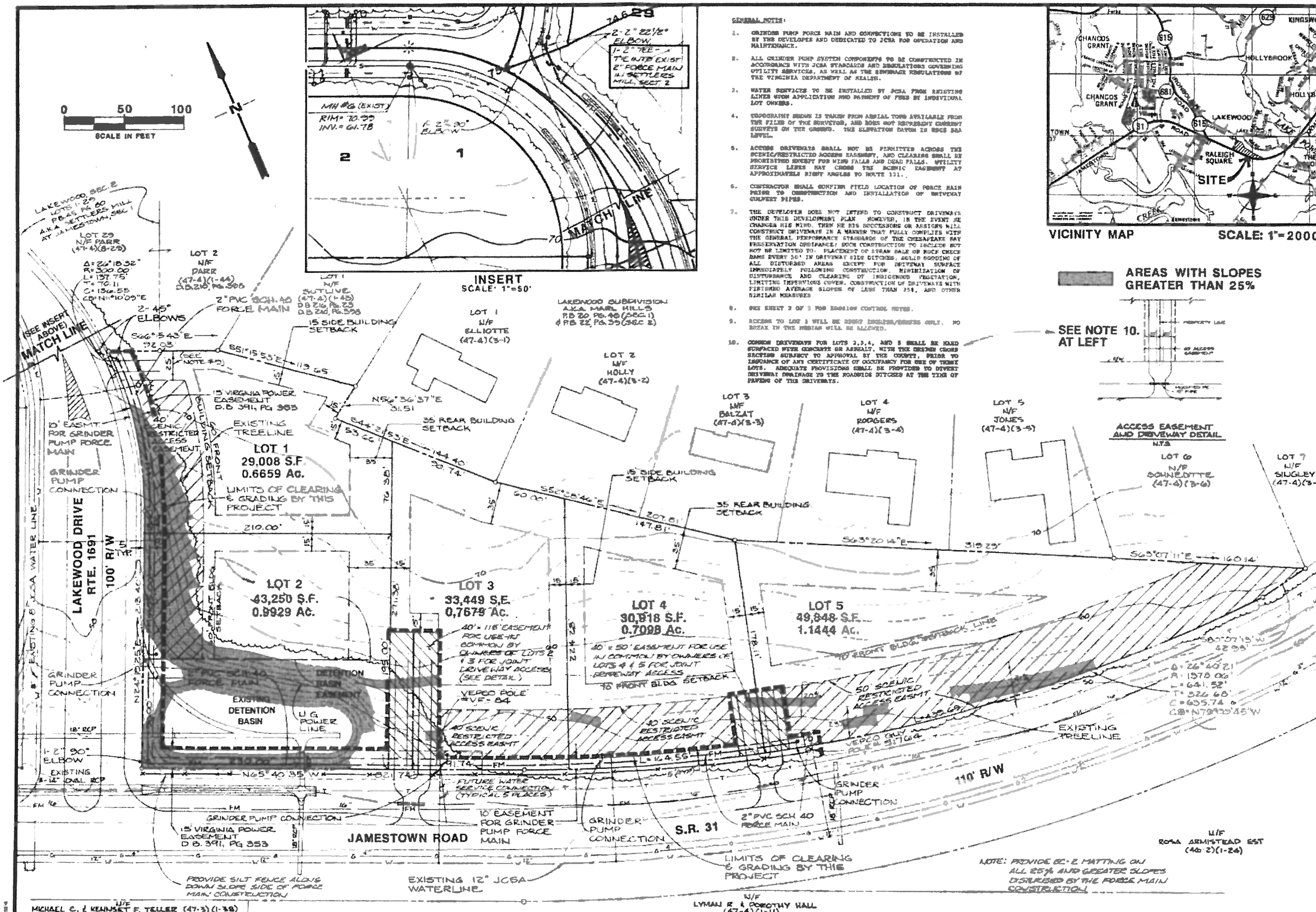
Designed DAR	Drawn EAW/DB
Scale 1"=60'	Date MAY 15, 1991
Project No. 90141	
Drawing No. PLAT	

FILE #7612

LOGAN SYSTEMS

Century 21
Glenn Gilley Realty
7408 Richmond Rd.
Williamsburg, VA 23188
Phone: 757-565-3773
Toll free: 800-296-3773
Fax: 757-565-3812
Home: 757-565-0287
wendellgaffney@aol.com
Wendell Gaffney

MC003_GOPC_LAKEWOOD_DRIVE - 035



GENERAL NOTES:

1. GRINDER PUMP FORCE MAIN AND CONNECTIONS TO BE INSTALLED BY THE DEVELOPER AND DEDICATED TO JCSA FOR OPERATION AND MAINTENANCE.

2. ALL GRINDER PUMP SYSTEM COMPONENTS TO BE CONSTRUCTED IN ACCORDANCE WITH JCSA STANDARDS AND REGULATIONS GOVERNING UTILITY SERVICES, AS WELL AS THE SEWERAGE REGULATIONS OF THE VIRGINIA DEPARTMENT OF HEALTH.

3. WATER SERVICES TO BE INSTALLED BY JCSA FROM EXISTING LINES UPON APPLICATION AND PAYMENT OF FEES BY INDIVIDUAL LOT OWNERS.

4. TOPOGRAPHY SHOWN IS TAKEN FROM AERIAL TOPO AVAILABLE FROM THE FILES OF THE SURVEYOR, AND DOES NOT REPRESENT CURRENT SURVEYS ON THE GROUND. THE ELEVATION DATUM IS USGS SEA LEVEL.

5. ACCESS DRIVEWAYS SHALL NOT BE PERMITTED ACROSS THE SCENIC/RESTRICTED ACCESS EASEMENT, AND CLEARING SHALL BE PROHIBITED EXCEPT FOR WIND FALLS AND DEAD FALLS. UTILITY SERVICE LINES MAY CROSS THE SCENIC EASEMENT AT APPROXIMATELY RIGHT ANGLES TO ROUTE 131.

6. CONTRACTOR SHALL CONFIRM FIELD LOCATION OF FORCE MAIN PRIOR TO CONSTRUCTION AND INSTALLATION OF DRIVEWAY CULVERT PIPES.

7. THE DEVELOPER DOES NOT INTEND TO CONSTRUCT DRIVEWAYS UNDER THIS DEVELOPMENT PLAN. HOWEVER, IN THE EVENT HE CHANGES HIS MIND, THEN HE HIS SUCCESSORS OR ASSIGNS WILL CONSTRUCT DRIVEWAYS IN A MANNER THAT FULLY COMPLIES WITH THE GENERAL PERFORMANCE STANDARDS OF THE CHESAPEAKE BAY PRESERVATION ORDINANCE; SUCH CONSTRUCTION TO INCLUDE BUT NOT BE LIMITED TO: PLACEMENT OF STRAW BALE OR ROCK CHECK DAMS EVERY 50' IN DRIVEWAY SIDE DITCHES, SOLID SODDING OF ALL DISTURBED AREAS EXCEPT FOR DRIVEWAY SURFACE IMMEDIATELY FOLLOWING CONSTRUCTION, MINIMIZATION OF DISTURBANCE AND CLEARING OF INDIGENOUS VEGETATION, LIMITING IMPERVIOUS COVER, CONSTRUCTION OF DRIVEWAYS WITH FINISHED AVERAGE SLOPES OF LESS THAN 25%, AND OTHER SIMILAR MEASURES.

8. SEE SHEET 2 OF 3 FOR EROSION CONTROL NOTES.

9. ACCESS TO LOT 1 WILL BE RIGHT INGRESS/EGRESS ONLY. NO BREAK IN THE MEDIAN WILL BE ALLOWED.

10. COMMON DRIVEWAYS FOR LOTS 2,3,4, AND 5 SHALL BE HARD SURFACED WITH CONCRETE OR ASPHALT, WITH THE DESIGN CROSS SECTION SUBJECT TO APPROVAL BY THE COUNTY, PRIOR TO ISSUANCE OF ANY CERTIFICATE OF OCCUPANCY FOR USE OF THESE LOTS. ADEQUATE PROVISIONS SHALL BE PROVIDED TO DIVERT DRIVEWAY DRAINAGE TO THE ROADSIDE DITCHES AT THE TIME OF PAVING OF THE DRIVEWAYS.

COMMONWEALTH OF VIRGINIA — DON A. RAINEY — No. 1652 — 4/15/4 — LAND SURVEYOR

COMMONWEALTH OF VIRGINIA — DON A. RAINEY — No. 016210 — PROFESSIONAL ENGINEER

RECEIVED — MAR 199_ — PLANNING DEPARTMENT

DEVELOPMENT PLAN OF FIVE LOTS ON JAMESTOWN ROAD
OWNED BY: VENTURE INVESTMENTS, INC.

JAMES CITY COUNTY, VIRGINIA

No.	DATE	REVISION / COMMENT / NOTE	BY

Designed	Drawn
DAR	
Scale 1"=50'	Date MAY 15, 1991
Project No. 90141	
Drawing No. 1 OF 3	

MC003_GCPC_LAKEWOOD_DRIVE - 036

Prepared by: RAINEY ENGINEERING Christiansburg, Virginia

FILE #7612

PB20
PG48

LAKE POWELL

R. A. FLINT

POOLE

330'±

HIGH WATER

ROBERT T. ARMISTEAD
& LETITIA HANSON

N70°14'E
157.05'

95'

N58°24'E
101.54'

N44°36'E
126.45'

N11°59'E
108.10'

N10°20'W
44.12'

Δ=10°07'
R=330.00'
T=29.67'
L=58.21'

S73°29'E
28.70'

Δ=57°32'
R=78.67'
T=44.80'
L=81.66'

N6°40'E
65.00'

N20°55'W
185.33'

N15°53'W
161.40'

N55°27'E
166.53'

N4°42'W
144.43'

N52°29'W
207.83'

N63°26'W
478.83'

S80°09'W
167.24'

S28°07'E
111.59'

S22°26'E
118.31'

S48°12'W
162.52'

S75°32'W
110.00'

Δ=4°42'
R=335.00'
T=13.23'
L=26.45'

Δ=1°04'
R=533.52'
T=5.00'
L=10.00'

S2°53'38"W
209.71'

S3°23'E
432.05'

S4°30'W
441.80'

S4°30'W
133.44'

LOT NO. 8

LOT NO. 7

LOT NO. 5

LOT NO. 4

WELL LOT

MARL HILLS SUBDIVISION

MARL HILLS SUBDIVISION

VIRGINIA STATE HIGHWAY ROUTE 31

Recorded May 15, 1963
800
D. B. 90, page 513

A PARCEL OF LAND
STANDING IN THE NAME OF
ROBERT T. ARMISTEAD & LETITIA HANSON
JAMESTOWN DISTRICT
JAMES CITY COUNTY, VIRGINIA
SCALE 1" = 100' OCTOBER 9, 1962

AREA - 20.4 ACRES

M0000[illegible]PG LAKEWOOD DRIVE - 037

A. GENERAL NOTES:

1. BOUNDARY, EASEMENTS, AND SETBACK INFORMATION AS SHOWN WAS TAKEN FROM RECORD PLAT. TOPOGRAPHY AS SHOWN HAS BEEN FIELD VERIFIED BY AES USING THE BENCHMARK NOTED. NO UNDERGROUND UTILITIES HAVE BEEN LOCATED OR VERIFIED BY THIS SURVEY. CONTRACTOR TO CONTACT "MISS UTILITY" PRIOR TO ANY CONSTRUCTION ACTIVITY.
2. ALL TREES MAY BE REMOVED WITHIN THE CLEARING LIMITS SHOWN HEREON.
3. SILT FENCE TO BE PROVIDED ON DOWNSLOPE SIDE OF ALL DISTURBED AREAS.
4. CONTRACTOR TO PROVIDE STANDARD V.D.O.T. COARSE AGGREGATE #1 STONE CONSTRUCTION ENTRANCE.
5. HOUSE DIMENSIONS BASED ON INFORMATION AS SUPPLIED BY THE OWNER AND/OR DEVELOPER. CONTRACTOR TO VERIFY ALL DIMENSIONS, ALIGNMENTS AND PROVISIONS.
6. BUILDER SHALL BE RESPONSIBLE FOR SEEKING A VARIANCE TO THE DRIVEWAY SETBACK REQUIREMENTS FROM THE APPROPRIATE AGENCY. (IF APPLICABLE)

B: BUILDING SETBACKS PER RECORDED PLAT (P.B. 64, PG. 70)

1. FRONT SETBACK: 60 FEET FROM THE FRONT LOT LINE.
2. REAR SETBACK: 35 FEET FROM THEREAR LOT LINE.
3. SIDE SETBACKS: 90 AND 15 FEET FROM THE SIDE LOT LINES;

NOTES:
EXISTING DETENTION BASIN TO BE MONITORED FOR SIGNS OF SEDIMENTATION. ADDITIONAL EROSION AND SEDIMENT CONTROL PRACTICES MAY BE REQUIRED TO PROTECT THE FACILITY.

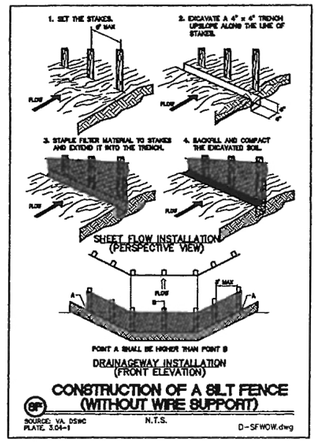
HOUSE DIMENSIONS ARE BASED ON INFORMATION AS SUPPLIED BY THE OWNER AND/OR DEVELOPER. CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ALIGNMENTS AND PROVISIONS PRIOR TO BEGINNING CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED TO AES CONSULTING ENGINEERS FOR CORRECTION AND/OR JUSTIFICATION PRIOR TO PROCEEDING WITH ANY WORK. CONTRACTOR SHALL ASSUME RESPONSIBILITY FOR ERRORS THAT ARE NOT REPORTED.

NOTE:
AREAS OF SLOPES 25% OR GREATER

NOTE:
PROVIDE 56 L.F. OF 18"RCP @ 6.25% INV. IN=44.00'±, INV. OUT= 40.5'±. WITH RIP RAP OUTLET PROTECTION
(REGRADE ROADSIDE DITCH TO ENSURE POSITIVE DRAINAGE. TOPSOIL, SEED OR SOD, AND HYDRO MULCH/STRAW ALL AREAS OF DISTURBANCE WITHIN R/W.)

EROSION CONTROL NOTE:

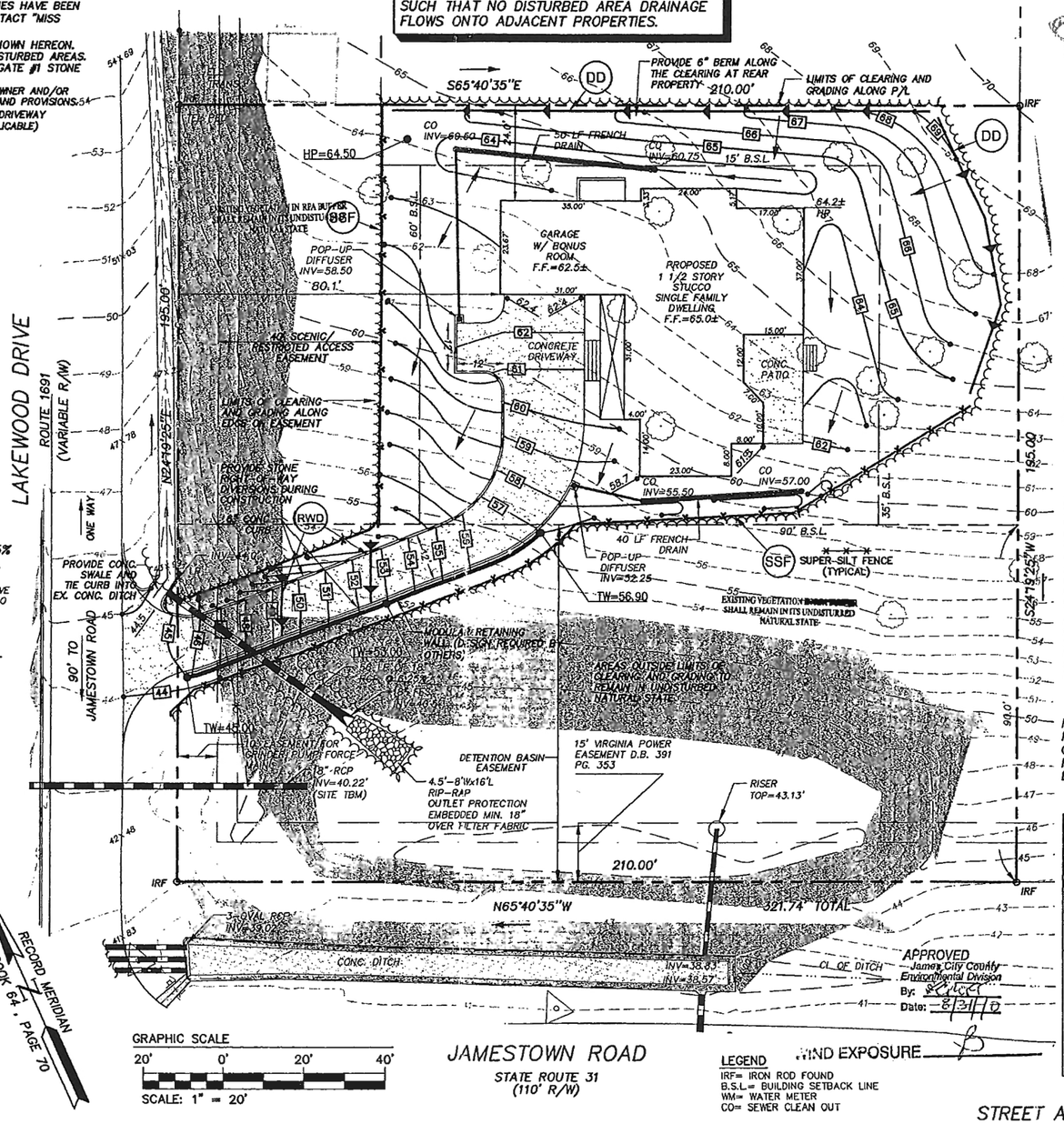
UPON REMOVAL OF ALL EROSION AND SEDIMENT CONTROL ITEMS, ALL TRAPPED/CONTAINED SEDIMENT SHALL BE REMOVED FROM LOT AND PROPERLY DISPOSED OF. ROADSIDE DITCH AND, IF APPLICABLE OUTFALL DITCHES SHALL BE CLEANED OF SEDIMENT/OR CONSTRUCTION DEBRIS ON A REGULAR BASIS DURING CONSTRUCTION.



CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)

SOURCE: VA. DSWC PLATE 3.04-1 N.T.S. D-SFWOW.dwg

NOTE:
DRAINAGE CONTROL / IMPROVEMENTS SHALL BE INSTALLED IMMEDIATELY AFTER CLEARING. SUCH THAT NO DISTURBED AREA DRAINAGE FLOWS ONTO ADJACENT PROPERTIES.



GRAPHIC SCALE
20' 0' 20' 40'
SCALE: 1" = 20'

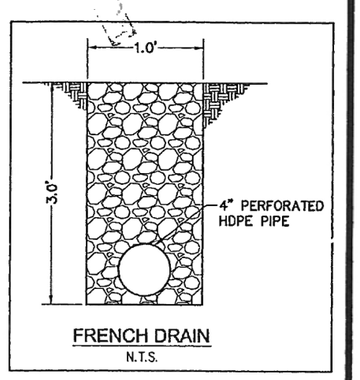
JAMESTOWN ROAD
STATE ROUTE 31
(110' R/W)

LEGEND
IRF= IRON ROD FOUND
B.S.L.= BUILDING SETBACK LINE
WM= WATER METER
CO= SEWER CLEAN OUT

WIND EXPOSURE

APPROVED
James City County
Environmental Division
By:
Date: 8/31/10

AREA OF LOT 2
40,950 S.F.±
0.9401 ACRES±



FRENCH DRAIN
N.T.S.

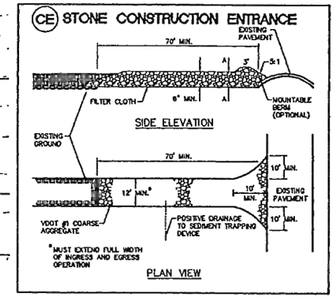
NOTE:
THIS PLAT IS BASED UPON RECORD AND OTHER AVAILABLE INFORMATION AND DOES NOT REPRESENT A CURRENT BOUNDARY SURVEY.

NOTE:
THIS PROPERTY LIES IN ZONE X, (AREAS DETERMINED TO BE OUTSIDE THE 500 YEAR FLOOD PLAIN) PER F.I.R.M. #510201-0045 B, DATED 2/8/91.

NOTES:
1. ALL DISTURBED AREAS ARE TO BE SEEDED, SODDED, OR MULCHED WITHIN 7 DAYS OF REACHING FINAL GRADE.
2. NO RPA CHESAPEAKE BAY AREAS ARE LOCATED ON PROPERTY.

NOTE:
PROVIDE STONE CONSTRUCTION ENTRANCE DURING CONSTRUCTION. CONTRACTOR RESPONSIBLE FOR KEEPING LAKEWOOD DRIVE FREE OF MUD AND DEBRIS ADJACENT TO PROPOSED DRIVEWAY

(CE) STONE CONSTRUCTION ENTRANCE



TAX PARCEL: (47-4)(11-2)
STREET ADDRESS: #100 LAKEWOOD DRIVE

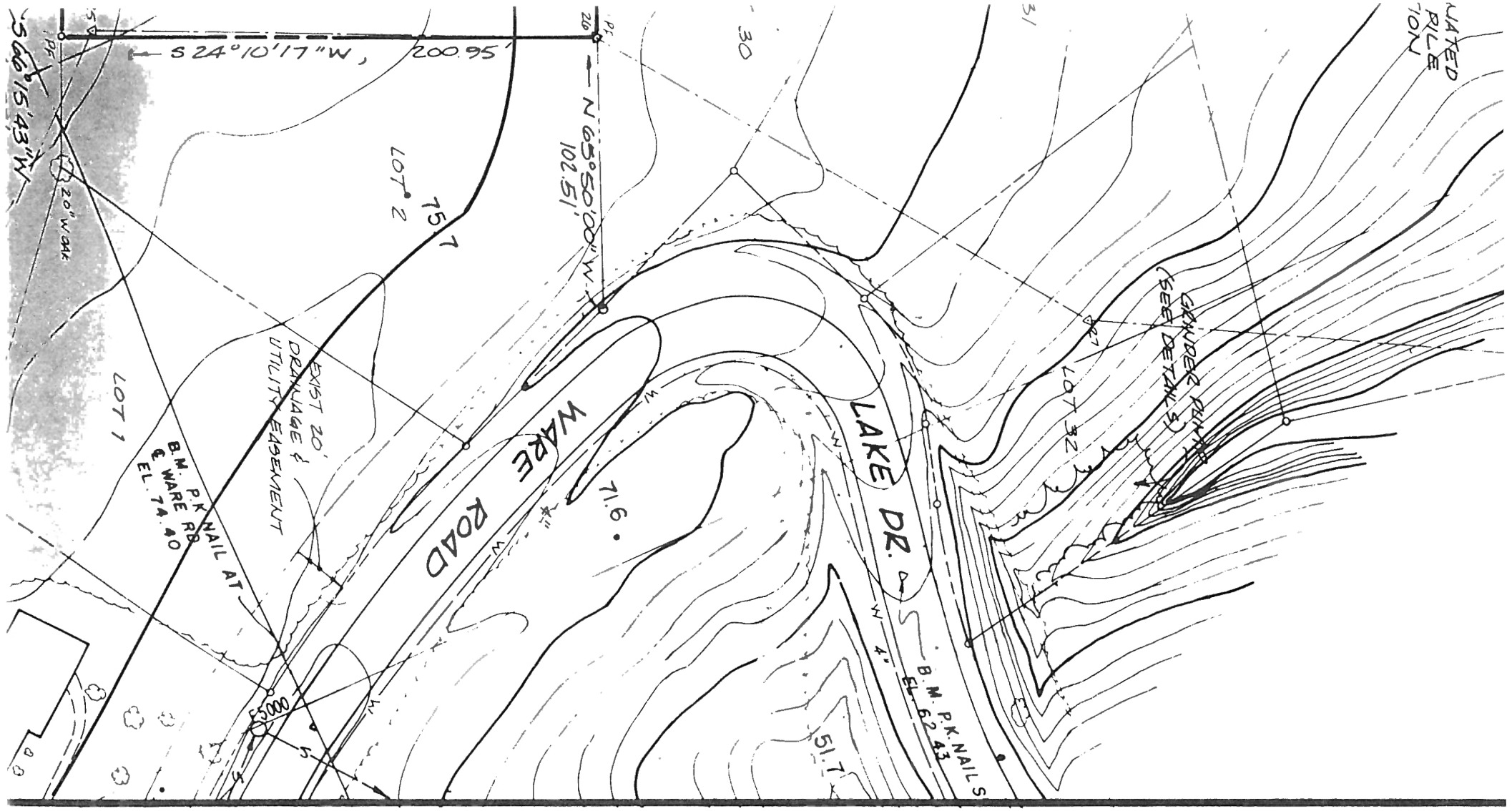
AES CONSULTING ENGINEERS
WILLIAMSBURG • RICHMOND • GLOUCESTER
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994

DEVELOPMENT PLAN
LOT 2, SUBDIVISION OF FIVE LOTS
ON JAMESTOWN ROAD
PREPARED FOR: MARK URICK
JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA

COMMONWEALTH OF VIRGINIA
ROBERT D. MANN
Lic. No. 002509
11/18/09
LAND SURVEYOR

No.	DATE	REVISION / COMMENT / NOTE	BY
2	11/18/09	REVISED PER COUNTY COMMENTS	RED
1	8/24/09	REVISED HOUSE PER NEW PLAN & REVISED GRADING	RED

Designed	Drawn
AES	AES
Scale	Date
1"=20'	11/18/09
Project No.	
9340-1	
Drawing No.	
1 OF 1	



SEWER, DRAINAGE, SEDIMENT & EROSION CONTROL

LAKEWOOD SECTION II

OWNER/DEVELOPER: MECCA DEVELOPMENT CORP.

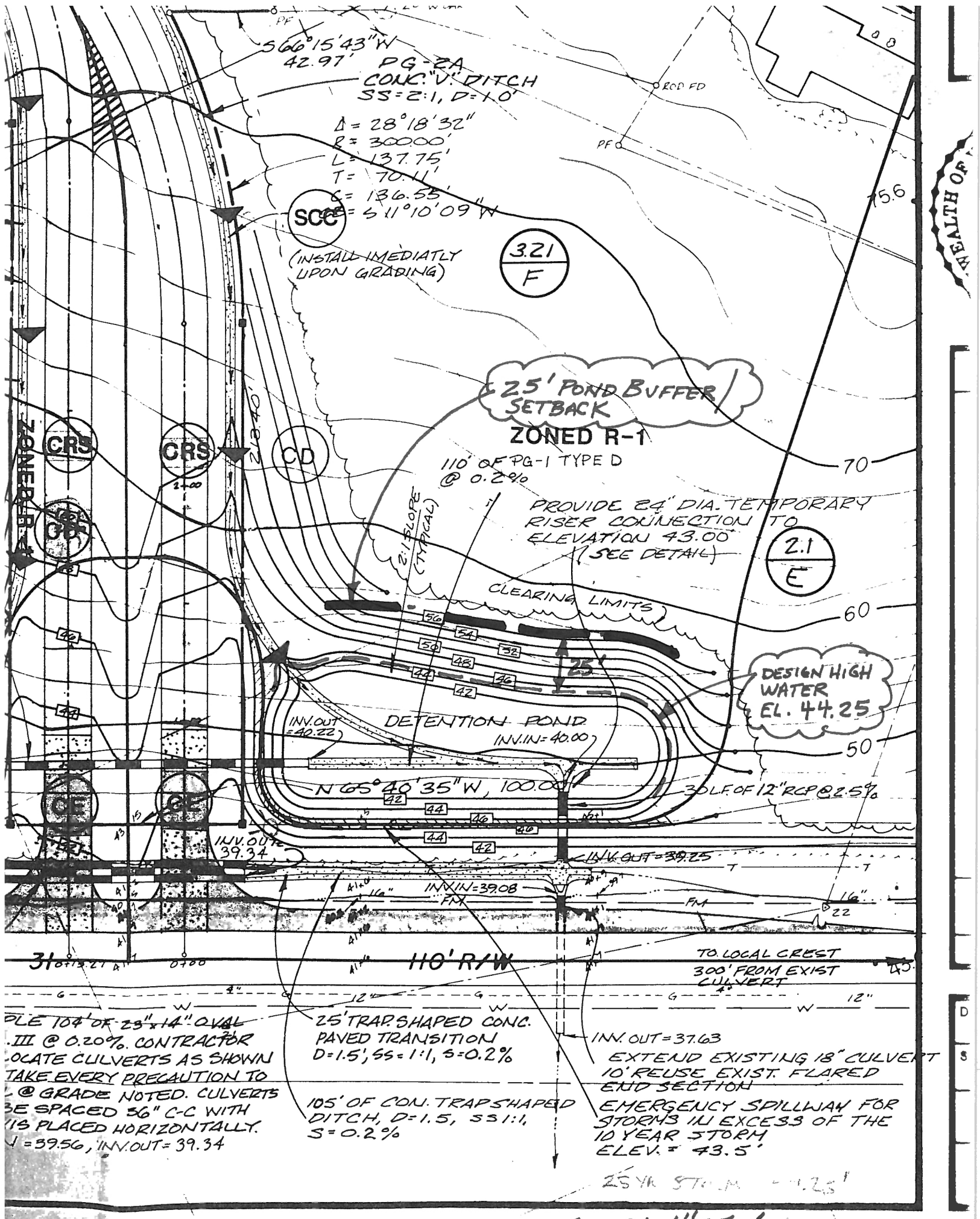
MESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA

AES, a professional corporation

1761 Jamestown Road, Williamsburg, Va. 23185

804-253-0040

Architecture, Engineering, Surveying, Planning



OLE 104' OF 23"x14" OVAL
.III @ 0.20%. CONTRACTOR
OCATE CULVERTS AS SHOWN
AKE EVERY PRECAUTION TO
@ GRADE NOTED. CULVERTS
BE SPACED 56" C-C WITH
IS PLACED HORIZONTALLY.
J = 39.56, INV. OUT = 39.34

25' TRAP. SHAPED CONC. PAVED TRANSITION D=1.5', SS=1:1, S=0.2%

105' OF CON. TRAPSHAPED DITCH, D=1.5, SS 1:1, S=0.2%

INV. OUT = 37.63

EXTEND EXISTING 18" CULVERT 10' REUSE EXIST. FLARED END SECTION

EMERGENCY SPILLWAY FOR STORMS IN EXCESS OF THE 10 YEAR STORM ELEV. = 43.5'

25 YR STORM = 41.25'

SCALE: 1"=50'

S-3E

MC003_GCPC_LAKEWOOD_DRIVE - 040

25 yr. Storm $Q_{in} = 47.9$ cfs

Try Elev. 43.0 $q_o = 7.5$ cfs

Storage = 39000 ft³

$V_o = 75(t_c)(Q_{in} - q_o) = 75(22)(47.9 - 7.5) = 666000$ ft³ (Low)

Try Elev. 44.0 $q_o = 9.0$ cfs

Storage = 60000 ft³

$V_o = 75(22)(47.9 - 9.0) = 64200$ ft³ (Low)

Try Elev. 44.25 $q_o = 9.25$ cfs

Storage = 66000 ft³

$V_o = 75(22)(47.9 - 9.25) = 63750$ ft³ (Close Enough)

25 yr. Storm Elev. = 44.25 ft. $Q = 9.25$ cfs < 10.28 cfs Good

Use 12" RCP

– Req'd Sediment Storage Vol.

$(23.5\ Ac)(67\ yd^3/Ac.)(27\ ft^3/yd^3) = 42500$ ft³

A temporary riser structure is to be place at the enterance of the culvert to elevation 43.0 ft.

Conclusion :

Detention Pond for Sec. II is designed to detain a 25 yr. storm event and release it at a rate 2 yr. pre-development rate. The 25 yr. detention pond elevation is at 44.25 ft. and is released through a 12 inch RCP. The emergency spillway has an invert at 44.25 ft. and is designed to operate in excess of the 25 yr. storm event.

- Design High Water EL. 44.25
- 25-YEAR STORM

Sellers Mill Sec I
LAKEWOOD SEC 2

Public Works

Drainage Calcs

Revised Calcs

Lakewood Sec II

#6240 SCW
2/6/87

Detention Pond Design For Small Sites

Pre-development

A = 1022500 S.F. = 23.5 Ac ±
C = 0.25 (Woodlands)

L = 580' Overland Flow ΔElev. = 76.4 - 70 = 6.4'
S = 6.4/580 = 1.1%
t_c = 33 min (Fig 1.5.1.2)

L = 780' Channel Flow ΔElev. = 70. - 47 = 23
S = 23/780 = 2.9%
t_c = 5.5 min. (Fig 1.5.1.2)

L = 1020' Channel Flow ΔElev. = 47 - 39 = 8'
S = 8/1020 = 0.78%
t_c = 11 min (Fig 1.5.1.2)

t_c = 33 + 5.5 + 11 = 41.5 min.

I_2 = 1.75 in/hr. , Q_2 = 10.28 cfs

I_{10} = 3.1 in/hr. , Q_{10} = 18.2 cfs

Post-development

- Composite "C" Value -

	Area	C	CA
Rdside & Grass Channel	2.7	0.2	0.54
Business Neighborhood Areas	10.35	0.6	6.21
Residential	5.1	0.4	2.04
	ΣA = 18.15		ΣCA = 8.79

$$C = \frac{CA}{A} = 0.48$$

L = 3000' ΔElev. = 75' - 44' = 31'

t_c = 22 min (Fig 1.5.1.2)

$I_2 = \frac{130.3}{18.5+22} = 3.22$ in/hr. , Q_2 = 28.05 cfs

$I_{10} = \frac{189.2}{22.1+22} = 4.29$ in/hr. , Q_{10} = 37.37 cfs

— Critical Storm Duration for 10 Yr. Post-Dev.

$$T_c = \sqrt{\frac{2CAa(b - t_c/4)}{q_o}} - b$$

Trial 1

Given: $C = 0.48$
$A = 18.15$
$t_c = 22$ min.
$a = 189.2$
$b = 22.1$
$q_o = 10.28$ cfs (allowable peak outflow)

$$T_c = \sqrt{\frac{2(0.48)18.15(189.2)(22.1 - 22/4)}{10.28}} - 22.1$$

$T_c = 51$ min.

$t_c = 22$ min.

— Peak Inflow:

$$Q_o = CA\left[\frac{a}{b + T_c}\right] = 0.48(18.15)\left[\frac{189.2}{22.1 + 51}\right] = 22.5 \text{ cfs}$$

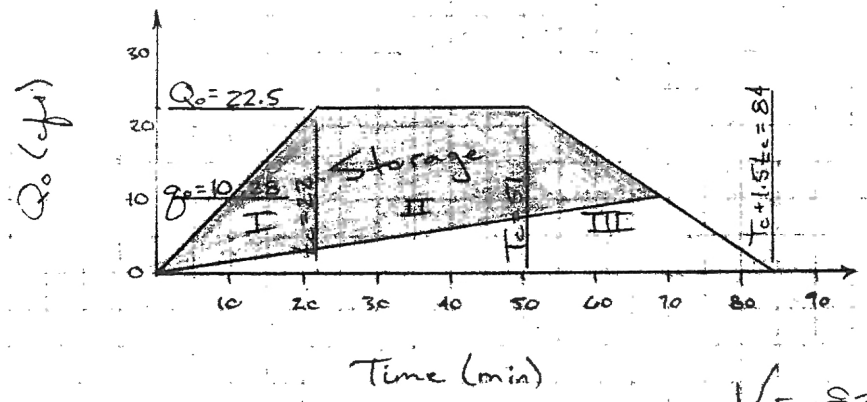
— Req'd Storage for Critical 10 Yr. Storm:

$$V = \left[Q_o T_c + \frac{Q_o t_c}{4} - \frac{q_o T_c}{2} - \frac{3 q_o t_c}{4}\right] 60$$

$$= \left[22.5(51) + \frac{22.5(22)}{4} - \frac{10.28(51)}{2} - \frac{3(10.28)22}{4}\right] 60$$

$$V = 50370 \text{ ft}^3$$

Check:



	Area	
I	$22.5(22)\frac{1}{2} =$	247.5
II	$22.5(51-22) =$	652.5
III	$22.5(84-51)\frac{1}{2} =$	371.25
		1271.25

Unshaded Area
$-10.28(84)\frac{1}{2} = -\ 431.76$
839.49

$V = 839.5(60) = 50370 \text{ ft}^3$

Checks

Critical Storm Duration for 25 yr. Post-Dev.

Pre-development

$A = 23.5$ Ac ±
$C = 0.25$

$t_c = 49.5$ min.

$I_2 = 1.75$ in/hr. , $Q_2 = 10.28$ cfs
$I_{10} = 3.1$ in/hr , $Q_{10} = 18.2$ cfs
$I_{25} = 3.75$ in/hr. , $Q_{25} = 22.0$ cfs

Post-development

$A = 18.15$ Ac ±
$C = 0.48$

$t_c = 22$ min. (Fig. 1.5.12.)

$I_2 = 3.22$ in/hr. , $Q_2 = 28.05$ cfs
$I_{10} = 4.29$ in/hr. , $Q_{10} = 37.37$ cfs
$I_{25} = 5.5$ in/hr. , $Q_{25} = 47.92$ cfs

$I = \frac{a}{b+T}$ (chart)

Outlet Structure:

Try 30'-$\binom{12}{15}$" RCP @ 2.5% Inv. In = 40.00'
Inv. Out = 39.25'

Determine outflow by assuming inlet control. (Chart 2)

Pond Surf. Elev. (ft.)	HW (ft)	HW/D 12" ⇐ D ⇒ 15"		Q (cfs) 12" ⇐ D ⇒ 15"	
43.0	3.0	3.0	2.4	7.5	11
43.5	3.5	3.5	2.8	8.5	12
44.0	4.0	4.0	3.2	9.0	13
44.5	4.5	4.5	3.6	9.5	14
45.0	5.0	5.0	4.0	10.0	15

4/15/87 SDW.

25 yr. Storm $Q_{in} = 47.9$ cfs

Try Elev. 43.0 $q_o = 7.5$ cfs

Storage = 39000 ft³

$V_o = 75(t_c)(Q_{in} - q_o) = 75(22)(47.9 - 7.5) = 666000$ ft³ (Low)

Try Elev. 44.0 $q_o = 9.0$ cfs

Storage = 60000 ft³

$V_o = 75(22)(47.9 - 9.0) = 64200$ ft³ (Low)

Try Elev. 44.25 $q_o = 9.25$ cfs

Storage = 66000 ft³

$V_o = 75(22)(47.9 - 9.25) = 63750$ ft³ (Close Enough)

25 yr. Storm Elev. = 44.25 ft. $Q = 9.25$ cfs < 10.28 cfs Good

Use 12" RCP

– Req'd Sediment Storage Vol.

$(23.5\ Ac)(67\ yd^3/Ac.)(27\ ft^3/yd^3) = 42500$ ft³

A temporary riser structure is to be place at the enterance of the culvert to elevation 43.0 ft.

Conclusion :

Detention Pond for Sec. II is designed to detain a 25 yr. storm event and release it at a rate 2 yr. pre-development rate. The 25 yr. detention pond elevation is at 44.25 ft. and is released through a 12 inch RCP. The emergency spillway has an invert at 44.25 ft. and is designed to operate in excess of the 25 yr. storm event.

For Public Works

LAKEWOOD, SECTION II

Re-development Calc's to Existing 18" Culvert Under Rt. 31

2/12/87

MC 003
S-35-87

VOID SEE 2/6/87 CALCS.

D.A. = 34.18 Ac. ±

Composite "C" Value

Watershed	A	C	CA
A	9.18	0.3	2.75
Lakewood Area	25.6	0.25	6.4
	34.78		9.15

$C = 9.11/34.78 = 0.26$

L = 850' Overland Flow
ΔElev = 28.3'
S = 3.3%
t_{c_1} = 27 min (fig 1.5.1.1)

L = 1720' Roadside Channel Flow
ΔElev = 10'
S = 0.58%
t_{c_2} = 17 min (fig 1.5.1.2)

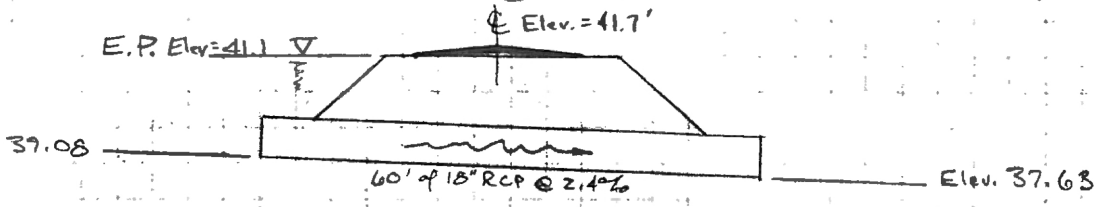
$T_c = t_{c_1} + t_{c_2} = 44$ min

$I_2 = 1.8$ in/hr , $Q_2 = 16.3$ cfs

$I_{10} = 3.4$ in/hr. , $Q_{10} = 30.7$ cfs

Upon field inspection it is discovered that the culvert outlet is presently half filled with earth and a proper swale leaving the culvert does not exist. By redefining the swale and flushing the pipe the hydraulic performance of the culvert can be improved. Thus, the stormwater from the culvert will flow away from a roadway fill via a swale which will then transition to sheet flow following the natural drainage pattern to Powhatan Creek.

Assume W.S. @ shoulder elev. (Worst condition)



Check Capacity of 18" RCP Culvert Under Rt 31

Known:
- Dia = 18"
- Length = 60'
- Inv. In = 39.08'
- Inv. Out = 37.63
- Slope = 2.4%

- Q_{cap} = 15 cfs
- V = 8.47 fps
- d_c = 1.45 ft
- $h_o = \frac{d_c + D}{2}$
- $HW = H + h_o - LS_o$

Inlet Control

Assume: HW = 41.1 − 39.08 = 2.02', HW/D = 1.35
Groove end w/ headwall

Q = 10 cfs (Chart 2)

Outlet Control

Downstream obstructions establishing a tailwater surface equal to or greater than the top of the culvert outlet do not exist. Therefore TW ≤ D. Assume flow at Qcap, 15 cfs

V = 8.47, A = 1.77 S.F., d_c = 1.45 ft., W_p = 4.14 S.F. (by Seeley Pg. 18-73, fig. B)

R = 0.377, $H = \left[1 + 0.5 + \frac{29(0.015)^2 60}{0.427^{1.33}}\right]\frac{8.47^2}{64.4} = 3.02$ → HW = 3.02 + 1.475 − 1.44 = 3.05

Inv. In Elev. (39.08) + (3.05) + HW = 42.13' is well above the road surface elevation and highly unlikely

Assume $T_w = D = h_o = 1.5' > d_c$, H = 2.02 − 1.5 + 1.44 = 1.96' then from Chart 9C

Q = 11.5 cfs > 10 cfs

Conclude: Inlet Controls

Conclusion:

Presently the 18" culvert recieves a Q_{total} = 30.7 cfs from a 34.78 Ac. ± watershed during a 10 yr. storm event. The watershed is 27% residential and 73% woodlands. Based on field data and the assumption that headwater equals 1.35 times the diameter of the entrance culvert ... it is determined that the culvert operates under inlet controled conditions at a capacity of Q_{cap} = 10 cfs. Therefore the 18 inch culvert is inadequate to function properly within a 10yr. or 2yr. storm event.

Drainage Calcs

#6240 SAW. 2/6/87

Lakewood Sec. II

Detention Pond Design For Small Sites

Pre-development

A = 1022500 S.F. ± = 23.5 Ac ±
C = 0.25 (Woodlands)

L = 580' Overland Flow ΔElev. = 76.4 - 70 = 6.4'
S = 6.4/580 = 1.1%
t_{c_1} = 33 min (fig.

L = 780' Channel Flow ΔElev. = 70. - 47 = 23
S = 23/780 = 2.9%
t_{c_2} = 5.5 min. (fig 1.5.1.2)

L = 1020' Channel Flow ΔElev. = 47 - 39 = 8'
S = 8/1020 = 0.78%
t_{c_3} = 11 min (fig 1.5.1.2)

t_c = 33 + 5.5 + 11 = 49.5 min.

I_2 = 1.75 in/hr., Q_2 = 10.28 cfs

I_{10} = 3.1 in/hr., Q_{10} = 18.2 cfs

23.5
10.15
= .35 ac gain

Post-development

- Composite "C" Value -

seems low

	Area	C	CA
Roadside & Grass Channel	2.7	0.2	0.54
Business Neighborhood Areas	10.35	0.6	6.21
Residential	5.1	0.4	2.04
	ΣA = 18.15		ΣCA = 8.79

$C = \frac{CA}{A} = 0.48$

L = 3000' ΔElev. = 75 - 44 = 31'

t_c = 22 min (fig. 1.5.1.2)

$I_2 = \frac{130.3}{18.5+22} = 3.22$ in/hr., Q_2 = 28.05 cfs

$I_{10} = \frac{189.2}{22.1+22} = 4.29$ in/hr., Q_{10} = 37.37 cfs

— Critical Storm Duration for 10 Yr. Post-Dev.

$$T_c = \frac{\sqrt{2CAa(b - t_c/4)}}{q_o} - b$$

Trial 1

Given: $C = 0.48$
$A = 18.15$
$t_c = 22$ min.
$a = 189.2$
$b = 22.1$
$q_o = 10.28$ cfs (allowable peak outflow)

$$T_c = \frac{\sqrt{2(0.48)18.15(189.2)(22.1 - 22/4)}}{10.28} - 22.1$$

$T_c = 51$ min.

$t_c = 22$ min.

— Peak Inflow:

$$Q_o = CA\left[\frac{a}{b + T_c}\right] = 0.48(18.15)\left[\frac{189.2}{22.1 + 51}\right] = 22.5 \text{ cfs}$$

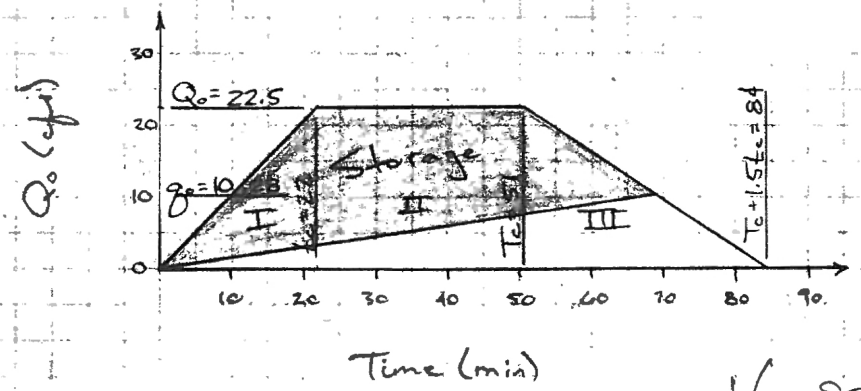
— Req'd Storage for Critical 10 Yr. Storm:

$$V = \left[Q_o T_c + \frac{Q_o t_c}{4} - \frac{q_o T_c}{2} - \frac{3 q_o t_c}{4}\right] 60$$

$$= \left[22.5(51) + \frac{22.5(22)}{4} - \frac{10.28(51)}{2} - \frac{3(10.28)22}{4}\right] 60$$

$$V = 50370 \text{ ft}^3$$

Check:



		Area
I	22.5(22)½ =	247.5
II	22.5(51-22) =	652.5
III	22.5(84-51)½ =	371.25
		1271.25

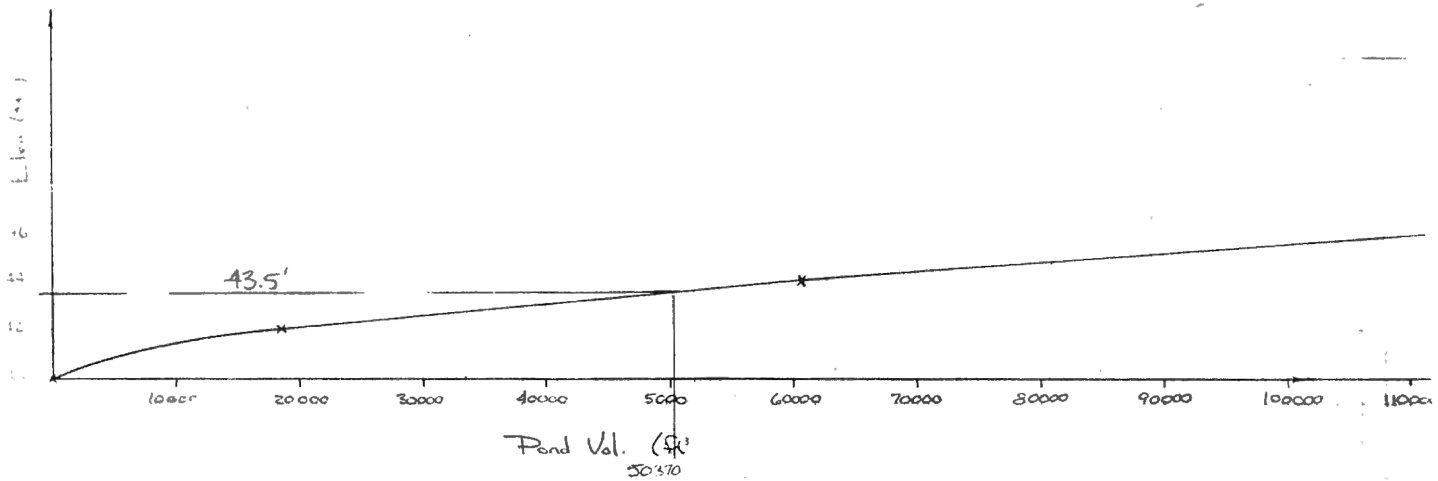
Unshaded Area
$-10.28(84)½ = -431.76$
839.49

$V = 839.5(60) = 50370 \text{ ft}^3$

Checks

"B"

Elev. (ft)	Area (ft^2)	Avg. Area (ft^2)	Depth (ft)	Incremental Vol (ft^3)	ΣVol (ft^3)
40	0				0
		9250	2	18500	
42	18500				18500
		21125	2	42250	
44	23750				60750
		27000	2	54000	
46	30250				114750



- Req'd Sediment Storage Vol.

$(23.5\ Ac \times 67\ ft^3/Ac.) = 1574.5\ ft^3$

→ Turned up pipe to be

42,511 cy for 18 ac
or 33,100

— Determine Pipe Size to Pass Q_2 Pre-dev.

Given: Pond Elev. = 43.5'
T_W = 1.5' (Assumed)
Q_2 = 14.34 cfs (pre-dev.)
HW = 43.5 - 40.0 = 3.5'

$HW = H + h_o - LS_o$

where: $h_o = T_W = 1.5'$
$LS_o = 30(0.025) = 0.75'$

$H = 3.5 - (1.5 - 0.75) = 2.75'$

$$H = \left[1 + K_e + \frac{29n^2L}{R^{1.33}}\right]\frac{V^2}{2g}$$

where: $K_e = 0.5$
$n = 0.015$ for RCP
$L = 30$
$R = A/W_p$

Try 18" Dia

$A = 1.77\ ft^2$
$WP = 4.71\ ft$
$R = 0.376$

$$2.75 = \left[1 + 0.5 + \frac{29(0.015)^2\,30}{0.376^{1.33}}\right]\frac{V^2}{2(32.2)}$$

$V = \sqrt{2.75(29.02)} = 8.93$ fps

$\therefore Q = 1.77(8.93) = 15.81$ cfs > 10.28 cfs

NG

Try 1.5 ~~~

$A = 1.23\ ft^2$
$WP = 3.93\ ft$
$R = 0.313$

$$2.75 = \left[1 + 0.5 + \frac{29(0.015)^2 30}{0.313^{1.33}}\right]\frac{V^2}{64.4}$$

$$V = \sqrt{2.75(26.64)} = 8.56\ fps$$

$$\therefore\ Q = 1.23(8.56) = 10.50\ cfs \quad \underline{\text{Close Enough}}$$

$$q_o = 10.50\ cfs$$

Trial 2

- Critical Storm Duration for 10 Yr. Post-Dev.:

$$T_c = \sqrt{\frac{2(0.48)\,18.15\,(189.2)(22.1 - 22/4)}{10.50}} - 22.1$$

$T_c = 50.0$ min

$t_c = 22$ min.

- Peak Inflow:

$$Q_o = 0.48(18.15)\left[\frac{189.2}{22.1 + 50.0}\right] = 22.9\ cfs$$

- Req'd Storage for Critical 10 Yr. Storm:

$$V = \left[22.9(50.0) + \frac{22.9(22)}{4} - \frac{10.50(50.0)}{2} - \frac{3(10.50)(22)}{4}\right]60$$

$$\underline{V = 50112\ ft^3} \rightarrow \text{Pond Elev.} = 43.5'$$

Conclusion: Detention Pond for Sec. II is designed to detain a 10 Yr. storm and release it at a 2yr. pre-development rate. The 10yr. detention pond elevation is at 43.5 ft and is released through a 15 in RCP pipe. The emergency spillway has an invert at 43.5 ft and is designed to operate in excess of 10 yr. storm events.

Sizing of Culvert Under Lakewood Dr. (Post Dev.) and Level Way

Composite "C" Value

Watershed	A	C	CA
A	9.18	0.3	2.75
B	0.5	0.45	0.23
Level Way to Rt 31	0.36	0.66	0.24
Rt 615 to Lakewood Dr	0.52	0.56	0.29
	10.56		3.51

$C = 3.51/10.56 = 0.33$

$A = 10.56$ Ac

L = 850 Overland Flow @ S = 3.3%
t_c = 27 min.

L = 1720 Channel Flow @ S = 0.58%
t_c = 17 min.

T_c = 44 min.

$I_2 = 1.8$ in/hr., $Q_2 = 6.27$ cfs

$I_{10} = 3.4$ in/hr., $Q_{10} = 11.85$ cfs

Use 3 - 14" x 23" Elliptical Pipe @ 0.2%
(Designated Equivalent = 18" Round)

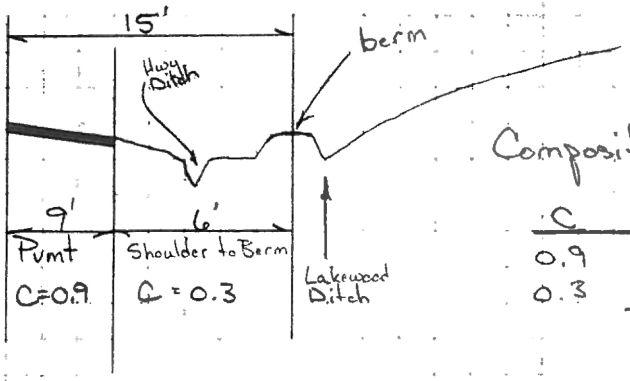
$Q_{cap} = 4.3$ cfs

$3 \times Q_{cap} = 12.9$ cfs > 11.85 cfs

Good

2/11/08

℄ of Rt 615 to Crest of Berm (From Level Way to Rt 31)



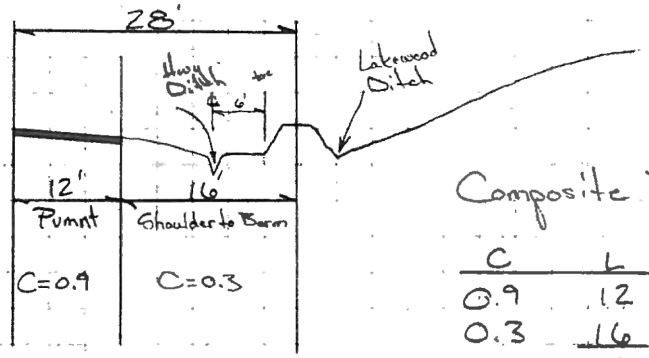
Composite "C" Value for ROW

C	L	CL
0.9	9	8.1
0.3	6	1.8
	15	9.9

$C = 9.9/15 = 0.66$

$A = 15'(1050') = 15750$ S.F. $= 0.36$ Ac.

℄ of Rt 31 to Crest of Berm (From Rt. 615 to Lakewood Dr.)



Composite "C" Value

C	L	CL
0.9	12	10.8
0.3	16	4.8
	28	15.6

$C = 15.6/28 = 0.56$

$A = 28'(810') = 22680$ S.F.± $= 0.52$ Ac.±

Sizing of Culvert at Level Way & Rt 615

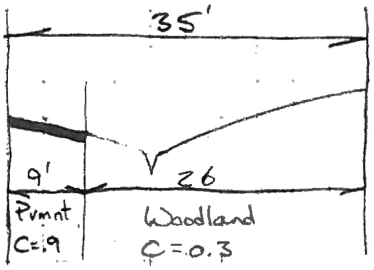
$A = 0.5\ Ac$

$C = 0.45$

$L = 390'$

$\Delta Elev. = 76 - 72.8 = 3.2'$

$S = 3.2/390 = 0.82\%$



Composite "C" Value

C	L	CL
0.9	9	8.1
0.3	26	7.8
	35	15.9

$C = 15.9/35 = 0.45$

$t_c = 21$ min

$I_2 = 3.0$ in/hr. , $Q = 0.68$ cfs

$I_{10} = 5.6$ in/hr. , $Q = 1.26$ cfs

Use a 15" RCP @ 2.1% $Q_{cap} = 8.5$ cfs **Good** ✓

Watershed A

$A = 9.18\ Ac \pm$

$C = 0.3$ (Residential)

Overland Flow $L = 850'$ $C = 0.3$ (Residential)

$\Delta Elev. = 78.4 - 50.1 = 28.3$

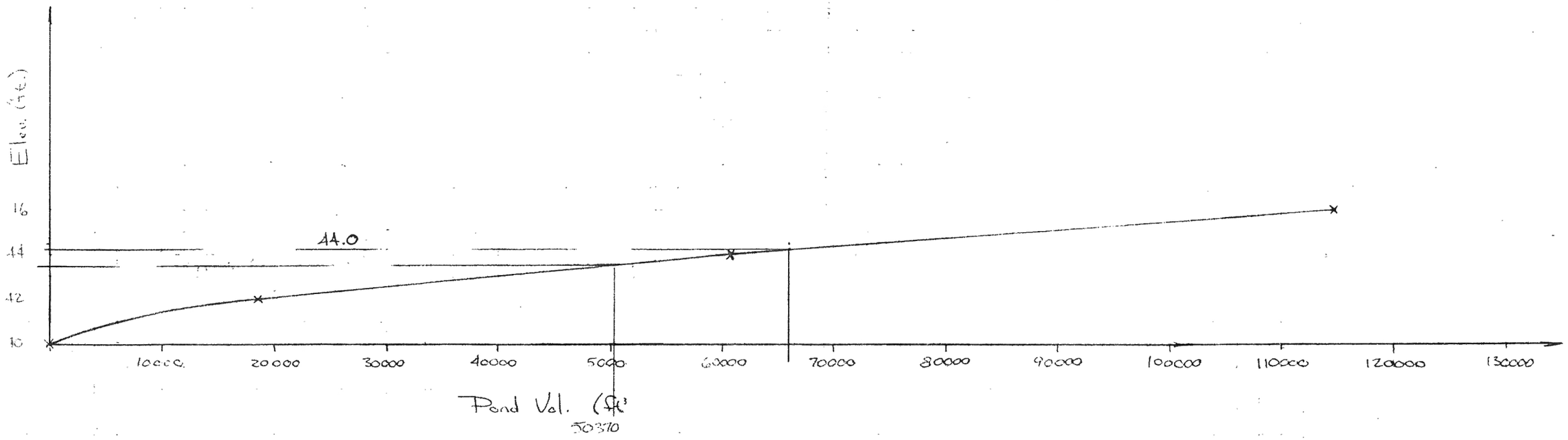
$S = 28.3/850 = 3.3\%$

$t_c = 27$ min.

3/

"B"

Elev. (ft)	Area (ft^2)	Avg. Area (ft^2)	Depth (ft)	Incremental Vol. (ft^3)	Σ Vol. (ft^3)
40	0				0
		9250	2	18500	
42	18500				18500
		21125	2	42250	
44	23750				60750
		27000	2	54000	
46	30250				114750



My Copy

Revised

Drainage Calcs

Lakewood Sec. II

#6240 Sew.
2/6/87

Detention Pond Design For Small Sites

Pre-development

A = 1022500 S.F. = = 23.5 Ac ±
C = 0.25 (Woodlands)

L = 580' Overland Flow ΔElev. = 76.4 - 70 = 6.4'
S = 6.4/580 = 1.1%
t_{c_1} = 33 min (Fig

L = 780' Channel Flow ΔElev. = 70. - 47 = 23
S = 23/780 = 2.9%
t_{c_2} = 5.5 min. (Fig 1 5.1.2)

L = 1020' Channel Flow ΔElev. = 47 - 39 = 8'
S = 8/1020 = 0.78%
t_{c_3} = 11 min (Fig 1.5.1.2)

t_c = 33 + 5.5 + 11 = 49.5 min.

I_2 = 1.75 in/hr. , Q_2 = 10.28 cfs

I_{10} = 3.1 in/hr. , Q_{10} = 18.2 cfs

Post-development

- Composite "C" Value -

	Area	C	CA
Roadside & Grass Channel	2.7	0.2	0.54
Business Neighborhood Areas	10.35	0.6	6.21
Residential	5.1	0.4	2.04
	ΣA = 18.15		ΣCA = 8.79

$C = \frac{CA}{A} = 0.48$

L = 3000' ΔElev. = 75' - 44' = 31'

t_c = 22 min (Fig 1.5.1.2)

$I_2 = \frac{130.3}{18.5+22} = 3.22$ in/hr. , Q_2 = 28.05 cfs

$I_{10} = \frac{189.2}{22.1+22} = 4.29$ in/hr. , Q_{10} = 37.37 cfs

— Critical Storm Duration for 10 Yr. Post-Dev.

$$T_c = \frac{\sqrt{2CA_a(b - t_c/4)}}{q_o} - b$$

Trial 1

Given: $C = 0.48$
$A = 18.15$
$t_c = 22$ min.
$a = 189.2$
$b = 22.1$
$q_o = 10.28$ cfs (allowable peak outflow)

$$T_c = \frac{\sqrt{2(0.48)18.15(189.2)(22.1 - 22/4)}}{10.28} - 22.1$$

$T_c = 51$ min.

$t_c = 22$ min.

— Peak Inflow:

$$Q_o = CA\left[\frac{a}{b + T_c}\right] = 0.48(18.15)\left[\frac{189.2}{22.1 + 51}\right] = 22.5 \text{ cfs}$$

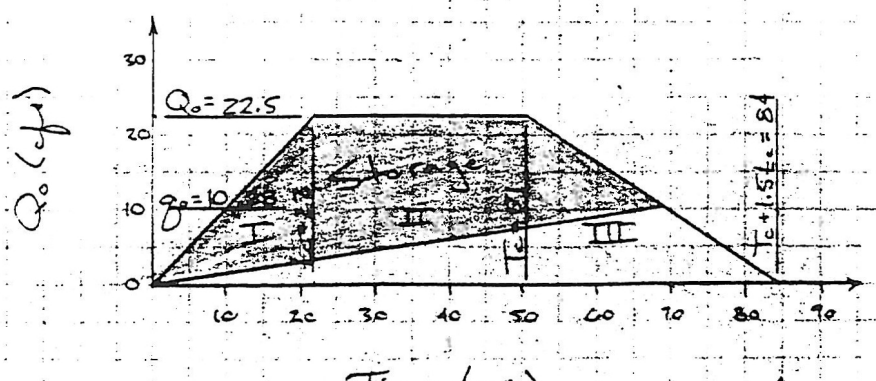
— Req'd Storage for Critical 10 Yr. Storm:

$$V = \left[Q_o T_c + \frac{Q_o t_c}{4} - \frac{q_o T_c}{2} - \frac{3 q_o t_c}{4}\right] 60$$

$$= \left[22.5(51) + \frac{22.5(22)}{4} - \frac{10.28(51)}{2} - \frac{3(10.28)22}{4}\right] 60$$

$$V = 50370 \text{ ft}^3$$

Check:

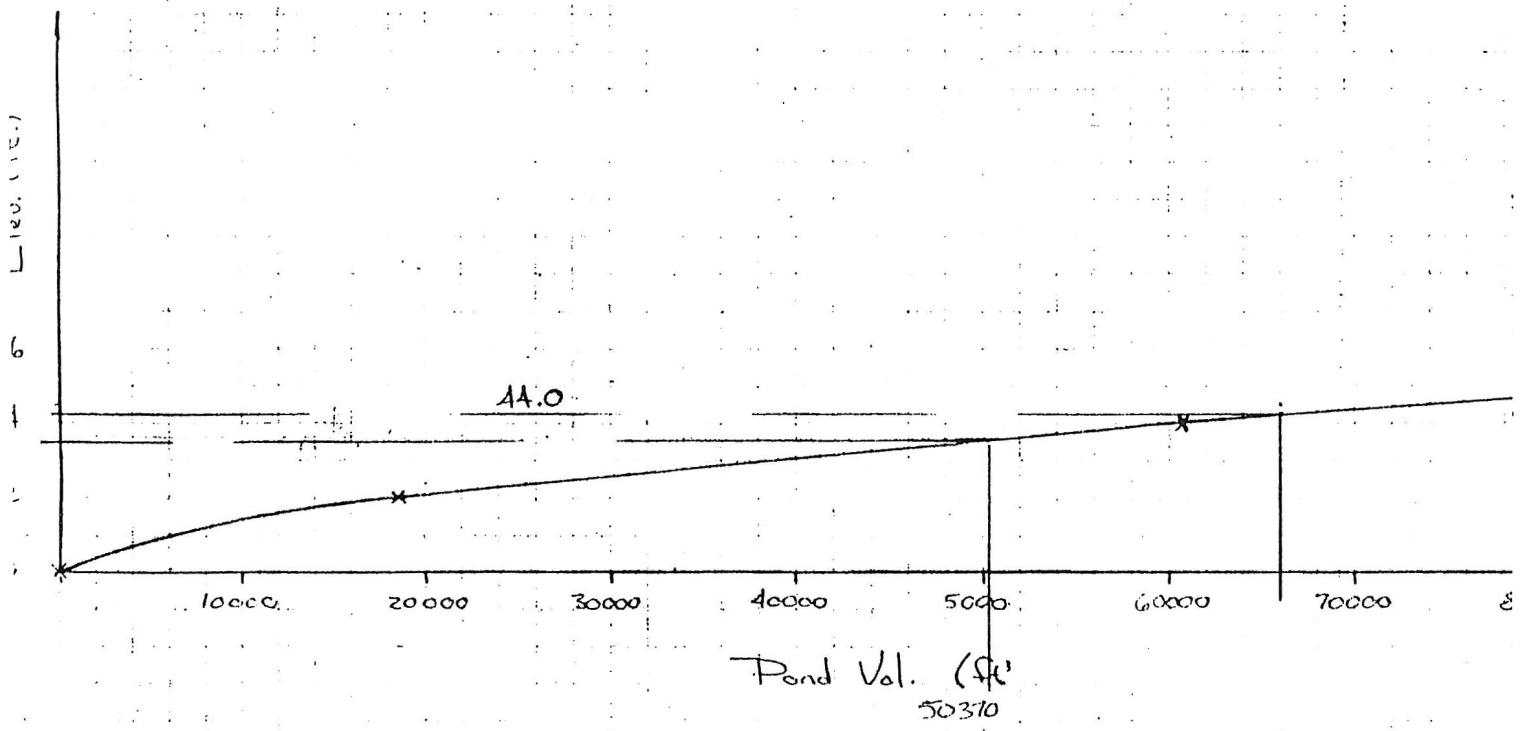


		Area
I	$22.5(22)\frac{1}{2} =$	247.5
II	$22.5(51-22) =$	652.5
III	$22.5(84-51)\frac{1}{2} =$	371.25
		1271.25
Unshaded Area	$-10.28(84)\frac{1}{2} =$	− 431.76
		839.49

$V = 839.5(60) = 50370 \text{ ft}^3$

Checks

Elev. (ft)	Area (ft^2)	Avg. Area (ft^2)	Depth (ft)	Incremental Vol. (ft^3)	Σ Vol. (ft^3)
40	0				0
		9250	2	18500	
42	18500				18500
		21125	2	42250	
44	23750				60750
		27000	2	54000	
46	30250				114750



Critical Storm Duration for 25 yr. Post-Dev.

Pre-development

$A = 23.5\ Ac =$
$C = 0.25$

$t_c = 49.5$ min.

$I_2 = 1.75$ in/hr. , $Q_2 = 10.28$ cfs
$I_{10} = 3.1$ in/hr , $Q_{10} = 18.2$ cfs
$I_{25} = 3.75$ in/hr. , $Q_{25} = 22.0$ cfs

Post-development

$A = 18.15\ Ac =$
$C = 0.48$

$t_c = 22$ min. (Fig. 1.5.12.)

$I_2 = 3.22$ in/hr , $Q_2 = 28.05$ cfs
$I_{10} = 4.29$ in/hr. , $Q_{10} = 37.37$ cfs
$I_{25} = 5.5$ in/hr. , $Q_{25} = 47.92$ cfs (chart)

$I = \frac{a}{b+T}$

Outlet Structure:

Try $30'-\binom{12}{15}$" RCP @ 2.5% Inv. In = 40.00'
Inv. Out = 39.25'

Determine outflow by assuming inlet control (Chart 2)

Pond Surf. Elev. (ft.)	HW (ft)	HW/D 12" ⇐ D ⇒ 15"		Q(cfs) 12" ⇐ D ⇒ 15"	
43.0	3.0	3.0	2.4	7.5	11
43.5	3.5	3.5	2.8	8.5	12
44.0	4.0	4.0	3.2	9.0	13
44.5	4.5	4.5	3.6	9.5	14
45.0	5.0	5.0	4.0	10.0	15

25 yr. Storm $Q_{in} = 47.9$ cfs

Try Elev. 43.0 $q_o = 7.5$ cfs

Storage = 39000 ft³

$V_o = 75(t_c)(Q_{in} - q_o) = 75(22)(47.9 - 7.5) = 666000$ ft³ (Low)

Try Elev. 44.0 $q_o = 9.0$ cfs

Storage = 60000 ft³

$V_o = 75(22)(47.9 - 9.0) = 64200$ ft³ (Low)

Try Elev. 44.25 $q_o = 9.25$ cfs

Storage = 66000 ft³

$V_o = 75(22)(47.9 - 9.25) = 63750$ ft³ (Close Enough)

25 yr. Storm Elev. = 44.25 ft. $Q = 9.25$ cfs < 10.28 cfs Good

Use 12" RCP

- Req'd Sediment Storage Vol.

$(23.5\ Ac)(67\ yd^3/Ac.)(27\ ft^3/yd^3) = 42500\ ft^3$

A temporary riser structure is to be place at the enterance of the culvert to elevation 43.0 ft.

Conclusion :

Detention Pond for Sec. II is designed to detain a 25 yr. storm event and release it at a rate 2 yr. pre-development rate. The 25 yr. detention pond elevation is at 44.25 ft. and is released through a 12 inch RCP. The emergency spillway has an invert at 44.25 ft. and is designed to operate in excess of the 25 yr. storm event.

For Public Works

Pre-development Calc's to Existing 18" Culvert Under Rt. 31

± 66.90

2/12/87

D.A. = 34.78 Ac. ±

Composite "C" Value

Watershed	A	C	CA
A	9.18	0.3	2.75
Lakewood Area	25.6	0.25	6.4
	34.78		9.15

$C = 9.11 / 34.78 = 0.26$

L = 850' Overland Flow
ΔElev = 28.3'
S = 3.3%
t_{c_1} = 27 min (fig 1.5.1.1)

L = 1720' Roadside Channel Flow
ΔElev = 10'
S = 0.58%
t_{c_2} = 17 min (fig 1.5.1.2)

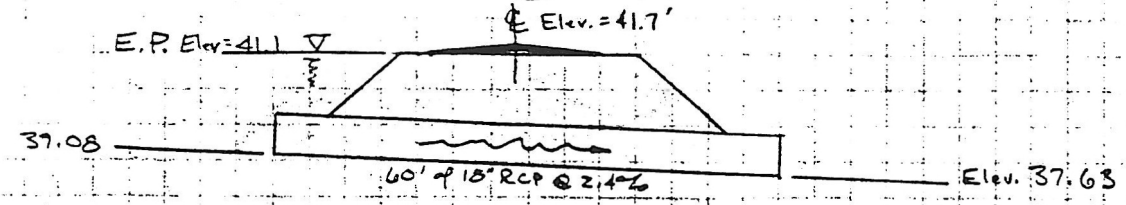
$T_c = t_{c_1} + t_{c_2}$ = 44 min

I_2 = 1.8 in/hr , Q_2 = 16.3 cfs

I_{10} = 3.4 in/hr. , Q_{10} = 30.7 cfs

Upon field inspection it is discovered that the culvert outlet is presently half filled with earth and a proper swale leaving the culvert does not exist. By redefining the swale and flushing the pipe the hydraulic performance of the culvert can be improved. Thus, the stormwater from the culvert will flow away from a roadway fill via a swale which will then transition to sheet flow following the natural drainage pattern to Powhatan Creek.

Assume W.S. @ shoulder elev. (Worst condition)



Check Capacity of 18" RCP Culvert Under Rt 31

Known: Dia = 18"
Length = 60'
Inv. In = 39.08'
Inv. Out = 37.63
Slope = 2.4%

Q_{cap} = 15 cfs
V = 8.47 fps
d_c = 1.45 ft
$h_o = \frac{d_c + D}{2}$
$HW = H + h_o - LS_o$

Inlet Control

Assume: HW = 41.1 − 39.08 = 2.02', HW/D = 1.35
Groove end w/ headwall

Q = 10 cfs (Chart 2)

Outlet Control

Downstream obstructions establishing a tailwater surface equal to or greater than the top of the culvert outlet do not exist. Therefore $TW \leq D$. Assume flow at Q_{cap}, 15 cfs

V = 8.47, A = 1.77 S.F, d_c = 1.45 ft, W_p = 4.14 S.F (by Seeley Pg. 18-73, fig. 8)
R = 0.377 $H = \left[1 + 0.5 + \frac{29(0.015)^2(60)}{0.427^{1.33}}\right]\frac{8.47^2}{64.4} = 3.02$ → HW = 3.02 + 1.475 − 1.44 = 3.0

Inv. In Elev. (39.08) + (3.05) + HW = 42.13' is well above the road surface elevation and highly unlik.

Assume $T_w = D = h_o = 1.5' > d_c$, H = 2.02 − 1.5 + 1.44 = 1.96' then from Chart 2

Q = 11.5 cfs > 10 cfs

Conclude: Inlet Controls

Conclusion:

Presently the 18" culvert recieves a Q_{total} = 30.7 cfs from a 34.78 Ac. ± watershed during a 10 yr. storm event. The watershed is 27% residential and 73% woodlands. Based on field data and the assumption that headwater equals 1.35 times the diameter of the entrance culvert, it is determined that the culvert operates under inlet controled conditions at a capacity of Q_{cap} = 10 cfs. Therefore the 18 inch culvert is inadequate to function properly within a 10yr. or 2yr. storm event.

Drainage Calcs

Lakewood Sec. II

#6240 SGH 2/6/87

Detention Pond Design For Small Sites

Pre-development

A = 1022500 S.F. ± = 23.5 Ac ±
C = 0.25 (Woodlands)

L = 580' Overland Flow ΔElev. = 76.4 − 70 = 6.4'
S = 6.4/580 = 1.1%
t_{c_1} = 33 min (fig.

L = 780' Channel Flow ΔElev. = 70. − 47 = 23
S = 23/780 = 2.9%
t_{c_2} = 5.5 min. (fig 1.5.1.2)

L = 1020' Channel Flow ΔElev. = 47 − 39 = 8'
S = 8/1020 = 0.78%
t_{c_3} = 11 min (fig 1.5.1.2)

t_c = 33 + 5.5 + 11 = 49.5 min.

I_2 = 1.75 in/hr., Q_2 = 10.28 cfs ✓

I_{10} = 3.1 in/hr., Q_{10} = 18.2 cfs

23.5
18.15
5.35 are gone

Post-development

- Composite "C" Value -

	Area	C	CA
Rdside & Grass Channel	2.7	0.2	0.54
Business Neighborhood Areas	10.35	0.6	4.21
Residential	5.1	0.4	2.04
	ΣA = 18.15		ΣCA = 8.79

$C = \frac{CA}{A} = 0.48$

L = 3000' ΔElev. = 75' − 44' = 31'

t_c = 22 min (fig. 1.5.1.2)

$I_2 = \frac{130.3}{18.5+22} = 3.22$ in/hr., Q_2 = 28.05 cfs

$I_{10} = \frac{189.2}{22.1+22} = 4.29$ in/hr., Q_{10} = 37.37 cfs

— Critical Storm Duration for 10 Yr. Post-Dev.

$$T_c = \frac{\sqrt{2CAa(b - t_c/4)}}{q_o} - b$$

Trial 1

Given: $C = 0.48$
$A = 18.15$
$t_c = 22$ min.
$a = 189.2$
$b = 22.1$
$q_o = 10.28$ cfs (allowable peak outflow)

$$T_c = \frac{\sqrt{2(0.48)18.15(189.2)(22.1 - 22/4)}}{10.28} - 22.1$$

$T_c = 51$ min.

$t_c = 22$ min.

— Peak Inflow:

$$Q_o = CA\left[\frac{a}{b + T_c}\right] = 0.48(18.15)\left[\frac{189.2}{22.1 + 51}\right] = 22.5 \text{ cfs}$$

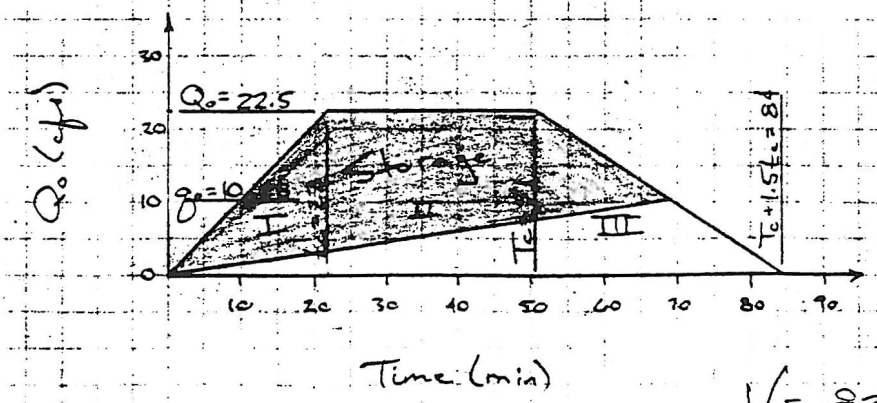
— Req'd Storage for Critical 10 Yr. Storm:

$$V = \left[Q_o T_c + \frac{Q_o t_c}{4} - \frac{q_o T_c}{2} - \frac{3 q_o t_c}{4}\right] 60$$

$$= \left[22.5(51) + \frac{22.5(22)}{4} - \frac{10.28(51)}{2} - \frac{3(10.28)22}{4}\right] 60$$

$$V = 50370 \text{ ft}^3$$

Check:

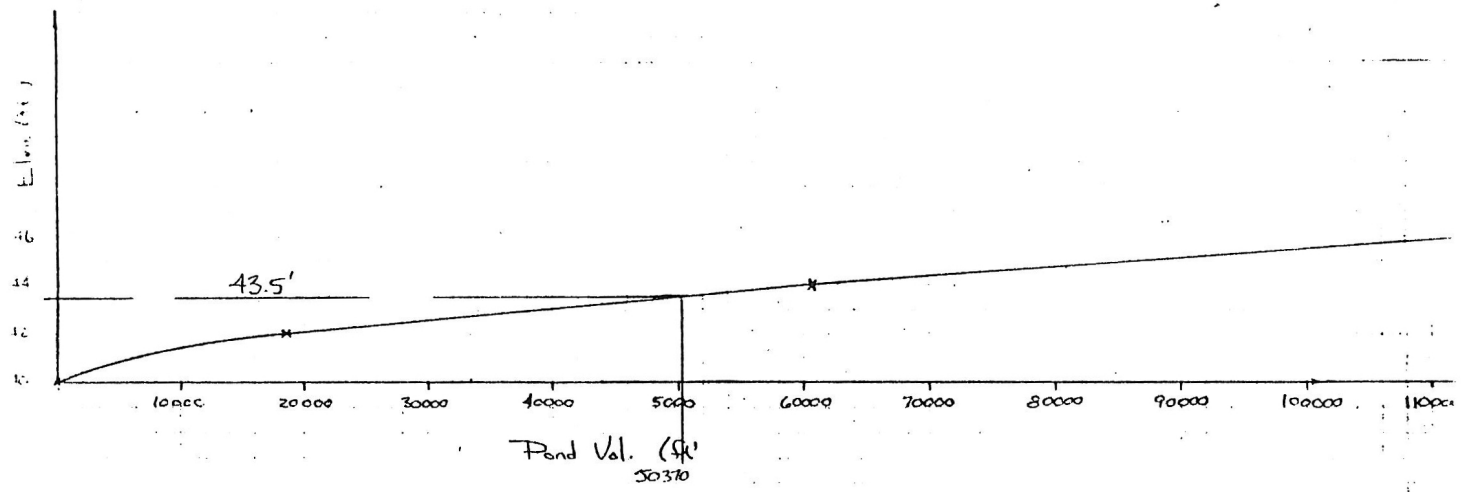


	Area	
I	22.5(22)½ =	247.5
II	22.5(51-22) =	652.5
III	22.5(84-51)½ =	371.25
		1271.25
Unshaded Area	−10.28(84)½ =	− 431.76
		839.49

$V = 839.5(60) = 50370 \text{ ft}^3$

Checks

Elev. (ft)	Area (ft^2)	Avg. Area (ft^2)	Depth (ft)	Incremental Vol. (ft^3)	Σ Vol. (ft^3)
40	0				0
		9250	2	18500	
42	18500				18500
		21125	2	42250	
44	23750				60750
		27000	2	54000	
46	30250				114750



- Req'd Sediment Storage Vol.

$(23.5\ Ac \times 67\ ft^3/Ac.) = 1574.5\ ft^3$

→ Turned up pipe to be 42,511 (y) for 18 ac or 33,100

— Determine Pipe Size to Pass Q_2 Pre-dev.

Given: Pond Elev. = 43.5'
T_W = 1.5' (Assumed)
Q_2 = 14.34 cfs (pre-dev.)
HW = 43.5 - 40.0 = 3.5'

$HW = H + h_o - LS_o$

where: $h_o = T_W = 1.5'$
$LS_o = 30(0.025) = 0.75'$

$H = 3.5 - (1.5 - 0.75) = 2.75'$

$$H = \left[1 + K_e + \frac{29n^2L}{R^{1.33}}\right]\frac{V^2}{2g}$$

where: $K_e = 0.5$
$n = 0.015$ for RCP
$L = 30$
$R = A/W_p$

Try 18" = Dia

$A = 1.77\ ft^2$
$WP = 4.71\ ft$
$R = 0.376$

$$2.75 = \left[1 + 0.5 + \frac{29(0.015)^2 30}{0.376^{1.33}}\right]\frac{V^2}{2(32.2)}$$

$$V = \sqrt{2.75(29.02)} = 8.93\ fps$$

$\therefore Q = 1.77(8.93) = 15.81\ cfs > 10.28\ cfs$

NG

Try 15 :

$A = 1.23\ ft^2$
$WP = 3.93\ ft$
$R = 0.313$

$$2.75 = \left[1 + 0.5 + \frac{29(0.015)^2 30}{0.313^{1.33}}\right]\frac{V^2}{64.4}$$

$$V = \sqrt{2.75(26.64)} = 8.56\ fps$$

$\therefore Q = 1.23(8.56) = 10.50\ cfs$ Close Enough

$q_o = 10.50\ cfs$

Trial 2

– Critical Storm Duration for 10 Yr. Post-Dev.:

$$T_c = \sqrt{\frac{2(0.48)18.15(189.2)(22.1 - 22/4)}{10.50}} - 22.1$$

$T_c = 50.0\ min$

$t_c = 22\ min.$

– Peak Inflow:

$$Q_o = 0.48(18.15)\left[\frac{189.2}{22.1 + 50.0}\right] = 22.9\ cfs$$

– Req'd Storage for Critical 10 Yr. Storm:

$$V = \left[22.9(50.0) + \frac{22.9(22)}{4} - \frac{10.50(50.0)}{2} - \frac{3(10.50)(22)}{4}\right]60$$

$V = 5011.2\ ft^3$ → Pond Elev. = 43.5'

Conclusion: Detention Pond for Sec. II is designed to detain a 10 Yr. storm and release it at a 2yr. pre-development rate. The 10yr. detention pond elevation is at 43.5 ft and is released through a 15 in RCP pipe. The emergency spillway has an invert at 43.5 ft and is designed to operate in excess of 10 yr. storm events.

Sizing of Culvert Under Lakewood Dr. (Post Dev.) and Level Way

Composite "C" Value

Watershed	A	C	CA
A	9.18	0.3	2.75
B	0.5	0.45	0.23
Level Way to Rt 31	0.36	0.66	0.24
Rt 615 to Lakewood Dr	0.52	0.56	0.29
	10.56		3.51

$C = 3.51/10.56 = 0.33$

$A = 10.56$ Ac

L = 850 Overland Flow @ S = 3.3%
t_c = 27 min.

L = 1720 Channel Flow @ S = 0.58%
t_c = 17 min.

T_c = 44 min.

$I_2 = 1.8$ in/hr., $Q_2 = 6.27$ cfs

$I_{10} = 3.4$ in/hr., $Q_{10} = 11.85$ cfs

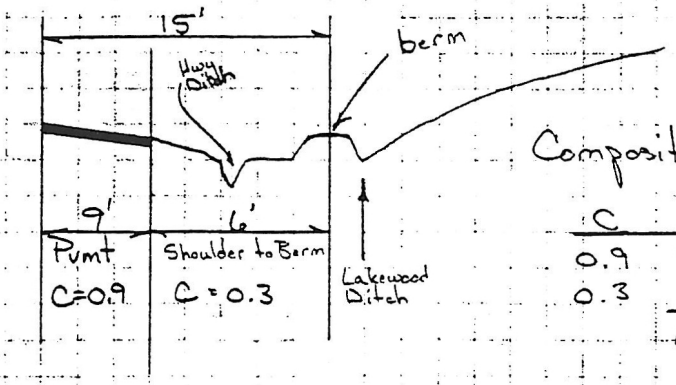
Use 3 - 14" x 23" Elliptical Pipe @ 0.2%
(Designated Equivalent = 18" Round)

$Q_{cap} = 4.3$ cfs

$3 \times Q_{cap} = 12.9$ cfs > 11.85 cfs

Good

℄ of Rt 615 to Crest of Berm (From Level Way to Rt 31)



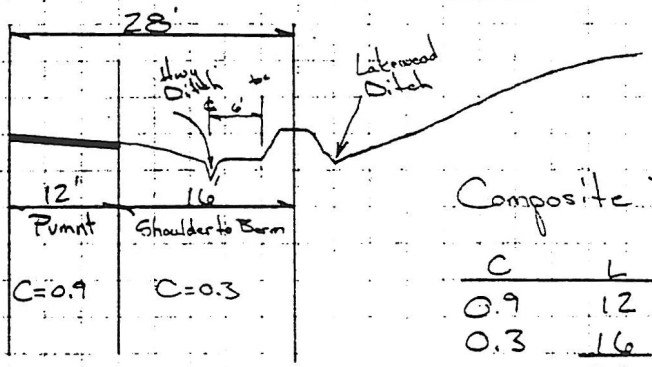
Composite "C" Value for ROW

C	L	CL
0.9	9	8.1
0.3	6	1.8
	15	9.9

$C = 9.9/15 = 0.66$

$A = 15'(1050') = 15750$ S.F. $= 0.36$ Ac.

℄ of Rt 31 to Crest of Berm (From Rt. 615 to Lakewood Dr.)



Composite "C" Value

C	L	CL
0.9	12	10.8
0.3	16	4.8
	28	15.6

$C = 15.6/28 = 0.56$

$A = 28'(810') = 22680$ S.F.± $= 0.52$ Ac.±

Sizing of Culvert at Level Way & Rt 615

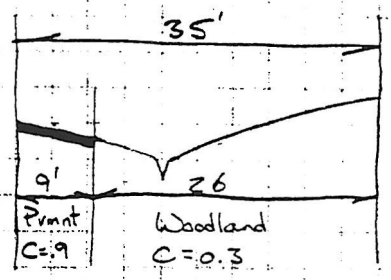
$A = 0.5\ Ac$

$C = 0.45$

$L = 390'$

$\Delta Elev. = 76 - 72.8 = 3.2'$

$S = 3.2/390 = 0.82\%$



Composite "C" Value

C	L	CL
0.9	9	8.1
0.3	26	7.8
	35	15.9

$C = 15.9/35 = 0.45$

$t_c = 21$ min

$I_2 = 3.0$ in/hr. , $Q = 0.68$ cfs

$I_{10} = 5.6$ in/hr. , $Q = 1.26$ cfs

Use a 15" RCP @ 2.1% $Q_{cap} = 8.5$ cfs. **Good** ✓

Watershed A

$A = 9.18\ Ac \pm$

$C = 0.3$ (Residential)

Overland Flow $L = 850'$ $C = 0.3$ (Residential)

$\Delta Elev. = 78.4 - 50.1 = 28.3$

$S = 28.3/850 = 3.3\%$

$t_c = 27$ min.

Hydrograph Summary Report

SP-66-02
MC 003

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	Manual	13.66	22	66	59,334	1	----	------	------	1-Yr. Pre-Develope
2	Manual	16.40	22	66	71,227	2	----	------	------	2-Yr. Pre-Develope
3	Manual	22.85	22	66	99,224	10	----	------	------	10-Yr. Pre-Develop
4	Manual	26.26	22	66	114,061	25	----	------	------	25-Yr. Pre-Develop
5	Manual	31.73	22	66	137,768	100	----	------	------	100-Yr. Pre-Develo
6	Manual	14.38	22	66	62,436	1	----	------	------	1-Yr. Post-Develop
7	Manual	17.26	22	66	74,976	2	----	------	------	2-Yr. Post-Develop
8	Manual	24.05	22	66	108,860	10	----	------	------	10-Yr. Post-Develo
9	Manual	27.64	22	66	120,041	25	----	------	------	25-Yr. Post-Develo
10	Manual	33.40	22	66	145,028	100	----	------	------	100-Yr. Post-Devel
11	Reservoir	6.04	22	110	59,334	1	1	42.28	23,225	Orig. 1-Yr design
12	Reservoir	6.80	22	110	71,227	2	2	42.48	27,538	Original 2-Yr desi
13	Reservoir	8.66	22	110	99,224	10	3	43.08	40,265	Orig 10-Yr. Design
14	Reservoir	9.55	22	110	114,061	25	4	43.42	47,408	Orig. 25-Yr Design
15	Reservoir	10.88	22	110	137,768	100	5	43.99	59,357	Orig 100-Yr Design
16	Reservoir	6.23	22	110	62,436	1	6	42.33	24,287	Orig. 1-Yr Post
17	Reservoir	7.05	22	110	74,976	2	7	42.55	29,087	Orig. 2-Yr Post
18	Reservoir	8.99	22	110	108,860	10	8	43.20	42,748	Orig. 10-Yr Post
19	Reservoir	9.90	22	110	120,041	25	9	43.56	50,367	Orig. 25-Yr Post
20	Reservoir	11.19	22	110	145,028	100	10	44.13	63,186	Orig. 100-Yr Post
21	Reservoir	9.59	22	88	62,436	1	6	44.12	17,757	Proposed Design 1-
22	Reservoir	10.04	22	88	74,976	2	7	44.30	20,853	Proposed Design 2-
23	Reservoir	11.75	22	88	108,860	10	8	45.08	34,056	Proposed Design 10
24	Reservoir	12.54	22	110	120,041	25	9	45.48	40,817	Proposed Design 25
25	Reservoir	13.74	22	110	145,028	100	10	46.14	51,911	Proposed Design 10

DHW

BMP #1

MODIFICATION TO RISER AS PART OF SP-66-02 GRACE COV. PRES CHURCH

Proj. file: swmfdesign.GPW	IDF file: Norfolk.IDF	Run date: 07-16-2002

Hydrograph Report

English

Hyd. No. 7

2-Yr. Post-Developed

Hydrograph type	= Manual	Peak discharge	= 17.26 cfs
Storm frequency	= 2 yrs	Time interval	= 22 min

Total Volume = 74,976 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)
0.37	3.63
0.73	5.18
1.10	17.26 <<
1.47	9.32
1.83	6.73
2.20	4.32
2.57	3.11
2.93	2.59
3.30	2.42
3.67	2.24

...End

Hydrograph Report

English

Hyd. No. 8

10-Yr. Post-Developed

Hydrograph type	= Manual	Peak discharge	= 24.05 cfs
Storm frequency	= 10 yrs	Time interval	= 22 min

Total Volume = 108,860 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)
0.37	5.05
0.73	7.21
1.10	24.05 <<
1.47	12.99
1.83	9.38
2.20	6.01
2.57	4.33
2.93	3.61
3.30	3.37
3.67	3.34
4.03	3.13

...End

Hydrograph Report

English

Hyd. No. 9

25-Yr. Post-Developed

Hydrograph type	= Manual	Peak discharge	= 27.64 cfs
Storm frequency	= 25 yrs	Time interval	= 22 min

Total Volume = 120,041 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)
0.37	5.80
0.73	8.29
1.10	27.64 <<
1.47	14.93
1.83	10.78
2.20	6.91
2.57	4.98
2.93	4.15
3.30	3.87
3.67	3.59

...End

Hydrograph Report

English

Hyd. No. 10

100-Yr. Post-Developed

Hydrograph type	= Manual	Peak discharge	= 33.40 cfs
Storm frequency	= 100 yrs	Time interval	= 22 min

Total Volume = 145,028 cuft

Hydrograph Discharge Table

Time (hrs)	Outflow cfs)
0.37	7.01
0.73	10.02
1.10	33.40 <<
1.47	18.03
1.83	13.02
2.20	8.35
2.57	6.01
2.93	5.01
3.30	4.68
3.67	4.34

...End

Hydrograph Report

English

Hyd. No. 11

Orig. 1-Yr design

Hydrograph type	= Reservoir	Peak discharge	= 6.04 cfs
Storm frequency	= 1 yrs	Time interval	= 22 min
Inflow hyd. No.	= 1	Reservoir name	= Original Design
Max. Elevation	= 42.28 ft	Max. Storage	= 23,225 cuft

Storage Indication method used.

Total Volume = 59,334 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
0.37	2.87	40.32	0.11	-----	-----	-----	-----	-----	-----	-----	0.11
0.73	4.10	40.74	0.89	-----	-----	-----	-----	-----	-----	-----	0.89
1.10	13.66 <<	41.72	3.11	-----	-----	-----	-----	-----	-----	-----	3.11
1.47	7.38	42.25	5.95	-----	-----	-----	-----	-----	-----	-----	5.95
1.83	5.33	42.28 <<	6.04	-----	-----	-----	-----	-----	-----	-----	6.04 <<
2.20	3.41	42.18	5.67	-----	-----	-----	-----	-----	-----	-----	5.67
2.57	2.46	42.03	4.99	-----	-----	-----	-----	-----	-----	-----	4.99
2.93	2.05	41.79	3.60	-----	-----	-----	-----	-----	-----	-----	3.60
3.30	1.91	41.64	2.44	-----	-----	-----	-----	-----	-----	-----	2.44
3.67	1.78	41.56	2.32	-----	-----	-----	-----	-----	-----	-----	2.32
4.03	0.00	41.37	2.20	-----	-----	-----	-----	-----	-----	-----	2.20
4.40	0.00	41.09	1.68	-----	-----	-----	-----	-----	-----	-----	1.68
4.77	0.00	40.88	1.23	-----	-----	-----	-----	-----	-----	-----	1.23
5.13	0.00	40.73	0.86	-----	-----	-----	-----	-----	-----	-----	0.86
5.50	0.00	40.63	0.62	-----	-----	-----	-----	-----	-----	-----	0.62
5.87	0.00	40.55	0.47	-----	-----	-----	-----	-----	-----	-----	0.47
6.23	0.00	40.49	0.35	-----	-----	-----	-----	-----	-----	-----	0.35
6.60	0.00	40.44	0.29	-----	-----	-----	-----	-----	-----	-----	0.29
6.97	0.00	40.41	0.24	-----	-----	-----	-----	-----	-----	-----	0.24
7.33	0.00	40.38	0.19	-----	-----	-----	-----	-----	-----	-----	0.19
7.70	0.00	40.35	0.16	-----	-----	-----	-----	-----	-----	-----	0.16
8.07	0.00	40.33	0.13	-----	-----	-----	-----	-----	-----	-----	0.13
8.43	0.00	40.31	0.11	-----	-----	-----	-----	-----	-----	-----	0.11
8.80	0.00	40.30	0.10	-----	-----	-----	-----	-----	-----	-----	0.10
9.17	0.00	40.28	0.09	-----	-----	-----	-----	-----	-----	-----	0.09
9.53	0.00	40.27	0.08	-----	-----	-----	-----	-----	-----	-----	0.08
9.90	0.00	40.26	0.08	-----	-----	-----	-----	-----	-----	-----	0.08
10.27	0.00	40.25	0.07	-----	-----	-----	-----	-----	-----	-----	0.07
10.63	0.00	40.24	0.07	-----	-----	-----	-----	-----	-----	-----	0.07
11.00	0.00	40.23	0.06	-----	-----	-----	-----	-----	-----	-----	0.06

...End

Reservoir Report

English

Reservoir No. 2 - Original Design

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	40.12	00	0	0
1.88	42.00	18,500	17,390	17,390
3.88	44.00	23,750	42,250	59,640
5.88	46.00	30,250	54,000	113,640

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	0.0	0.0	0.0
Span in	= 18.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.12	0.00	0.00	0.00
Length ft	= 150.0	0.0	0.0	0.0
Slope %	= 0.07	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
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	40.12	0.00	---	---	---	---	---	---	---	0.00
0.19	1,739	40.31	0.10	---	---	---	---	---	---	---	0.10
0.38	3,478	40.50	0.36	---	---	---	---	---	---	---	0.36
0.56	5,217	40.68	0.74	---	---	---	---	---	---	---	0.74
0.75	6,956	40.87	1.21	---	---	---	---	---	---	---	1.21
0.94	8,695	41.06	1.62	---	---	---	---	---	---	---	1.62
1.13	10,434	41.25	2.02	---	---	---	---	---	---	---	2.02
1.32	12,173	41.44	2.30	---	---	---	---	---	---	---	2.30
1.50	13,912	41.62	2.33	---	---	---	---	---	---	---	2.33
1.69	15,651	41.81	3.80	---	---	---	---	---	---	---	3.80
1.88	17,390	42.00	4.84	---	---	---	---	---	---	---	4.84

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Hydrograph Report

English

Hyd. No. 21

Proposed Design 1-Yr

Hydrograph type	= Reservoir	Peak discharge	= 9.59 cfs
Storm frequency	= 1 yrs	Time interval	= 22 min
Inflow hyd. No.	= 6	Reservoir name	= Modified Origin
Max. Elevation	= 44.12 ft	Max. Storage	= 17,757 cuft

Storage Indication method used.

Total Volume = 62,436 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
0.37	3.02	42.15	2.31	0.24	-----	-----	-----	-----	-----	-----	0.24
0.73	4.31	42.74	5.11	0.30	-----	-----	-----	-----	-----	-----	0.30
1.10	14.38 <<	43.76	8.65	0.34	-----	-----	6.46	-----	-----	-----	6.80
1.47	7.76	44.12 <<	9.59	0.08	-----	-----	23.19	-----	-----	-----	9.59 <<
1.83	5.61	43.86	8.92	0.28	-----	-----	10.26	-----	-----	-----	8.42
2.20	3.59	43.64	8.33	0.36	-----	-----	2.85	-----	-----	-----	3.21
2.57	2.59	43.64	8.31	0.36	-----	-----	2.67	-----	-----	-----	3.04
2.93	2.16	43.61	8.23	0.37	-----	-----	1.70	-----	-----	-----	2.07
3.30	2.01	43.61	8.23	0.37	-----	-----	1.72	-----	-----	-----	2.09
3.67	1.87	43.60	8.21	0.37	-----	-----	1.50	-----	-----	-----	1.87
4.03	0.00	43.50	7.91	0.36	-----	-----	0.76	-----	-----	-----	1.12
4.40	0.00	43.37	7.51	0.35	-----	-----	-----	-----	-----	-----	0.35
4.77	0.00	43.31	7.31	0.35	-----	-----	-----	-----	-----	-----	0.35
5.13	0.00	43.25	7.11	0.34	-----	-----	-----	-----	-----	-----	0.34
5.50	0.00	43.19	6.91	0.34	-----	-----	-----	-----	-----	-----	0.34
5.87	0.00	43.13	6.70	0.33	-----	-----	-----	-----	-----	-----	0.33
6.23	0.00	43.07	6.49	0.33	-----	-----	-----	-----	-----	-----	0.33
6.60	0.00	43.02	6.28	0.32	-----	-----	-----	-----	-----	-----	0.32
6.97	0.00	42.96	6.05	0.32	-----	-----	-----	-----	-----	-----	0.32
7.33	0.00	42.90	5.82	0.32	-----	-----	-----	-----	-----	-----	0.32
7.70	0.00	42.85	5.60	0.31	-----	-----	-----	-----	-----	-----	0.31
8.07	0.00	42.79	5.37	0.31	-----	-----	-----	-----	-----	-----	0.31
8.43	0.00	42.74	5.11	0.30	-----	-----	-----	-----	-----	-----	0.30
8.80	0.00	42.69	4.86	0.30	-----	-----	-----	-----	-----	-----	0.30
9.17	0.00	42.64	4.61	0.29	-----	-----	-----	-----	-----	-----	0.29
9.53	0.00	42.59	4.34	0.29	-----	-----	-----	-----	-----	-----	0.29
9.90	0.00	42.54	4.02	0.28	-----	-----	-----	-----	-----	-----	0.28
10.27	0.00	42.49	3.71	0.28	-----	-----	-----	-----	-----	-----	0.28
10.63	0.00	42.44	3.41	0.27	-----	-----	-----	-----	-----	-----	0.27
11.00	0.00	42.39	3.13	0.27	-----	-----	-----	-----	-----	-----	0.27
11.37	0.00	42.34	2.94	0.26	-----	-----	-----	-----	-----	-----	0.26
11.73	0.00	42.30	2.76	0.26	-----	-----	-----	-----	-----	-----	0.26
12.10	0.00	42.25	2.58	0.25	-----	-----	-----	-----	-----	-----	0.25
12.47	0.00	42.21	2.40	0.25	-----	-----	-----	-----	-----	-----	0.25
12.83	0.00	42.17	2.33	0.25	-----	-----	-----	-----	-----	-----	0.25
13.20	0.00	42.12	2.28	0.24	-----	-----	-----	-----	-----	-----	0.24

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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
13.57	0.00	42.08	2.24	0.24	-----	-----	-----	-----	-----	-----	0.24
13.93	0.00	42.04	2.19	0.23	-----	-----	-----	-----	-----	-----	0.23
14.30	0.00	42.00	2.14	0.23	-----	-----	-----	-----	-----	-----	0.23
14.67	0.00	41.57	1.21	0.17	-----	-----	-----	-----	-----	-----	0.17
15.03	0.00	41.25	0.51	0.12	-----	-----	-----	-----	-----	-----	0.12

...End

Reservoir Report

English

Reservoir No. 4 - Modified Original Design

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	40.80	02	0	0
1.20	42.00	1,220	733	733
3.20	44.00	13,821	15,041	15,774
5.60	46.40	19,938	40,511	56,285

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	= 40.80	40.80	0.00	0.00
Length ft	= 150.0	5.0	0.0	0.0
Slope %	= 0.07	1.00	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	= 15.71	0.00	0.00	0.00
Crest El. ft	= 43.50	0.00	0.00	0.00
Weir Coeff.	= 3.00	0.00	0.00	0.00
Eqn. Exp.	= 1.50	0.00	0.00	0.00
Multi-Stage	= Yes	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	40.80	0.00	0.00	---	---	0.00	---	---	---	0.00
0.12	73	40.92	0.04	0.03	---	---	0.00	---	---	---	0.03
0.24	147	41.04	0.15	0.06	---	---	0.00	---	---	---	0.06
0.36	220	41.16	0.36	0.10	---	---	0.00	---	---	---	0.10
0.48	293	41.28	0.56	0.13	---	---	0.00	---	---	---	0.13
0.60	367	41.40	0.81	0.15	---	---	0.00	---	---	---	0.15
0.72	440	41.52	1.07	0.16	---	---	0.00	---	---	---	0.16
0.84	513	41.64	1.42	0.18	---	---	0.00	---	---	---	0.18
0.96	587	41.76	1.68	0.20	---	---	0.00	---	---	---	0.20
1.08	660	41.88	1.92	0.21	---	---	0.00	---	---	---	0.21
1.20	733	42.00	2.15	0.23	---	---	0.00	---	---	---	0.23

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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
1.40	2,237	42.20	2.37	0.25	---	---	0.00	---	---	---	0.25
1.60	3,741	42.40	3.16	0.27	---	---	0.00	---	---	---	0.27
1.80	5,246	42.60	4.42	0.29	---	---	0.00	---	---	---	0.29
2.00	6,750	42.80	5.40	0.31	---	---	0.00	---	---	---	0.31
2.20	8,254	43.00	6.22	0.32	---	---	0.00	---	---	---	0.32
2.40	9,758	43.20	6.94	0.34	---	---	0.00	---	---	---	0.34
2.60	11,262	43.40	7.60	0.35	---	---	0.00	---	---	---	0.35
2.80	12,766	43.60	8.21	0.37	---	---	1.49	---	---	---	1.86
3.00	14,270	43.80	8.77	0.33	---	---	7.74	---	---	---	8.07
3.20	15,774	44.00	9.30	0.16	---	---	16.66	---	---	---	9.30
3.44	19,825	44.24	9.90	0.00	---	---	30.00	---	---	---	9.90
3.68	23,876	44.48	10.46	0.00	---	---	45.72	---	---	---	10.46
3.92	27,927	44.72	10.99	0.00	---	---	63.51	---	---	---	10.99
4.16	31,979	44.96	11.50	0.00	---	---	83.14	---	---	---	11.50
4.40	36,030	45.20	11.99	0.00	---	---	104.47	---	---	---	11.99
4.64	40,081	45.44	12.46	0.00	---	---	127.35	---	---	---	12.46
4.88	44,132	45.68	12.91	0.00	---	---	151.70	---	---	---	12.91
5.12	48,183	45.92	13.35	0.00	---	---	177.43	---	---	---	13.35
5.36	52,234	46.16	13.77	0.00	---	---	204.47	---	---	---	13.77
5.60	56,285	46.40	14.18	0.00	---	---	232.75	---	---	---	14.18

...End

Hydrograph Report

English

Hyd. No. 22

Proposed Design 2-Yr.

Hydrograph type	= Reservoir	Peak discharge	= 10.04 cfs
Storm frequency	= 2 yrs	Time interval	= 22 min
Inflow hyd. No.	= 7	Reservoir name	= Modified Origin
Max. Elevation	= 44.30 ft	Max. Storage	= 20,853 cuft

Storage Indication method used.

Total Volume = 74,976 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
0.37	3.63	42.20	2.37	0.25	-----	-----	-----	-----	-----	-----	0.25
0.73	5.18	42.92	5.90	0.32	-----	-----	-----	-----	-----	-----	0.32
1.10	17.26 <<	44.02	9.35	0.14	-----	-----	17.75	-----	-----	-----	9.35
1.47	9.32	44.30 <<	10.04	-----	-----	-----	33.99	-----	-----	-----	10.04 <<
1.83	6.73	44.16	9.69	0.05	-----	-----	25.39	-----	-----	-----	9.69
2.20	4.32	43.79	8.74	0.33	-----	-----	7.44	-----	-----	-----	7.77
2.57	3.11	43.60	8.20	0.37	-----	-----	1.48	-----	-----	-----	1.85
2.93	2.59	43.65	8.34	0.36	-----	-----	2.94	-----	-----	-----	3.30
3.30	2.42	43.61	8.23	0.37	-----	-----	1.77	-----	-----	-----	2.13
3.67	2.24	43.62	8.26	0.37	-----	-----	2.05	-----	-----	-----	2.42
4.03	0.00	43.50	7.91	0.36	-----	-----	0.77	-----	-----	-----	1.13
4.40	0.00	43.37	7.51	0.35	-----	-----	-----	-----	-----	-----	0.35
4.77	0.00	43.31	7.31	0.35	-----	-----	-----	-----	-----	-----	0.35
5.13	0.00	43.25	7.11	0.34	-----	-----	-----	-----	-----	-----	0.34
5.50	0.00	43.19	6.91	0.34	-----	-----	-----	-----	-----	-----	0.34
5.87	0.00	43.13	6.70	0.33	-----	-----	-----	-----	-----	-----	0.33
6.23	0.00	43.07	6.49	0.33	-----	-----	-----	-----	-----	-----	0.33
6.60	0.00	43.02	6.28	0.32	-----	-----	-----	-----	-----	-----	0.32
6.97	0.00	42.96	6.05	0.32	-----	-----	-----	-----	-----	-----	0.32
7.33	0.00	42.90	5.82	0.32	-----	-----	-----	-----	-----	-----	0.32
7.70	0.00	42.85	5.60	0.31	-----	-----	-----	-----	-----	-----	0.31
8.07	0.00	42.80	5.37	0.31	-----	-----	-----	-----	-----	-----	0.31
8.43	0.00	42.74	5.11	0.30	-----	-----	-----	-----	-----	-----	0.30
8.80	0.00	42.69	4.86	0.30	-----	-----	-----	-----	-----	-----	0.30
9.17	0.00	42.64	4.61	0.29	-----	-----	-----	-----	-----	-----	0.29
9.53	0.00	42.59	4.34	0.29	-----	-----	-----	-----	-----	-----	0.29
9.90	0.00	42.54	4.03	0.28	-----	-----	-----	-----	-----	-----	0.28
10.27	0.00	42.49	3.72	0.28	-----	-----	-----	-----	-----	-----	0.28
10.63	0.00	42.44	3.41	0.27	-----	-----	-----	-----	-----	-----	0.27
11.00	0.00	42.39	3.13	0.27	-----	-----	-----	-----	-----	-----	0.27
11.37	0.00	42.34	2.94	0.26	-----	-----	-----	-----	-----	-----	0.26
11.73	0.00	42.30	2.76	0.26	-----	-----	-----	-----	-----	-----	0.26
12.10	0.00	42.25	2.58	0.26	-----	-----	-----	-----	-----	-----	0.26
12.47	0.00	42.21	2.41	0.25	-----	-----	-----	-----	-----	-----	0.25
12.83	0.00	42.17	2.33	0.25	-----	-----	-----	-----	-----	-----	0.25
13.20	0.00	42.12	2.28	0.24	-----	-----	-----	-----	-----	-----	0.24

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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
13.57	0.00	42.08	2.24	0.24	-----	-----	-----	-----	-----	-----	0.24
13.93	0.00	42.04	2.19	0.23	-----	-----	-----	-----	-----	-----	0.23
14.30	0.00	42.00	2.15	0.23	-----	-----	-----	-----	-----	-----	0.23
14.67	0.00	41.57	1.21	0.17	-----	-----	-----	-----	-----	-----	0.17
15.03	0.00	41.25	0.52	0.12	-----	-----	-----	-----	-----	-----	0.12

...End

Reservoir Report

English

Reservoir No. 4 - Modified Original Design

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	40.80	02	0	0
1.20	42.00	1,220	733	733
3.20	44.00	13,821	15,041	15,774
5.60	46.40	19,938	40,511	56,285

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	= 40.80	40.80	0.00	0.00
Length ft	= 150.0	5.0	0.0	0.0
Slope %	= 0.07	1.00	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	= 15.71	0.00	0.00	0.00
Crest El. ft	= 43.50	0.00	0.00	0.00
Weir Coeff.	= 3.00	0.00	0.00	0.00
Eqn. Exp.	= 1.50	0.00	0.00	0.00
Multi-Stage	= Yes	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	40.80	0.00	0.00	---	---	0.00	---	---	---	0.00
0.12	73	40.92	0.04	0.03	---	---	0.00	---	---	---	0.03
0.24	147	41.04	0.15	0.06	---	---	0.00	---	---	---	0.06
0.36	220	41.16	0.36	0.10	---	---	0.00	---	---	---	0.10
0.48	293	41.28	0.56	0.13	---	---	0.00	---	---	---	0.13
0.60	367	41.40	0.81	0.15	---	---	0.00	---	---	---	0.15
0.72	440	41.52	1.07	0.16	---	---	0.00	---	---	---	0.16
0.84	513	41.64	1.42	0.18	---	---	0.00	---	---	---	0.18
0.96	587	41.76	1.68	0.20	---	---	0.00	---	---	---	0.20
1.08	660	41.88	1.92	0.21	---	---	0.00	---	---	---	0.21
1.20	733	42.00	2.15	0.23	---	---	0.00	---	---	---	0.23

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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
1.40	2,237	42.20	2.37	0.25	---	---	0.00	---	---	---	0.25
1.60	3,741	42.40	3.16	0.27	---	---	0.00	---	---	---	0.27
1.80	5,246	42.60	4.42	0.29	---	---	0.00	---	---	---	0.29
2.00	6,750	42.80	5.40	0.31	---	---	0.00	---	---	---	0.31
2.20	8,254	43.00	6.22	0.32	---	---	0.00	---	---	---	0.32
2.40	9,758	43.20	6.94	0.34	---	---	0.00	---	---	---	0.34
2.60	11,262	43.40	7.60	0.35	---	---	0.00	---	---	---	0.35
2.80	12,766	43.60	8.21	0.37	---	---	1.49	---	---	---	1.86
3.00	14,270	43.80	8.77	0.33	---	---	7.74	---	---	---	8.07
3.20	15,774	44.00	9.30	0.16	---	---	16.66	---	---	---	9.30
3.44	19,825	44.24	9.90	0.00	---	---	30.00	---	---	---	9.90
3.68	23,876	44.48	10.46	0.00	---	---	45.72	---	---	---	10.46
3.92	27,927	44.72	10.99	0.00	---	---	63.51	---	---	---	10.99
4.16	31,979	44.96	11.50	0.00	---	---	83.14	---	---	---	11.50
4.40	36,030	45.20	11.99	0.00	---	---	104.47	---	---	---	11.99
4.64	40,081	45.44	12.46	0.00	---	---	127.35	---	---	---	12.46
4.88	44,132	45.68	12.91	0.00	---	---	151.70	---	---	---	12.91
5.12	48,183	45.92	13.35	0.00	---	---	177.43	---	---	---	13.35
5.36	52,234	46.16	13.77	0.00	---	---	204.47	---	---	---	13.77
5.60	56,285	46.40	14.18	0.00	---	---	232.75	---	---	---	14.18

...End

Hydrograph Report

English

Hyd. No. 23

Proposed Design 10-Yr.

Hydrograph type	= Reservoir	Peak discharge	= 11.75 cfs
Storm frequency	= 10 yrs	Time interval	= 22 min
Inflow hyd. No.	= 8	Reservoir name	= Modified Origin
Max. Elevation	= 45.08 ft	Max. Storage	= 34,056 cuft

Storage Indication method used.

Total Volume = 108,860 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
0.37	5.05	42.32	2.86	0.26	-----	-----	-----	-----	-----	-----	0.26
0.73	7.21	43.34	7.42	0.35	-----	-----	-----	-----	-----	-----	0.35
1.10	24.05 <<	44.51	10.52	-----	-----	-----	47.62	-----	-----	-----	10.52
1.47	12.99	45.08 <<	11.75	-----	-----	-----	94.08	-----	-----	-----	11.75 <<
1.83	9.38	45.04	11.67	-----	-----	-----	90.42	-----	-----	-----	11.67
2.20	6.01	44.75	11.07	-----	-----	-----	66.35	-----	-----	-----	11.07
2.57	4.33	44.33	10.11	-----	-----	-----	35.96	-----	-----	-----	10.11
2.93	3.61	43.83	8.84	0.31	-----	-----	9.02	-----	-----	-----	8.25
3.30	3.37	43.57	8.12	0.37	-----	-----	1.28	-----	-----	-----	1.65
3.67	3.34	43.67	8.40	0.36	-----	-----	3.61	-----	-----	-----	3.97
4.03	3.13	43.63	8.30	0.36	-----	-----	2.53	-----	-----	-----	2.89
4.40	0.00	43.53	8.01	0.36	-----	-----	1.00	-----	-----	-----	1.36
4.77	0.00	43.38	7.55	0.35	-----	-----	-----	-----	-----	-----	0.35
5.13	0.00	43.32	7.34	0.35	-----	-----	-----	-----	-----	-----	0.35
5.50	0.00	43.26	7.15	0.34	-----	-----	-----	-----	-----	-----	0.34
5.87	0.00	43.20	6.95	0.34	-----	-----	-----	-----	-----	-----	0.34
6.23	0.00	43.14	6.73	0.33	-----	-----	-----	-----	-----	-----	0.33
6.60	0.00	43.08	6.52	0.33	-----	-----	-----	-----	-----	-----	0.33
6.97	0.00	43.03	6.31	0.33	-----	-----	-----	-----	-----	-----	0.33
7.33	0.00	42.97	6.09	0.32	-----	-----	-----	-----	-----	-----	0.32
7.70	0.00	42.91	5.86	0.32	-----	-----	-----	-----	-----	-----	0.32
8.07	0.00	42.86	5.64	0.31	-----	-----	-----	-----	-----	-----	0.31
8.43	0.00	42.80	5.41	0.31	-----	-----	-----	-----	-----	-----	0.31
8.80	0.00	42.75	5.16	0.30	-----	-----	-----	-----	-----	-----	0.30
9.17	0.00	42.70	4.90	0.30	-----	-----	-----	-----	-----	-----	0.30
9.53	0.00	42.65	4.65	0.29	-----	-----	-----	-----	-----	-----	0.29
9.90	0.00	42.60	4.39	0.29	-----	-----	-----	-----	-----	-----	0.29
10.27	0.00	42.55	4.08	0.28	-----	-----	-----	-----	-----	-----	0.28
10.63	0.00	42.50	3.77	0.28	-----	-----	-----	-----	-----	-----	0.28
11.00	0.00	42.45	3.46	0.27	-----	-----	-----	-----	-----	-----	0.27
11.37	0.00	42.40	3.16	0.27	-----	-----	-----	-----	-----	-----	0.27
11.73	0.00	42.35	2.98	0.26	-----	-----	-----	-----	-----	-----	0.26
12.10	0.00	42.31	2.79	0.26	-----	-----	-----	-----	-----	-----	0.26
12.47	0.00	42.26	2.61	0.26	-----	-----	-----	-----	-----	-----	0.26
12.83	0.00	42.22	2.43	0.25	-----	-----	-----	-----	-----	-----	0.25
13.20	0.00	42.17	2.34	0.25	-----	-----	-----	-----	-----	-----	0.25

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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
13.57	0.00	42.13	2.29	0.24	-----	-----	-----	-----	-----	-----	0.24
13.93	0.00	42.09	2.25	0.24	-----	-----	-----	-----	-----	-----	0.24
14.30	0.00	42.05	2.20	0.23	-----	-----	-----	-----	-----	-----	0.23
14.67	0.00	42.01	2.16	0.23	-----	-----	-----	-----	-----	-----	0.23
15.03	0.00	41.64	1.42	0.18	-----	-----	-----	-----	-----	-----	0.18
15.40	0.00	41.30	0.61	0.13	-----	-----	-----	-----	-----	-----	0.13

...End

Reservoir Report

English

Reservoir No. 4 - Modified Original Design

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	40.80	02	0	0
1.20	42.00	1,220	733	733
3.20	44.00	13,821	15,041	15,774
5.60	46.40	19,938	40,511	56,285

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	= 40.80	40.80	0.00	0.00
Length ft	= 150.0	5.0	0.0	0.0
Slope %	= 0.07	1.00	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	= 15.71	0.00	0.00	0.00
Crest El. ft	= 43.50	0.00	0.00	0.00
Weir Coeff.	= 3.00	0.00	0.00	0.00
Eqn. Exp.	= 1.50	0.00	0.00	0.00
Multi-Stage	= Yes	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	40.80	0.00	0.00	---	---	0.00	---	---	---	0.00
0.12	73	40.92	0.04	0.03	---	---	0.00	---	---	---	0.03
0.24	147	41.04	0.15	0.06	---	---	0.00	---	---	---	0.06
0.36	220	41.16	0.36	0.10	---	---	0.00	---	---	---	0.10
0.48	293	41.28	0.56	0.13	---	---	0.00	---	---	---	0.13
0.60	367	41.40	0.81	0.15	---	---	0.00	---	---	---	0.15
0.72	440	41.52	1.07	0.16	---	---	0.00	---	---	---	0.16
0.84	513	41.64	1.42	0.18	---	---	0.00	---	---	---	0.18
0.96	587	41.76	1.68	0.20	---	---	0.00	---	---	---	0.20
1.08	660	41.88	1.92	0.21	---	---	0.00	---	---	---	0.21
1.20	733	42.00	2.15	0.23	---	---	0.00	---	---	---	0.23

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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
1.40	2,237	42.20	2.37	0.25	---	---	0.00	---	---	---	0.25
1.60	3,741	42.40	3.16	0.27	---	---	0.00	---	---	---	0.27
1.80	5,246	42.60	4.42	0.29	---	---	0.00	---	---	---	0.29
2.00	6,750	42.80	5.40	0.31	---	---	0.00	---	---	---	0.31
2.20	8,254	43.00	6.22	0.32	---	---	0.00	---	---	---	0.32
2.40	9,758	43.20	6.94	0.34	---	---	0.00	---	---	---	0.34
2.60	11,262	43.40	7.60	0.35	---	---	0.00	---	---	---	0.35
2.80	12,766	43.60	8.21	0.37	---	---	1.49	---	---	---	1.86
3.00	14,270	43.80	8.77	0.33	---	---	7.74	---	---	---	8.07
3.20	15,774	44.00	9.30	0.16	---	---	16.66	---	---	---	9.30
3.44	19,825	44.24	9.90	0.00	---	---	30.00	---	---	---	9.90
3.68	23,876	44.48	10.46	0.00	---	---	45.72	---	---	---	10.46
3.92	27,927	44.72	10.99	0.00	---	---	63.51	---	---	---	10.99
4.16	31,979	44.96	11.50	0.00	---	---	83.14	---	---	---	11.50
4.40	36,030	45.20	11.99	0.00	---	---	104.47	---	---	---	11.99
4.64	40,081	45.44	12.46	0.00	---	---	127.35	---	---	---	12.46
4.88	44,132	45.68	12.91	0.00	---	---	151.70	---	---	---	12.91
5.12	48,183	45.92	13.35	0.00	---	---	177.43	---	---	---	13.35
5.36	52,234	46.16	13.77	0.00	---	---	204.47	---	---	---	13.77
5.60	56,285	46.40	14.18	0.00	---	---	232.75	---	---	---	14.18

...End

Hydrograph Report

English

Hyd. No. 24

Proposed Design 25-Yr

Hydrograph type	= Reservoir	Peak discharge	= 12.54 cfs
Storm frequency	= 25 yrs	Time interval	= 22 min
Inflow hyd. No.	= 9	Reservoir name	= Modified Origin
Max. Elevation	= 45.48 ft	Max. Storage	= 40,817 cuft

Storage Indication method used.

Total Volume = 120,041 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
0.37	5.80	42.39	3.12	0.27	-----	-----	-----	-----	-----	-----	0.27
0.73	8.29	43.50	7.91	0.36	-----	-----	0.76	-----	-----	-----	1.12
1.10	27.64 <<	44.71	10.97	-----	-----	-----	62.78	-----	-----	-----	10.97
1.47	14.93	45.46	12.49	-----	-----	-----	129.10	-----	-----	-----	12.49
1.83	10.78	45.48 <<	12.54	-----	-----	-----	131.78	-----	-----	-----	12.54 <<
2.20	6.91	45.21	12.02	-----	-----	-----	105.89	-----	-----	-----	12.02
2.57	4.98	44.78	11.11	-----	-----	-----	68.04	-----	-----	-----	11.11
2.93	4.15	44.31	10.05	-----	-----	-----	34.26	-----	-----	-----	10.05
3.30	3.87	43.80	8.77	0.33	-----	-----	7.73	-----	-----	-----	8.06
3.67	3.59	43.59	8.18	0.37	-----	-----	1.42	-----	-----	-----	1.79
4.03	0.00	43.59	8.18	0.37	-----	-----	1.42	-----	-----	-----	1.79
4.40	0.00	43.40	7.61	0.35	-----	-----	0.01	-----	-----	-----	0.37
4.77	0.00	43.34	7.40	0.35	-----	-----	-----	-----	-----	-----	0.35
5.13	0.00	43.28	7.20	0.35	-----	-----	-----	-----	-----	-----	0.35
5.50	0.00	43.22	7.00	0.34	-----	-----	-----	-----	-----	-----	0.34
5.87	0.00	43.16	6.79	0.34	-----	-----	-----	-----	-----	-----	0.34
6.23	0.00	43.10	6.58	0.33	-----	-----	-----	-----	-----	-----	0.33
6.60	0.00	43.04	6.37	0.33	-----	-----	-----	-----	-----	-----	0.33
6.97	0.00	42.98	6.16	0.32	-----	-----	-----	-----	-----	-----	0.32
7.33	0.00	42.93	5.93	0.32	-----	-----	-----	-----	-----	-----	0.32
7.70	0.00	42.87	5.70	0.31	-----	-----	-----	-----	-----	-----	0.31
8.07	0.00	42.82	5.47	0.31	-----	-----	-----	-----	-----	-----	0.31
8.43	0.00	42.77	5.23	0.30	-----	-----	-----	-----	-----	-----	0.30
8.80	0.00	42.71	4.97	0.30	-----	-----	-----	-----	-----	-----	0.30
9.17	0.00	42.66	4.72	0.29	-----	-----	-----	-----	-----	-----	0.29
9.53	0.00	42.61	4.47	0.29	-----	-----	-----	-----	-----	-----	0.29
9.90	0.00	42.56	4.16	0.28	-----	-----	-----	-----	-----	-----	0.28
10.27	0.00	42.51	3.85	0.28	-----	-----	-----	-----	-----	-----	0.28
10.63	0.00	42.46	3.55	0.28	-----	-----	-----	-----	-----	-----	0.28
11.00	0.00	42.41	3.24	0.27	-----	-----	-----	-----	-----	-----	0.27
11.37	0.00	42.37	3.03	0.27	-----	-----	-----	-----	-----	-----	0.27
11.73	0.00	42.32	2.84	0.26	-----	-----	-----	-----	-----	-----	0.26
12.10	0.00	42.27	2.66	0.26	-----	-----	-----	-----	-----	-----	0.26
12.47	0.00	42.23	2.48	0.25	-----	-----	-----	-----	-----	-----	0.25
12.83	0.00	42.19	2.35	0.25	-----	-----	-----	-----	-----	-----	0.25
13.20	0.00	42.14	2.30	0.24	-----	-----	-----	-----	-----	-----	0.24

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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
13.57	0.00	42.10	2.26	0.24	-----	-----	-----	-----	-----	-----	0.24
13.93	0.00	42.06	2.21	0.23	-----	-----	-----	-----	-----	-----	0.23
14.30	0.00	42.02	2.17	0.23	-----	-----	-----	-----	-----	-----	0.23
14.67	0.00	41.76	1.68	0.20	-----	-----	-----	-----	-----	-----	0.20
15.03	0.00	41.39	0.78	0.14	-----	-----	-----	-----	-----	-----	0.14

...End

Reservoir Report

English

Reservoir No. 4 - Modified Original Design

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	40.80	02	0	0
1.20	42.00	1,220	733	733
3.20	44.00	13,821	15,041	15,774
5.60	46.40	19,938	40,511	56,285

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	= 40.80	40.80	0.00	0.00
Length ft	= 150.0	5.0	0.0	0.0
Slope %	= 0.07	1.00	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	= 15.71	0.00	0.00	0.00
Crest El. ft	= 43.50	0.00	0.00	0.00
Weir Coeff.	= 3.00	0.00	0.00	0.00
Eqn. Exp.	= 1.50	0.00	0.00	0.00
Multi-Stage	= Yes	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	40.80	0.00	0.00	---	---	0.00	---	---	---	0.00
0.12	73	40.92	0.04	0.03	---	---	0.00	---	---	---	0.03
0.24	147	41.04	0.15	0.06	---	---	0.00	---	---	---	0.06
0.36	220	41.16	0.36	0.10	---	---	0.00	---	---	---	0.10
0.48	293	41.28	0.56	0.13	---	---	0.00	---	---	---	0.13
0.60	367	41.40	0.81	0.15	---	---	0.00	---	---	---	0.15
0.72	440	41.52	1.07	0.16	---	---	0.00	---	---	---	0.16
0.84	513	41.64	1.42	0.18	---	---	0.00	---	---	---	0.18
0.96	587	41.76	1.68	0.20	---	---	0.00	---	---	---	0.20
1.08	660	41.88	1.92	0.21	---	---	0.00	---	---	---	0.21
1.20	733	42.00	2.15	0.23	---	---	0.00	---	---	---	0.23

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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
1.40	2,237	42.20	2.37	0.25	---	---	0.00	---	---	---	0.25
1.60	3,741	42.40	3.16	0.27	---	---	0.00	---	---	---	0.27
1.80	5,246	42.60	4.42	0.29	---	---	0.00	---	---	---	0.29
2.00	6,750	42.80	5.40	0.31	---	---	0.00	---	---	---	0.31
2.20	8,254	43.00	6.22	0.32	---	---	0.00	---	---	---	0.32
2.40	9,758	43.20	6.94	0.34	---	---	0.00	---	---	---	0.34
2.60	11,262	43.40	7.60	0.35	---	---	0.00	---	---	---	0.35
2.80	12,766	43.60	8.21	0.37	---	---	1.49	---	---	---	1.86
3.00	14,270	43.80	8.77	0.33	---	---	7.74	---	---	---	8.07
3.20	15,774	44.00	9.30	0.16	---	---	16.66	---	---	---	9.30
3.44	19,825	44.24	9.90	0.00	---	---	30.00	---	---	---	9.90
3.68	23,876	44.48	10.46	0.00	---	---	45.72	---	---	---	10.46
3.92	27,927	44.72	10.99	0.00	---	---	63.51	---	---	---	10.99
4.16	31,979	44.96	11.50	0.00	---	---	83.14	---	---	---	11.50
4.40	36,030	45.20	11.99	0.00	---	---	104.47	---	---	---	11.99
4.64	40,081	45.44	12.46	0.00	---	---	127.35	---	---	---	12.46
4.88	44,132	45.68	12.91	0.00	---	---	151.70	---	---	---	12.91
5.12	48,183	45.92	13.35	0.00	---	---	177.43	---	---	---	13.35
5.36	52,234	46.16	13.77	0.00	---	---	204.47	---	---	---	13.77
5.60	56,285	46.40	14.18	0.00	---	---	232.75	---	---	---	14.18

...End

Hydrograph Report

English

Hyd. No. 25

Proposed Design 100-Yr

Hydrograph type	= Reservoir	Peak discharge	= 13.74 cfs
Storm frequency	= 100 yrs	Time interval	= 22 min
Inflow hyd. No.	= 10	Reservoir name	= Modified Origin
Max. Elevation	= 46.14 ft	Max. Storage	= 51,911 cuft

DHW

Storage Indication method used.

Total Volume = 145,028 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
0.37	7.01	42.49	3.75	0.28	-----	-----	-----	-----	-----	-----	0.28
0.73	10.02	43.65	8.36	0.36	-----	-----	3.17	-----	-----	-----	3.53
1.10	33.40 <<	44.96	11.49	-----	-----	-----	82.82	-----	-----	-----	11.49
1.47	18.03	45.99	13.47	-----	-----	-----	185.40	-----	-----	-----	13.47
1.83	13.02	46.14 <<	13.74	-----	-----	-----	202.31	-----	-----	-----	13.74 <<
2.20	8.35	45.92	13.34	-----	-----	-----	177.16	-----	-----	-----	13.34
2.57	6.01	45.47	12.51	-----	-----	-----	130.19	-----	-----	-----	12.51
2.93	5.01	44.96	11.50	-----	-----	-----	83.13	-----	-----	-----	11.50
3.30	4.68	44.48	10.46	-----	-----	-----	45.73	-----	-----	-----	10.46
3.67	4.34	44.05	9.43	0.12	-----	-----	19.71	-----	-----	-----	9.43
4.03	0.00	43.55	8.05	0.37	-----	-----	1.10	-----	-----	-----	1.46
4.40	0.00	43.39	7.56	0.35	-----	-----	-----	-----	-----	-----	0.35
4.77	0.00	43.33	7.36	0.35	-----	-----	-----	-----	-----	-----	0.35
5.13	0.00	43.27	7.16	0.34	-----	-----	-----	-----	-----	-----	0.34
5.50	0.00	43.21	6.96	0.34	-----	-----	-----	-----	-----	-----	0.34
5.87	0.00	43.15	6.75	0.33	-----	-----	-----	-----	-----	-----	0.33
6.23	0.00	43.09	6.54	0.33	-----	-----	-----	-----	-----	-----	0.33
6.60	0.00	43.03	6.33	0.33	-----	-----	-----	-----	-----	-----	0.33
6.97	0.00	42.97	6.11	0.32	-----	-----	-----	-----	-----	-----	0.32
7.33	0.00	42.92	5.88	0.32	-----	-----	-----	-----	-----	-----	0.32
7.70	0.00	42.86	5.65	0.31	-----	-----	-----	-----	-----	-----	0.31
8.07	0.00	42.81	5.43	0.31	-----	-----	-----	-----	-----	-----	0.31
8.43	0.00	42.75	5.18	0.30	-----	-----	-----	-----	-----	-----	0.30
8.80	0.00	42.70	4.92	0.30	-----	-----	-----	-----	-----	-----	0.30
9.17	0.00	42.65	4.67	0.29	-----	-----	-----	-----	-----	-----	0.29
9.53	0.00	42.60	4.42	0.29	-----	-----	-----	-----	-----	-----	0.29
9.90	0.00	42.55	4.10	0.28	-----	-----	-----	-----	-----	-----	0.28
10.27	0.00	42.50	3.79	0.28	-----	-----	-----	-----	-----	-----	0.28
10.63	0.00	42.45	3.48	0.27	-----	-----	-----	-----	-----	-----	0.27
11.00	0.00	42.40	3.18	0.27	-----	-----	-----	-----	-----	-----	0.27
11.37	0.00	42.36	2.99	0.27	-----	-----	-----	-----	-----	-----	0.27
11.73	0.00	42.31	2.81	0.26	-----	-----	-----	-----	-----	-----	0.26
12.10	0.00	42.26	2.62	0.26	-----	-----	-----	-----	-----	-----	0.26
12.47	0.00	42.22	2.45	0.25	-----	-----	-----	-----	-----	-----	0.25
12.83	0.00	42.18	2.34	0.25	-----	-----	-----	-----	-----	-----	0.25
13.20	0.00	42.13	2.30	0.24	-----	-----	-----	-----	-----	-----	0.24

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
13.57	0.00	42.09	2.25	0.24	-----	-----	-----	-----	-----	-----	0.24
13.93	0.00	42.05	2.20	0.23	-----	-----	-----	-----	-----	-----	0.23
14.30	0.00	42.01	2.16	0.23	-----	-----	-----	-----	-----	-----	0.23
14.67	0.00	41.67	1.49	0.19	-----	-----	-----	-----	-----	-----	0.19

...End

Reservoir Report

English

Reservoir No. 4 - Modified Original Design

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	40.80	02	0	0
1.20	42.00	1,220	733	733
3.20	44.00	13,821	15,041	15,774
5.60	46.40	19,938	40,511	56,285

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	= 40.80	40.80	0.00	0.00
Length ft	= 150.0	5.0	0.0	0.0
Slope %	= 0.07	1.00	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	= 15.71	0.00	0.00	0.00
Crest El. ft	= 43.50	0.00	0.00	0.00
Weir Coeff.	= 3.00	0.00	0.00	0.00
Eqn. Exp.	= 1.50	0.00	0.00	0.00
Multi-Stage	= Yes	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	40.80	0.00	0.00	---	---	0.00	---	---	---	0.00
0.12	73	40.92	0.04	0.03	---	---	0.00	---	---	---	0.03
0.24	147	41.04	0.15	0.06	---	---	0.00	---	---	---	0.06
0.36	220	41.16	0.36	0.10	---	---	0.00	---	---	---	0.10
0.48	293	41.28	0.56	0.13	---	---	0.00	---	---	---	0.13
0.60	367	41.40	0.81	0.15	---	---	0.00	---	---	---	0.15
0.72	440	41.52	1.07	0.16	---	---	0.00	---	---	---	0.16
0.84	513	41.64	1.42	0.18	---	---	0.00	---	---	---	0.18
0.96	587	41.76	1.68	0.20	---	---	0.00	---	---	---	0.20
1.08	660	41.88	1.92	0.21	---	---	0.00	---	---	---	0.21
1.20	733	42.00	2.15	0.23	---	---	0.00	---	---	---	0.23

Continues on next page...

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
1.40	2,237	42.20	2.37	0.25	---	---	0.00	---	---	---	0.25
1.60	3,741	42.40	3.16	0.27	---	---	0.00	---	---	---	0.27
1.80	5,246	42.60	4.42	0.29	---	---	0.00	---	---	---	0.29
2.00	6,750	42.80	5.40	0.31	---	---	0.00	---	---	---	0.31
2.20	8,254	43.00	6.22	0.32	---	---	0.00	---	---	---	0.32
2.40	9,758	43.20	6.94	0.34	---	---	0.00	---	---	---	0.34
2.60	11,262	43.40	7.60	0.35	---	---	0.00	---	---	---	0.35
2.80	12,766	43.60	8.21	0.37	---	---	1.49	---	---	---	1.86
3.00	14,270	43.80	8.77	0.33	---	---	7.74	---	---	---	8.07
3.20	15,774	44.00	9.30	0.16	---	---	16.66	---	---	---	9.30
3.44	19,825	44.24	9.90	0.00	---	---	30.00	---	---	---	9.90
3.68	23,876	44.48	10.46	0.00	---	---	45.72	---	---	---	10.46
3.92	27,927	44.72	10.99	0.00	---	---	63.51	---	---	---	10.99
4.16	31,979	44.96	11.50	0.00	---	---	83.14	---	---	---	11.50
4.40	36,030	45.20	11.99	0.00	---	---	104.47	---	---	---	11.99
4.64	40,081	45.44	12.46	0.00	---	---	127.35	---	---	---	12.46
4.88	44,132	45.68	12.91	0.00	---	---	151.70	---	---	---	12.91
5.12	48,183	45.92	13.35	0.00	---	---	177.43	---	---	---	13.35
5.36	52,234	46.16	13.77	0.00	---	---	204.47	---	---	---	13.77
5.60	56,285	46.40	14.18	0.00	---	---	232.75	---	---	---	14.18

...End

GEO DESIGN CONSULTANTS, INC.
204-B GRAYSON RD.
VIRGINIA BEACH, VIRGINIA 23462
Phone: (804) 473-9533
Fax: (804) 473-9534

Project: SETTLERS MILL SUBDIVISION
Client: SETTLERS MILL SETTLEMENT
General Contractor: SAME
Grading Contractor: SAME
Technician: MIKE HIGGINS

Job No.: 94.130T
Client Job No.:
Date: 4/19/94
Weather: CLEAR Temp.(°F): 75
Field Copy Given to Client? ___ Yes _X_ No

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation Below Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	17.0	110.1	1	95	97	X		- 0'	DAM KEYWAY
2	17.2	110.0	1	95	97	X		- 1'	
3	17.2	109.5	1	95	96	X		- 2'	

Compaction Equipment Used:
(1) Test Location Established By: ESTIMATION
(2) Depth of Elev. of Test Established By: ESTIMATION
(3) Test Conducted On: INTERMITTENT BASIS
(4) Proctor Type: ASTM D698 (Standard)

Field Rep.
Proctor No.: 1
Max. Density (PCF): 113.0
Opt. Moisture (%): 16.5

Remarks:

APR-22-94 FRI 13:42 Geo Design Consultants P.02

GEO DESIGN CONSULTANTS, INC.
204-B GRAYSON RD.
VIRGINIA BEACH, VIRGINIA 23462
Phone: (804) 473-9533
Fax: (804) 473-9534

Project: SETTLERS MILL SUBDIVISION
Client: SETTLERS MILL DEVELOPMENT
General Contractor: SAME
Grading Contractor: SAME
Technician: MIKE HIGGINS

Job No.: 94.130T
Client Job No.:
Date: 4/20/94
Weather: CLEAR Temp.(°F): 85
Field Copy Given to Client? ___ Yes _X_ No

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation Below Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	22.2	99.9	2	95	95	X		1' ABOVE KEY	CENTER OF DAM
2	22.4	99.8	2	95	95	X		2' ABOVE KEY	CENTER OF DAM

Compaction Equipment Used:
(1) Test Location Established By:
(2) Depth of Elev. of Test Established By:
(3) Test Conducted On:
(4) Proctor Type: ASTM D698 (Standard)

Field Rep.
Proctor No.: 2
Max. Density (PCF): 105.5
Opt. Moisture (%): 18.4

Remarks:

APR-22-94 FRI 13:43 Geo Design Consultants P.03

APR-22-94 FRI 13:44 Geo Design Consultants P.04

GEO DESIGN CONSULTANTS, INC.
204-B GRAYSON RD.
VIRGINIA BEACH, VIRGINIA 23462
Phone: (804) 473-9533
Fax: (804) 473-9534

Project: SETTLERS MILL SUBDIVISION
Client: SETTLERS MILL DEVELOPMENT
General Contractor: SAME
Grading Contractor: SAME
Technician: W. ALEXANDER

Job No.: 94.130T
Client Job No.:
Date: 4/21/94
Weather: CLOUDY Temp.(°F): 60
Field Copy Given to Client? ___ Yes _X_ No

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation Below Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	22.8	101.1	2	95	96	X		2' ABOVE KEY	CENTER OF DAM
2	23.0	102	2	95	97	X		3' ABOVE KEY	CENTER OF DAM
3	22.1	99.9	2	95	95	X		4' ABOVE KEY	CENTER OF DAM
4	22.5	99.8	2	95	95	X		5' ABOVE KEY	CENTER OF DAM

Compaction Equipment Used:
(1) Test Location Established By: ESTIMATION
(2) Depth of Elev. of Test Established By: CONTRACTOR
(3) Test Conducted On: PART-TIME
(4) Proctor Type: ASTM D698 (Standard)

Field Rep.
Proctor No.: 2
Max. Density (PCF): 105.5
Opt. Moisture (%): 18.4

Remarks: CONTRACTOR EXCAVATED TEST PITS

Geo Design Consultants, Inc.

MOISTURE DENSITY RELATIONSHIP
(Proctor Method)

Job Name SETTLERS MILL SUBDIVISION Proctor No. 2

Job No. 94.130T Date 4-19-94

Client SETTLERS MILL DEVELOPMENT

Material Description TAN SILTY CLAY W/LITTLE F-SAND

Sampling Location OFF-SITE Depth N/A

Test Method ASTM D698A

Maximum Dry Density (pcf) 113.0

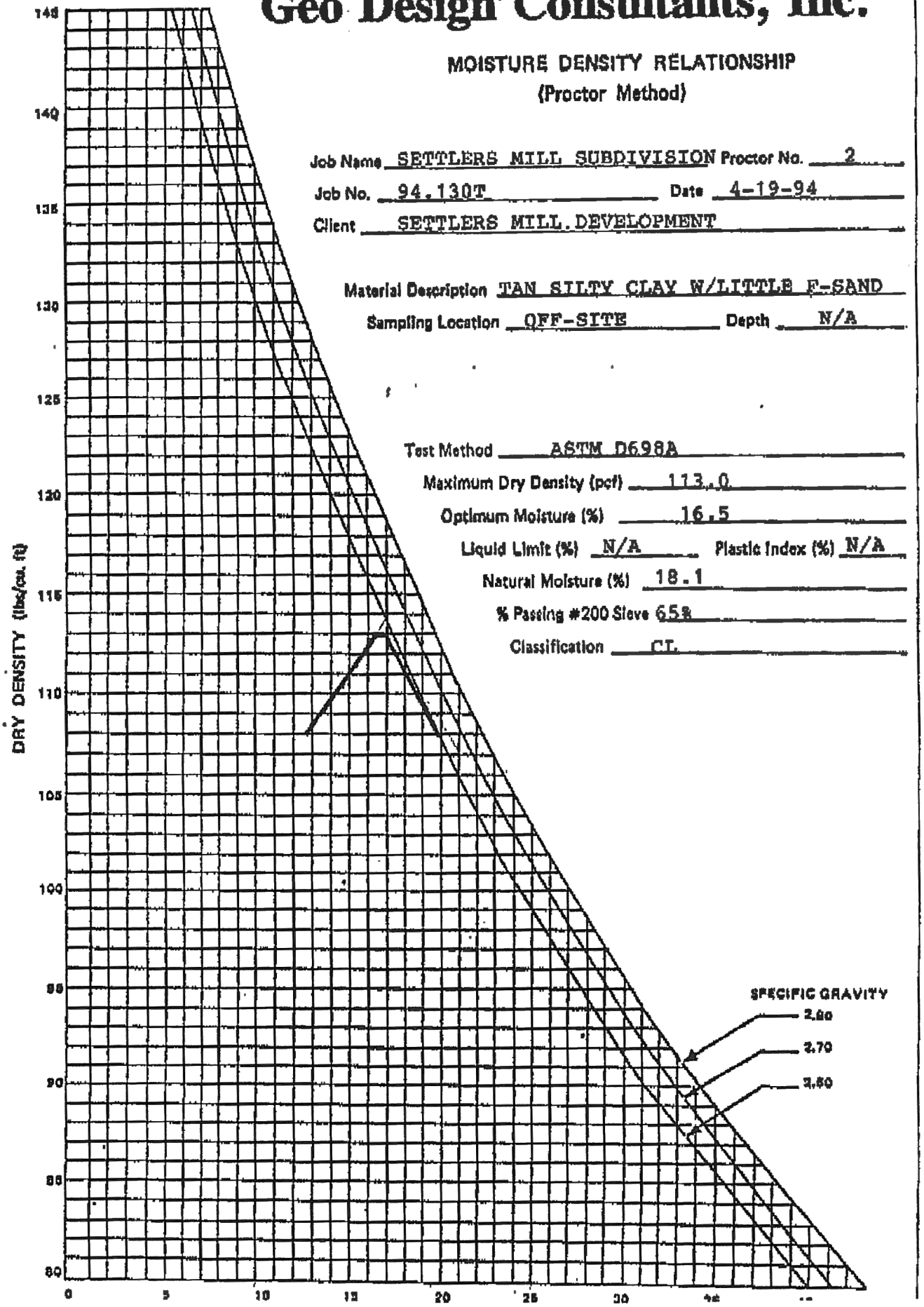
Optimum Moisture (%) 16.5

Liquid Limit (%) N/A Plastic Index (%) N/A

Natural Moisture (%) 18.1

% Passing #200 Sieve 65%

Classification CL



Geo Design Consultants, Inc.

MOISTURE DENSITY RELATIONSHIP
(Proctor Method)

Job Name SETTLERS MILL SUBDIVISION Proctor No. 3

Job No. 94.130T Date 4-22-94

Client SETTLERS MILL DEVELOPMENT

Material Description TAN SILTY CLAY W/LITTLE F-SAND

Sampling Location OFF-SITE Depth N/A

Test Method ASTM D698A

Maximum Dry Density (pcf) 105.5

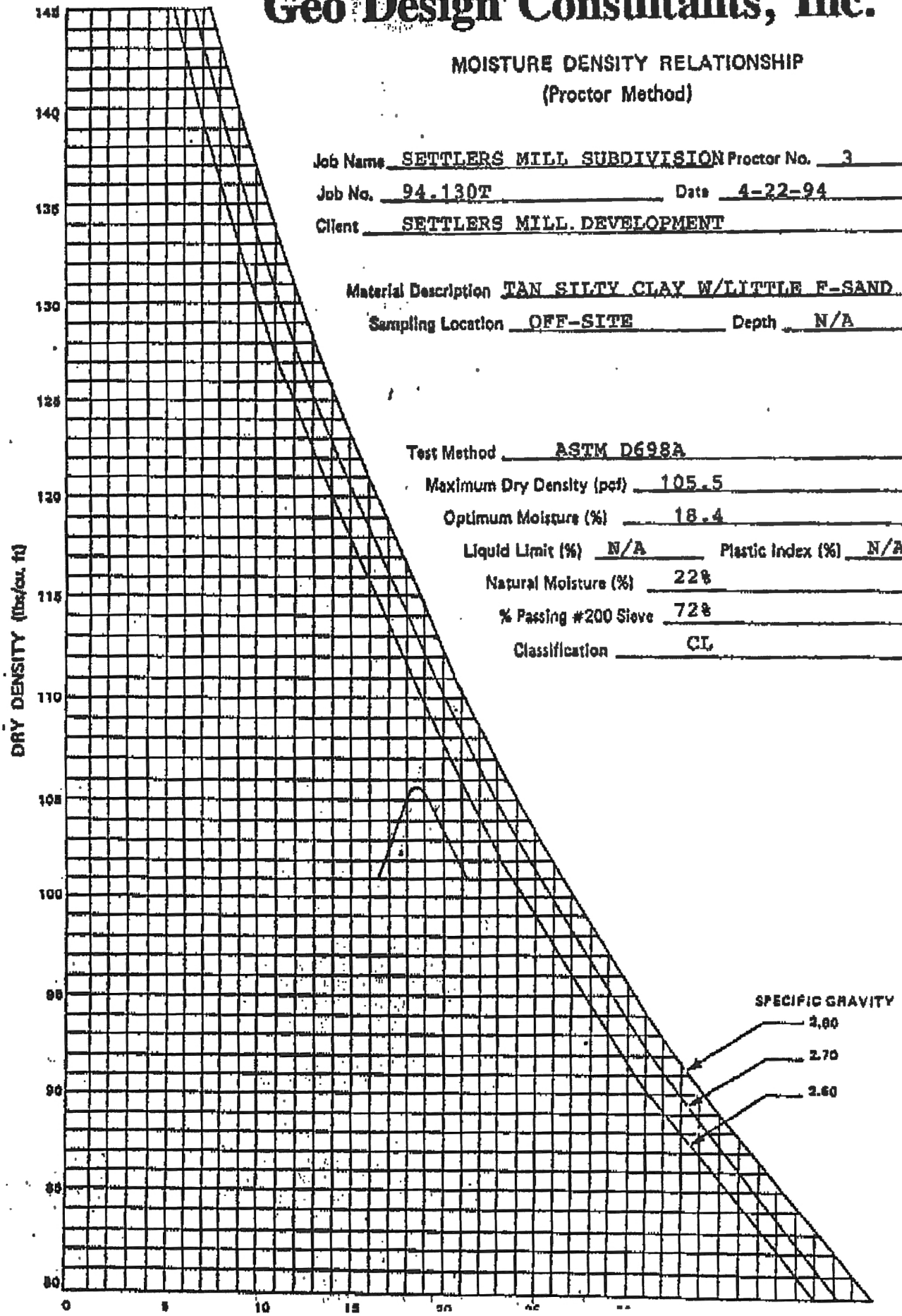
Optimum Moisture (%) 18.4

Liquid Limit (%) N/A Plastic Index (%) N/A

Natural Moisture (%) 22%

% Passing #200 Sieve 72%

Classification CL



GEO DESIGN CONSULTANTS, INC.
204-B GRAYSON ROAD
VIRGINIA BEACH, VA 23462
PHONE:(804) 473-9533
FAX:(804) 473-9534

FACSIMILE COVER SHEET

DATE: 4/22/94
TO: Pat Menichini
COMPANY:
FAX #: 253-6663
FROM: Camille A. Kattan, P.E.

NO. OF PAGES INCLUDING COVER SHEET 6

MESSAGE:

IF THERE ARE ANY PROBLEMS WITH THE TRANSMISSION OF THIS FAX OR YOU HAVE RECEIVED THIS FAX IN ERROR; PLEASE CONTACT OUR OFFICE AT: (804) 473-9533

DEVELOPMENT MANAGEMENT

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

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

ENVIRONMENTAL DIVISION
(757) 253-6670
environ@james-city.va.us

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

COUNTY ENGINEER
(757) 253-6678

INTEGRATED PEST MANAGEMENT
(757) 253-2620

September 11, 2002

Mr. Charles J. Bodnar, P.E.
LandMark Design Group
4029 Ironbound Road, Suite 100
Williamsburg, Va. 23188

Re: Reduced Freeboard Variance Request
Grace Covenant Presbyterian Church
County Plan No. SP-066-02
County BMP ID Code: MC 003

Dear Mr. Bodnar:

The Environmental Division is in receipt of your written request dated August 27th 2002 to obtain variance for reduced freeboard associated with BMP # 1 which is situated in the southeast corner of the site along Jamestown Road. The stormwater management facility is an existing dry pond facility which will be modified to accept drainage from the proposed development site.

Minimum Standard 3.01 of the Virginia Stormwater Management Handbook and County standards would require a minimum of 2 feet of freeboard from the 100-year design high water elevation to top of dam for facilities without an emergency spillway. For this specific BMP, an emergency spillway was not provided. The principal spillway is intended to pass the 100-year design event safely through the facility and based on the 100-year design high water elevation (El. 46.14) as compared to design top of dam elevation (El. 46.5), only 0.36 feet of freeboard is provided.

The plan approving authority may waive or modify any of the Minimum Standards which are deemed inappropriate or too restrictive for site conditions. Based on our full review of information as submitted, the variance as requested is hereby ***approved.***

The variance was considered appropriate due to information as submitted in the revised plan of development application and the variance request letter including: 1) there are distinct restraints and limitations to expand the size of the dry pond due to the Community Character Corridor to the north, the entrance to Lakewood/Settlers Mill Subdivision to the east, VDOT right-of-way to the south and the proposed site entrance to the west; 2) the principal spillway device is being modified to meet current standards; 3) a bioretention facility was added to the onsite parking lot island to provide additional extended detention and attenuation prior to the conveyance of drainage to BMP # 1; 4) an enhanced maintenance plan was provided for the owner to routinely inspect the riser for clogging after each storm event; 5) there appears to be an adequate and safe flow path which would not impact Jamestown Road and Lakewood Drive should the modified facility overtop due to unexpected conditions.

In addition, approval of the variance is subject to following conditions:

1. The Owner/Applicant should be made completely aware of the reduced freeboard requirement and all provisions of this variance and the Inspection/Maintenance Agreement for the BMP;

2. The variance approval shall become part of the approved site stormwater management plan;

3. The Owner/Applicant should ensure that maintenance of BMP # 1 is adequately performed in accordance with the schedule presented on Sheet C-7 of the plan set and Minimum Standards 3.01 and 3.02 of the Virginia Stormwater Management Handbook. Proper maintenance will reduce the chance of clogging of the principal flow control and the potential for subsequent overtopping of the dam embankment.

Please note that approval of this variance, with the conditions stated, in no way implies final approval of a site or subdivision plan as required by the Chapter 24 Zoning or Chapter 19 Subdivisions of the County Code; nor, does it constitute final approval of an erosion and sediment control or stormwater management plan as required by Chapter 8 Erosion and Sediment Control and Chapter 23 Chesapeake Bay Preservation of the County Code. Approval of this variance is also contingent upon no major (substantial) changes in the development plan, the subject best management practice facility, or if site conditions change, become apparent or alter significantly following the date of this approval.

Sincerely,

Darryl E. Cook, P.E.
Environmental Director

DEC/sjt

cc: Christopher Johnson, Planning

SWMProg/Variances/SPvar/Var091102

Larry S. Barry, P.E., President
Norman H. Mason, L.S., VP
Vaughn B. Rinner, C.L.A.
Elizabeth J. Anderson, P.E.
Kenneth A. Dierks
Robert P. Kerr, R.E.P., P.W.S.

LANDMARK DESIGN GROUP

Clayton E. Massey, P.E.
Charles R. Orsborne, L.S.
Stephen A. Romeo, L.S.
Mark W. Strickland, P.E.
William R. Turner, Jr., A.I.C.P.
A. Gary Webb, P.E.

August 27, 2002

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

Re: Grace Covenant Presbyterian Church
Jamestown Road
LMDG Job No. 2001201-000.03
JCC Plan No. SP-066-02

Dear Darryl:

Per discussions with Mr. Scott Thomas, P.E., we are hereby requesting a variance to the 100-year freeboard requirement for BMP No. 1 for the above referenced project.

BMP No. 1 was designed and constructed as part of the Lakewood Subdivision, Section 2. The facility was designed - to meet flow attenuation requirements - with the Grace Covenant Presbyterian Church site having a weighted "c" of 0.60. The facility called for a top of embankment between the VDOT drainage ditch along Jamestown Road and the facility to have an elevation of 46. From the topographic survey of the site, it appears that the facility was not constructed in accordance with the approved construction plans. The area to be cleared required for correct installation of the original design was not cleared and the BMP was constructed closer to Jamestown Road than originally planned. Due to these facts, the embankment between the facility and the Jamestown Road drainage ditch was not built to the correct elevation. We are, as part of this construction plan, constructing the top of the embankment to an elevation of 46.5. We are accomplishing this by steeping the side slope of the Jamestown Road drainage ditch and shrinking the area of BMP No. 1.

Since the construction of the facility, the County has declared Jamestown Road a Community Corridor Buffer and restricts the amount of clearing that can be performed adjacent to the right-of-way. With the proposed plan for Grace Covenant, no clearing - beyond that which is needed for utilities and entrances - can be made adjacent to the Jamestown Road right-of-way without violating the Community Corridor Buffer. With this requirement, BMP No. 1 is restricted to the area between the existing woodsline, the drainage ditch along Jamestown Road and Lakewood Drive.

As you know, the *Virginia Stormwater Management Handbook* indicates "an embankment without an emergency spillway must provide at least 2 feet of freeboard from the maximum 100-year storm WSE to the lowest point on the top of the embankment." In addition, "an embankment with an emergency spillway

must provide at least 1 foot of freeboard from the maximum 100-year storm WSE to the lowest point on the top of the embankment." An emergency spillway must be constructed in a cut area. Due to the site constraints, three sides of the basin are in fill and the final side is wooded. Thus, no emergency spillway can be provided for this facility.

We have explored the use of other on-site treatment facilities in order to reduce the storage volume required for this facility. We have installed a bioretention facility to provide water quality treatment of a portion of the site. The reduction in storage volume due to this facility is accounted for in the calculations for BMP No. 1.

Under the current design, the 100-year storm is designed to pass through the principal spillway. The 100-year storm WSE rises to within 0.36 feet of the top of the embankment. We have analyzed the basin to see if the freeboard requirement for this facility could be met if the top of the embankment were raised. Using the maximum maintainable slope of 3:1, we analyzed elevations 47, 47.5 and 48 to see what would happen on the 100-year storm event. Elevation 48 was chosen as the maximum top of embankment elevation due to the requirement to match the grades along the edge of Lakewood Drive. Under each of these other scenarios, the freeboard provided was less than the designed elevation of 46.5.

Provisions have been made in the BMP Maintenance Plan (Sheet C-7) requiring Grace Covenant to check the riser structure for trash and debris after each storm event. This will prevent clogging of the principal spillway that could result in overtopping of the dam. An anti-vortex device has been specified on the plans for the principal spillway since it is designed to handle the 100-year storm event.

We have explored every avenue to repair this facility to meet the requirements of the *Virginia Stormwater Management Handbook* and the *James City County BMP Manual*. We are unable to meet the requirement for 2-feet of freeboard between the 100-year storm WSE and the top of embankment. We, thus, ask for a variance for this facility.

If you have any questions or comments, please do not hesitate to contact us.

Best regards,
The LandMark Design Group Inc.

Charles J. Bodnar, P.E.
Associate

CJB/cb

Copy to: File 2001201-000.03
Grace Covenant Presbyterian Church

Larry S. Barry, P.E., President
Norman H. Mason, L.S., VP
Vaughn B. Rinner, C.L.A.
Elizabeth J. Anderson, P.E.
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A. Gary Webb, P.E.

August 27, 2002

Mr. Chris Johnson
James City County Planning Division
P.O. Box 8784
Williamsburg, VA 23187-8784

Re: Grace Covenant Presbyterian Church
Jamestown Road
LMDG Job No. 2001201-000.03
JCC Plan No. SP-066-02

Dear Chris:

We are pleased to submit, for approval, twelve (12) copies of the revised site plan for the above referenced project. In response to the comments of your facsimile dated August 23, 2002, we offer the following:

JCSA

1. Water and sewer data sheets were not changed by previous comments. Data sheets submitted with the project in May 2002 are still valid.
2. The requested note has been added to Sheet C-3 of the construction plans. In addition, concrete channels have been added within the ditch where the proposed ditch crosses the existing force main.
3. The note has been changed per the comment.

VDOT

1. Sight distance information and speed limits have been added to Sheet C-3 of the plan.
2. The radii at the entrance have been changed to 25-feet.

Environmental

1. The revised BMP point worksheet is attached as part of this submittal package and has been provided to Mr. Scott Thomas, P.E. under separate cover.
2. As discussed with Mr. Scott Thomas, P.E., the conservation easement plat is in process and will be submitted when completed.
3. The off-site weighted "c" calculation is attached as part of this submittal package and has been provided to Mr. Scott Thomas, P.E. under separate cover.

4. Please find attached a copy of the required variance request for BMP No. 1. This letter has been forwarded to Mr. Scott Thomas, P.E. under separate cover.
5. The trash rack for the top of the riser structure has been changed, on Sheet C-5, to be a fully symmetrical, triangular-shaped unit. In addition, it has been noted on the riser detail, on Sheet C-5, that the riser shall contain an anti-vortex plate.
6. The blank "x's" in the BMP maintenance plan, on Sheet C-7, have been filled in with the required elevations and dimensions.
7. In regards to the bioretention facility, we offer the following:

    a. The bioretention facility has been labeled, on Sheet C-3, as BMP No. 3.
    b. It has been noted on the detail, on Sheet C-5, that the sand layer is optional.
    c. As discussed with Mr. Scott Thomas, P.E., we will ensure that the filter fabric between the planting soil media and the stone underdrain is the appropriate type of fabric.
    d. The width of the cell section has been noted on the detail on Sheet C-5.
    e. The width and depth of the gravel diaphragm have been added to the detail on Sheet C-5.
    f. A note has been added to the detail on Sheet C-5 requiring the certification of the planting soil layer be part of the construction certification requirements associated with the BMP.
    g. A note has been added to the detail on Sheet C-5 indicating that the bioretention facility must be constructed in accordance with the County BMP Manual and the State Minimum Standards.
    h. Sheet L-1 has been modified to show the landscaping required by the County BMP Manual and the State Minimum Standards. A note has been added to the detail on Sheet C-5 to refer the Contractor to the Landscape Plan for planting requirements.

As discussed this morning, Grace Covenant would like to acquire the Land Disturbing Permit next week to allow for erosion control installation, clearing and rough grading of the site to begin. Please contact us as soon as the Environmental Division has signed off on the plan so this permit can be acquired. If you have any questions or comments, please do not hesitate to contact us.

Best regards,
The LandMark Design Group Inc.

Charles J. Bodnar, P.E.
Associate

CJB/tmp

Copy to: File 2001201-000.03
Grace Covenant Presbyterian Church

Wendell

After your voice mail message, I was able to look into our records and find information on the BMP. It was in the Settlers Mill Section 1 file, however, the plan was for Lakewood Section 2, County Plan No. S-35-87. Assigned County BMP ID Code for the BMP is MC 003.

Design of the facility was based on the 25-year storm event, so this would be the official design high water. Design high water elevation for the 25-year storm is at El. 44.25 and the 25 ft. buffer would be landward of that elevation. I transposed this information onto the 1 inch = 50 ft. scale plan to give you an idea of how far that is into Lot 2 buildable area.

As you can see, the 25 ft. buffer would not encroach onto Lot 2 beyond the top of the graded sideslope of the pond. Therefore, any development (clearing, grading or permanent structures) for Lot 2 could not encroach onto the graded slope of the pond. This is reasonable and probably would not be performed anyway; therefore, it would appear that the 25 ft. buffer requirement would result in virtually no impact to Lot 2 at all.

This is a preliminary assessment using available information. If the limit of clearing, grading or permanent structure proposed on Lot 2 would be in the vicinity of the BMP, the building application (plot plan) for Lot 2 would need to show design high water for the BMP and the 25 ft. setback, so we could make final determination. At that time we would either ask to reconfigure the plan to avoid the buffer or if there is no way to avoid impacts to the buffer, a variance request requested in writing from the owner or tenant (current or future), not the builder, would be necessary to our division. This is an administrative process where we try to limit impact to the greatest extent possible and try to restore impacted buffer area back to natural meadow or forest conditions to the greatest extent practical or by use of native tree, shrub or groundcover landscaping.

This should answer your questions. If not call me at 757-253-6639.

Scott J. Thomas SAT 7-16-02
Civil Engineer
Environmental Division

Per Bill Cain

Open space drainage easement generic so belongs to Co

ENVIRONMENTAL – STORMWATER TRANSMITTAL

PROTECTING RESOURCES PRIDE IN DELICATE ENVIRONMENTS

James City County Jamestown 1607

COUNTY PLAN NO: SP-66-02

BMP ID CODE: MC003

WATERSHED: MILL CREEK

- ☐ **ENTIRE RECORD FILE**
- ☐ **ASBUILTS**
- ☐ **CONSTRUCTION CERTIFICATION**
- ☐ **COMPUTATIONS**
- ☑ **OTHER:** A copy of these revised computations, for SP-66-02 Grace Covenant Presbyterian Church, needs to go in the MC003 file. The BMP riser on the existing pond was modified on the church plan.

NAME: Scott J. Thomas

SIGNATURE: Scott J Thomas

DATE: 9/24/08

Grace Covenant Presbyterian Church

JAMES CITY COUNTY - ENVIRONMENTAL DIVISION

Office Phone: 757-253-6670 Fax Number: 757-259-4032

DATE SENT: 7/16/02

Name: Wendell Gaffney
Firm or Company: Century 21 REALTY
Facsimile Number: 757-565-3812
Number of pages including this transmittal: 5
From: Scott J. Thomas

James City County
P O Box 8784
Williamsburg VA 23187-8784

Comments: See Attached Note + Plans.
RE: LOT 2, FIVE LOTS ON Jamestown ROAD.

If you do not receive all pages, call 757-253-6670 as soon as possible

RE: LOT 2
NEXT TO MC 003.

SCOTT J. THOMAS, P.E.
CIVIL ENGINEER

ENVIRONMENTAL DIVISION

101 MOUNTS BAY ROAD, P.O. BOX 8784 (757) 253-6639
WILLIAMSBURG, VIRGINIA 23187-8784 FAX: (757) 259-4032
E-MAIL: scottt@james-city.va.us

Frances C. Geissler

From: Adam Kinsman
Sent: Monday, June 09, 2008 4:46 PM
To: Frances C. Geissler; John Horne
Subject: RE: Generic Easements

The county is not responsible for maintenance of undesignated, generic utility (or other) easements.

From: Frances C. Geissler
Sent: Monday, June 09, 2008 4:40 PM
To: Adam Kinsman; John Horne
Subject: Generic Easements

Question of the Week: Does the presence of a generic utility easement on a subdivision plat in a neighborhood without a mandatory HOA imply responsibility on the part of the County? If there is an undesignated easement and no responsible party, is the County responsible? OR, asked another way, do we have the ability to maintain the structure or are we required to maintain the structure? How responsible are we when no one else is responsible?

We think we have the ability, not the obligation, to act. Would that view hold up in court?

THANKS – seriously!

WATERSHED	MC	MAINTENANCE PLAN	No	CTRL STRUC DESC	None
BMP ID NO	003	SITE AREA acre	14.4	CTRL STRUC SIZE inches	
PLAN NO	S-35-87	LAND USE	SF Residential	OTLT BARRL DESC	RCP Barrel
TAX PARCEL	(47-4)(9-1A)	old BMP TYP	Dry Pond	OTLT BARRL SIZE inch	18
PIN NO	4740900001A	JCC BMP CODE			
CONSTRUCTION DATE	1/1/1987	POINT VALUE		EMERG SPILLWAY	No
PROJECT NAME	Settlers Mill Basin at Jamestown Rd			DESIGN HW ELEV	
FACILITY LOCATION	Settlers Mill Entrance Jamestown Road			PERM POOL ELEV	
CITY-STATE	Williamsburg, Va. 23185	SVC DRAIN AREA acres	18.15	2-YR OUTFLOW cfs	28.04
CURRENT OWNER	Settlers Mill Inc.			10-YR OUTFLOW cfs	37.37
OWNER ADDRESS	111 Old Colony Lane			REC DRAWING	No
OWNER ADDRESS 2		SERVICE AREA DESCRI	Settlers Mill & Jamestown Road		
CITY-STATE-ZIP CODE	Williamsburg, Va. 23185	IMPERV AREA acres		CONSTR CERTIF	No
OWNER PHONE		RECV STREAM	UT of Mill Creek-Lake Pow		
MAINT AGREEMENT	No	EXT DET-WQ-CTRL	No	LAST INSP DATE	1/12/2001
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft	0	INTERNAL RATING	4
		CHAN PROT CTRL	No	MISC/COMMENTS	
		CHAN PROT VOL acre-ft	0	form Lakewood Sec 2. At Lakewood Drive entrance.	
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	No		

Get Last BMP No

Return to Menu

Previous Comments

GEL | SJT

ENVIRONMENTAL DIVISION REVIEW COMMENTS
GRACE COVENANT PRESBYTERIAN CHURCH
COUNTY PLAN NO. SP - 066 - 02
August 9, 2002

Stormwater Management / Drainage:

1. ✓ Open Space Credit. Previous comment # 23 was not fully addressed. Although an "Easement Exhibit" was provided, it does not appear the hatched area as shown on the exhibit as Proposed Conservation Easement area totals 3.566 acres as previously claimed in the BMP worksheet. Also, the response to previous comment # 23 indicated that "the BMP point calculation has been adjusted to meet the recalculated area of the conservation easement". The revised BMP worksheet was not found in the design report or resubmittal documents. OK

2. ✓ Open Space Credit. Provide a conservation easement plat for conservation easement areas as claimed in the BMP worksheet and as shown on the "Easement Exhibit" as provided. IN PROCESS

3. ✓ BMP # 1 Design. Previous comment # 31 was not fully addressed. The weighted runoff coefficient computation for a C factor of 0.43, as used for postdevelopment analyses of BMP # 1, was not found in the design report or resubmittal documents.

4. ✓ BMP # 1. Response to previous comment # 32 is acknowledged. Although page 5-51 of the VSMH indicates that if emergency spillways are not practical due to site constraints, the 100-year storm event must be routed through the riser and barrel system, Minimum Standard 3.01 of the VSMH (page 3.01-12) indicates that "an embankment without an emergency spillway must provide at least 2 feet of freeboard from the maximum 100-year storm WSE to the lowest point on the top of the embankment." County policy as outlined on page 12 of the design plan checklist is consistent with this VSMH requirement. Based on the current design, the riser/barrel system will pass the 100-year design event with only 0.35 feet of freeboard to top of dam. A variance request, in writing, must be presented to the Environmental Division to vary from County requirements and Minimum Standard 3.01 of the VSMH. The variance request must clearly outline site restraints that restrict raising the dam or providing additional storage volume in the basin and whether reduced freeboard may cause any consequences to the dam structure or adjacent roadways. *(Note: If minimum freeboard requirements are not honored, heavy reliance will be placed on the maintenance aspects of BMP # 1 to ensure the facility functions as designed as clogging of the principal spillway could result in overtopping of the dam. Therefore, the maintenance plan is not typical of most detention basins. Ensure the BMP maintenance plan for BMP # 1 as shown on Sheet C-7 adequately addresses this concern if a variance request is deemed necessary.)*

Variance request letter dated Aug 27 2002

5. ✓ BMP # 1 Trash Rack. The trash rack as proposed for the DI-1 top of BMP # 1 is similar to the trash rack necessary for the low flow orifice on the riser (per details Sheet C-5). A fully symmetrical, triangular-shaped trash rack is recommended for the top of the proposed DI-1 riser structure rather than the right triangle type unit as proposed. A symmetrical unit would be more aesthetically pleasing and is more typically used for riser tops. Also, an anti-vortex plate should be a part of the trash rack design, especially if the riser is being utilized to pass the 100-year storm event.

6. ✓ Maintenance Plan. Some information is missing in the first paragraph and in Item # 1 of the maintenance plan for BMP # 1 on Sheet C-7. Numeric or elevation data is required for several blank "x's".

7. Bioretention Cell. A bioretention area was added to the main parking cell in the middle of the site to address previous comment # 42. The following comments pertain to the bioretention cell:

7a) Label the bioretention cell in the parking area as BMP # 3 on plan Sheet C-3.
7b) The sand filter layer per the detail on Sheet C-5 is optional.
7c) Ensure geotextile as shown on the detail on Sheet C-5, between the stone underdrain and planting soil media layers is properly designed and specified to permit the free flow of water yet retain soil particle migration into the gravel envelope.
7d) Show a dimension for the width of the cell section on the details on Sheet C-7.
7e) Show approximate width and depth dimensions for the pea gravel diaphragm on the detail on Sheet C-7.
7f) Certification of the planting soil layer will be required in accordance with Appendix E of the County BMP manual to fulfill construction certification requirements associated with this BMP.
7g) Add a note to the "Bioretention Basin Sections" detail on Sheet C-5 of the plan to indicate that installation/materials for construction of the bioretention cell shall be in accordance with Group D BMP requirements of the County BMP Manual (pages 48-50) and Minimum Standards 3.11 (Bioretention) and 3.13 (pages 3.13-12 and 13) of the Virginia Stormwater Management Handbook. These references should be followed for proper installation, materials and construction sequencing for the plants, mulch layer, planting soil layer, the underdrain and the stone diaphragm.
7h) Landscape Plan Sheet L-1 should also refer to Minimum Standard 3.11 of the VSMH for proper selection and requirements associated with bioretention cell plantings; or alternatively, appropriate notes should be provided on Sheet L-1 referring to bioretention details on Sheet C-5. A minimum of three species of trees and three species of shrubs and herbaceous ground cover are required. Refer to pages 3.11-16 through 38 of the VSMH. *(Currently, the landscape plan is not consistent with VSMH Minimum Standard requirements for bioretention BMPs.)*

8. Storm Structure. A 12-inch storm drain was added to the plan in the southwest corner of the site to address previous comment # 37. It does not appear that a typical ES-1 headwall configuration will work at this location due the sharp deflection angle between the swale and the pipe entrance and due to the slope area in back (south) of the pipe entrance. Flow may bypass the headwall and overflow down the slope. An L-shaped headwall may be necessary at this location. Please evaluate the design to ensure the proper headwall is used so that flow from within the channel is not bypassed around the headwall and culvert entrance in an uncontrolled manner onto the downstream slope.

L-wall added Sheet C-3.

BMP POINT CALCULATIONS
FOR
GRACE COVENANT CHURCH

LMDG File No. 2001201-000.03

- Per boundary of site, the site area is 7.288 acres.

- Per meeting of March 8, 2002, with Scott Thomas (JCC Environmental Division), the existing borrow pit can be counted as an infiltration basin for the project. The borrow pit accepts drainage from 0.969 acres of the site, and 0.128 acres of off-site. Thus, the total drainage area served by the existing borrow pit is 1.097 acres.

  BMP Points = $\frac{1.097}{7.288}$ x 8 = **1.20 BMP points**

- The existing dry detention basin (Part of the subdivision design) will be modified to become an extended dry detention basin. This basin will be designed to serve a site drainage area of 6.235 acres. In addition, this basin serves an off-site drainage area of 7.626 acres. Thus, the total drainage area served by this basin is 13.861 acres.

  BMP Points = $\frac{13.861}{7.288}$ x 4 = **7.61 BMP points**

- A total of 2.814 acres of open space will remain in its natural state for this project.

  BMP Points = $\frac{2.814}{7.288}$ x 100 x 0.10 = **3.86 BMP points**

- Total BMP Points for Site = 1.20 + 7.61 + 3.86 = **12.67 BMP points**

FINAL BMP WORKSHEET

OFF-SITE WEIGHTED C CALCULATION
FOR
GRACE COVENANT CHURCH

LMDG File No. 2001201-000.03

- Total off-site area that drains to BMP No. 1 is 7.626 acres. From County GIS mapping, we were able to determine that 1.602 acres of the drainage area is impervious (roadways, houses, walks, driveways, etc).

- Weighted c = $\frac{0.9\ (1.602) + 0.3\ (6.024)}{7.626}$

  Weighted c = 0.43

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

Name	Content	Date
Jo Anna Ripley	PC184 GRACE COVENANT PRESBYTERIAN CHURCH ADDITIONAL AS-BUILT DATA	7/16/2015

Stormwater Division

MEMORANDUM

DATE: July 22, 2014
TO: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services
FROM: Jacob Smith, Stormwater Intern
PO: 110426
RE: Files Approved for Scanning

NAME PDF/SCANNED FILE:	GRACE COVENANT PRESBYTERIAN CHURCH		
BMP ID OR GEN FILE NUMBER:	MC003, PC184	**OWNER NAME:**	~~VENTURE INVESTMENTS INC.~~ GRACE COVENANT PRESBYTERIAN CHURCH ~~DB/FILE CONTRADICTORY~~
PIN:	4730100073B	**SITE ADDRESS:**	1677 JAMESTOWN ROAD
		LEGAL DESCRIPTION:	P-II MECCA SUB

MAINTENANCE AGREEMENT IN FILE:	N/A	**BOOK/PAGE OR DOCUMENT NO.:**	N/A	**OTHER DESCRIPTION:**	N/A

BOX NO.:	1	**COMMENTS:**	DEED

Recorded 3/31/92 DB 555/508 PB 55/60

OWNER'S CONSENT AND DEDICATION

THIS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE WISHES AND DESIRES OF THE UNDERSIGNED OWNERS AND PROPRIETORS.

BY: ______________________ ________
RONALD L. HENSARLING, PRESIDENT — DATE
VENTURE INVESTMENTS, INC.

STATE OF VIRGINIA

I, ______________________, A NOTARY PUBLIC, DO CERTIFY THAT THE PERSON WHOSE NAME IS SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN MY CITY AND STATE AFORESAID.

GIVEN UNDER MY HAND THIS ___ DAY OF __________, 19___.

MY COMMISSION EXPIRES __________ BY: __________

SURVEYOR'S STATEMENT

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

GIVEN UNDER MY HAND THIS 15 DAY OF MAY, 1991.

BY: ______________________

CLERK'S CERTIFICATE
STATE OF VIRGINIA, COUNTY OF JAMES CITY

IN THE CLERK'S OFFICE OF THE CIRCUIT COURT FOR THE COUNTY OF JAMES CITY THE ______ DAY OF __________, 19___, THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORD AS THE LAW DIRECTS.

TESTE: ______________________, CLERK.

PLAT BOOK: ______, PAGE: ______

CERTIFICATE OF APPROVAL

THIS SUBDIVISION, KNOWN AS FIVE LOTS ON JAMESTOWN ROAD IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE COMMITTED TO RECORD.

DATE ______ ______________ HIGHWAY ENGINEER

DATE ______ ______________ HEALTH OFFICER

DATE 3/27/92 ______________ AGENT OF GOVERNING BODY

SOURCE OF TITLE

TITLE TO THE LAND SHOWN HEREON IS VESTED IN VENTURE INVESTMENTS, INC., A VIRGINIA CORPORATION, BY DEED DATED MARCH 31, 1987, RECORDED IN DB 336, AT PAGE 794 ON APRIL 1, 1987 (SEE PB 45, PAGE 93) IN THE CLERK'S OFFICE OF THE CIRCUIT COURT OF THE CITY OF WILLIAMSBURG AND COUNTY OF JAMES CITY, VIRGINIA.

AREA TABULATION

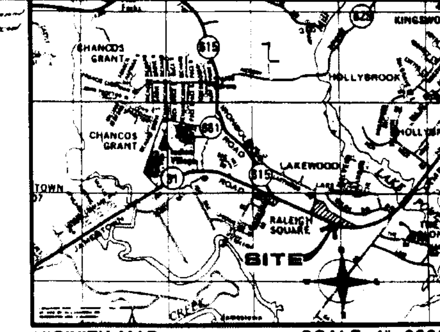
Mylars in Richmond mapped on Kard copy.

LOT NO.	S.F.	ACRES	% OF TOTAL
1	29,008	0.6659	16%
2	43,250	0.9929	23%
3	33,449	0.7679	18%
4	30,918	0.7098	17%
5	49,848	1.1444	26%
TOTAL	186,473	4.2809	100%

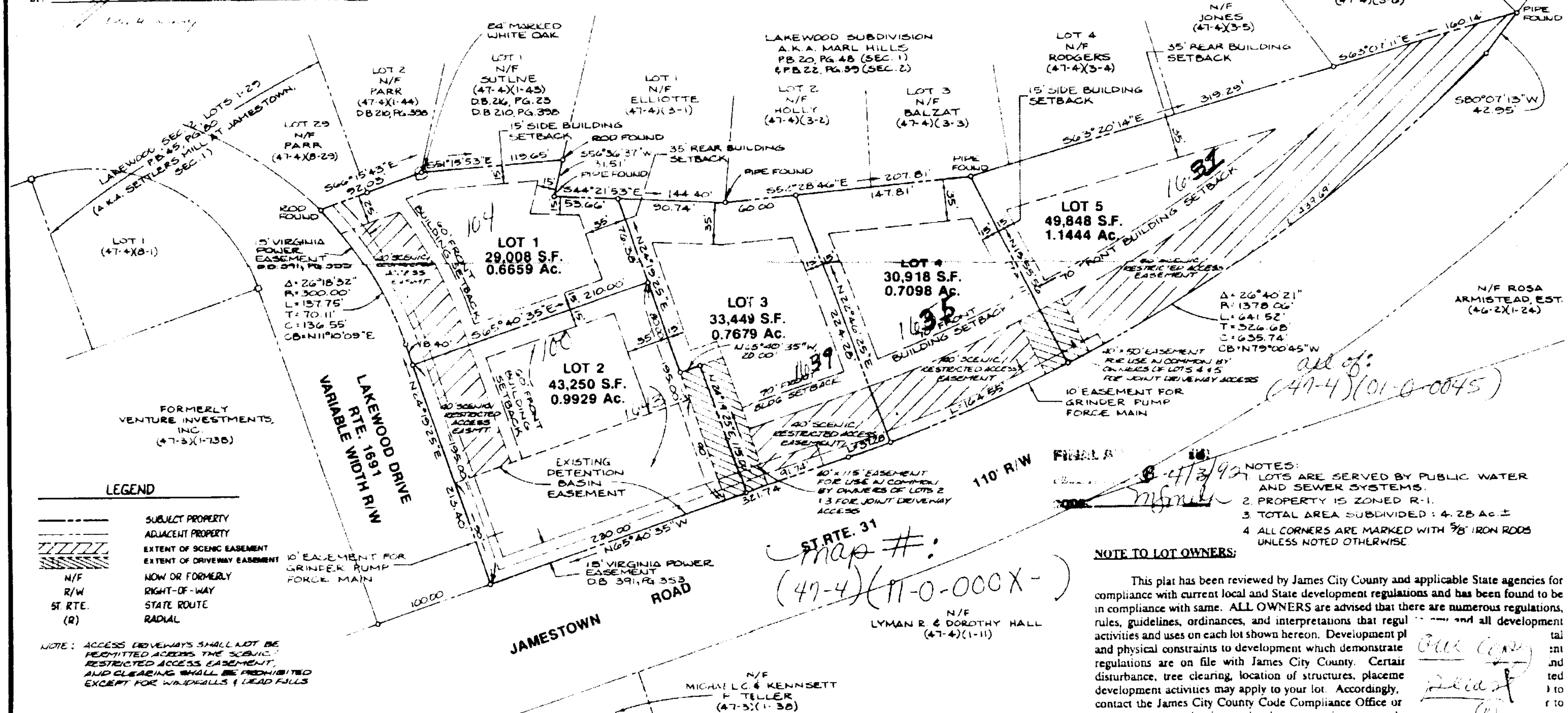
60 0 60
SCALE IN FEET

NOTE TO LOT OWNER(S):

LOT OWNERS ARE HEREBY ADVISED TO OBTAIN AND REVIEW THE DEVELOPMENT PLAN (SHEETS 1, 2 & 3 OF 3) DATED MAY 15, 1991 FOR THIS SUBDIVISION. SPECIFIC CONDITIONS, RESTRICTIONS AND REQUIREMENTS WHICH EFFECT THE USE OF EACH LOT ARE RECITED THEREON.



VICINITY MAP SCALE: 1"=2000'



NOTES:
1. LOTS ARE SERVED BY PUBLIC WATER AND SEWER SYSTEMS.
2. PROPERTY IS ZONED R-1.
3. TOTAL AREA SUBDIVIDED: 4.28 Ac.±
4. ALL CORNERS ARE MARKED WITH 5/8" IRON RODS UNLESS NOTED OTHERWISE.

NOTE TO LOT OWNERS:

This plat has been reviewed by James City County and applicable State agencies for compliance with current local and State development regulations and has been found to be in compliance with same. ALL OWNERS are advised that there are numerous regulations, rules, guidelines, ordinances, and interpretations that regul[illegible] and all development activities and uses on each lot shown hereon. Development pl[illegible]tal and physical constraints to development which demonstrate [illegible]ent regulations are on file with James City County. Certai[illegible]and disturbance, tree clearing, location of structures, placeme[illegible]ted development activities may apply to your lot. Accordingly, [illegible] to contact the James City County Code Compliance Office or [illegible]r to commencing any clearing or development activity on any l[illegible]

5-37-91

COMMONWEALTH OF VIRGINIA — DON A. RAINEY — No. 1652 — LAND SURVEYOR

COMMONWEALTH OF VIRGINIA — DON A. RAINEY — No. 016210 — PROFESSIONAL ENGINEER

PLAT OF FIVE LOTS ON JAMESTOWN ROAD
OWNED BY: VENTURE INVESTMENTS, INC.
JAMES CITY COUNTY, VIRGINIA

NO.	DATE	REVISION / COMMENT / NOTE	BY

Designed DAR	Drawn EAW/DB
Scale 1"=60'	Date MAY 15, 1991
Project No. 90141	
Drawing No. PLAT	

BY: _____ _____
RONALD L. HENSARLING, PRESIDENT) DATE
VENTURE INVESTMENTS, INC.

STATE OF [illegible]

I, _____, A NOTARY PUBLIC, DO CERTIFY THAT THE PERSON WHOSE NAME IS SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN MY CITY AND STATE AFORESAID.

GIVEN UNDER MY HAND THIS ___ DAY OF _____, 19__.

MY COMMISSION EXPIRES _____ BY: _____

SURVEYOR'S STATEMENT

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

GIVEN UNDER MY HAND THIS 15th DAY OF MAY, 1991.

BY: _____ C.L.S. #1052

TESTE: _____, CLERK.

PLAT BOOK: _____, PAGE: _____

CERTIFICATE OF APPROVAL

THIS SUBDIVISION, KNOWN AS FIVE LOTS ON JAMESTOWN ROAD IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE COMMITTED TO RECORD.

DATE _____ _____ HIGHWAY ENGINEER

DATE _____ _____ HEALTH OFFICER

DATE 3/27/92 _____ AGENT OF GOVERNING BODY

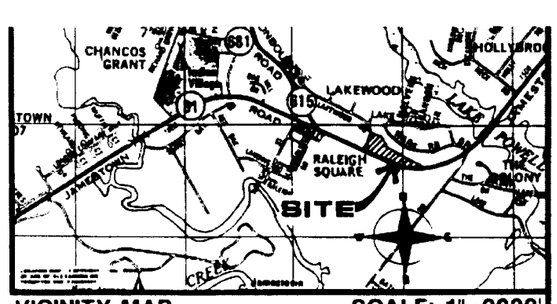
SOURCE OF TITLE

TITLE TO THE LAND SHOWN HEREON IS VESTED IN VENTURE INVESTMENTS, INC., A VIRGINIA CORPORATION, BY DEED DATED MARCH 31, 1987, RECORDED IN DB 336, AT PAGE 796 ON APRIL 1, 1987 (SEE PB 45, PAGE 9) IN THE CLERK'S OFFICE OF THE CIRCUIT COURT OF THE CITY OF WILLIAMSBURG AND COUNTY OF JAMES CITY, VIRGINIA.

5	49,848	1.1444	26%
TOTAL	186,473	4.2809	100%

60 0 60
SCALE IN FEET

RECORD MERIDIAN PB 45 PG 9



VICINITY MAP SCALE: 1"=2000'

NOTE TO LOT OWNER(S):

LOT OWNERS ARE HEREBY ADVISED TO OBTAIN AND REVIEW THE DEVELOPMENT PLAN (SHEETS 1, 2 & 3 OF 3) DATED MAY 15, 1991 FOR THIS SUBDIVISION. SPECIFIC CONDITIONS, RESTRICTIONS AND REQUIREMENTS WHICH EFFECT THE USE OF EACH LOT ARE RECITED THEREON.

LEGEND

- SUBJECT PROPERTY
- ADJACENT PROPERTY
- EXTENT OF SCENIC EASEMENT
- EXTENT OF DRIVEWAY EASEMENT
- N/F NOW OR FORMERLY
- R/W RIGHT-OF-WAY
- ST. RTE. STATE ROUTE
- (R) RADIAL

NOTE: ACCESS DRIVEWAYS SHALL NOT BE PERMITTED ACROSS THE SCENIC/RESTRICTED ACCESS EASEMENT, AND CLEARING SHALL BE PROHIBITED EXCEPT FOR WINDFALLS & DEAD FALLS.

LOT 1 N/F SUTLNE (47-4)(1-45) D.B.216, PG.23 D.B.210, PG.398
LOT 2 N/F PARR (47-4)(1-44) D.B.210, PG.398
LOT 29 N/F PARR (47-4)(8-29)
LOT 1 (47-4)(8-1)
LOT 1 N/F ELLIOTTE (47-4)(3-1)
LOT 2 N/F HOLLY (47-4)(3-2)
LOT 3 N/F BALZAT (47-4)(3-3)
LOT 4 N/F RODGERS (47-4)(3-4)
LOT 5 N/F JONES (47-4)(3-5)
LOT 6 N/F SCHNEDTTE (47-4)(3-6)
LOT 7 N/F SINGLEY (47-4)(3-7)
LAKEWOOD SUBDIVISION A.K.A. MARL HILLS P.B.20, PG.48 (SEC.1) & P.B.22, PG.39 (SEC.2)
LAKEWOOD SEC. 2 LOTS 1-29 P.B.45, PG.40 (A.K.A. SETTLERS MILL AT JAMESTOWN, SEC.1)
FORMERLY VENTURE INVESTMENTS, INC. (47-3)(1-38)
N/F ROSA ARMISTEAD, EST. (46-2)(1-24)
N/F LYMAN R. & DOROTHY HALL (47-4)(1-11)
N/F MICHAEL C. & KENNSETT F. TELLER (47-3)(1-38)

84" MARKED WHITE OAK
ROD FOUND
PIPE FOUND
15' SIDE BUILDING SETBACK
35' REAR BUILDING SETBACK
15' SIDE BUILDING SETBACK
35' REAR BUILDING SETBACK
S66°15'43"E 92.03'
S51°15'53"E 119.65'
S56°36'37"W 31.51'
S44°21'53"E 144.40'
90.74'
60.00'
S52°28'46"E 207.81'
147.81'
S63°07'11"E 160.14'
S63°20'14"E 319.29'
S80°07'13"W 42.95'
L=439.69'
N24°19'25"E 195.00'
213.40'
N24°19'25"E 80.00'
N22°46'25"E 135.00'
N22°46'25"E 224.28'
S65°40'35"E 210.00'
N65°40'35"W 230.00'
N65°40'35"W 20.00'
L=164.55'
321.74'
76.30'
18.40'
100.00'
LAKEWOOD DRIVE RTE. 1691 VARIABLE WIDTH R/W
ST. RTE. 31
110' R/W
ROAD
JAMESTOWN

LOT 1 29,008 S.F. 0.6659 Ac.
LOT 2 43,250 S.F. 0.9929 Ac.
LOT 3 33,449 S.F. 0.7679 Ac.
LOT 4 30,918 S.F. 0.7098 Ac.
LOT 5 49,848 S.F. 1.1444 Ac.

15' VIRGINIA POWER EASEMENT D.B.391, PG.355
Δ=26°18'32" R=300.00' L=137.75' T=70.11' C=136.55' CB=N11°10'09"E
50' SCENIC/RESTRICTED ACCESS EASEMENT
50' FRONT BUILDING SETBACK
40' SCENIC/RESTRICTED ACCESS EASEMT.
40' SCENIC/RESTRICTED ACCESS EASEMENT
40' SCENIC/RESTRICTED ACCESS EASEMENT
Δ=26°40'21" R=1378.06' L=641.52' T=326.68' C=635.74' CB=N79°00'45"W
40'x50' EASEMENT FOR USE IN COMMON BY OWNERS OF LOTS 4 & 5 FOR JOINT DRIVEWAY ACCESS
10' EASEMENT FOR GRINDER PUMP FORCE MAIN
EXISTING DETENTION BASIN EASEMENT
40'x115' EASEMENT FOR USE IN COMMON BY OWNERS OF LOTS 2 & 3 FOR JOINT DRIVEWAY ACCESS
10' EASEMENT FOR GRINDER PUMP FORCE MAIN
15' VIRGINIA POWER EASEMENT D.B.391, PG.353

all of: (47-4)(01-0-0045)

Map #: (47-4)(11-0-000X-)

NOTES:
1. LOTS ARE SERVED BY PUBLIC WATER AND SEWER SYSTEMS.
2. PROPERTY IS ZONED R-1.
3. TOTAL AREA SUBDIVIDED : 4.28 Ac.±
4. ALL CORNERS ARE MARKED WITH 5/8" IRON RODS UNLESS NOTED OTHERWISE.

NOTE TO LOT OWNERS:

This plat has been reviewed by James City County and applicable State agencies for compliance with current local and State development regulations and has been found to be in compliance with same. ALL OWNERS are advised that there are numerous regulations, rules, guidelines, ordinances, and interpretations that regul... any and all development activities and uses on each lot shown hereon. Development pl... tal and physical constraints to development which demonstrate ...nt regulations are on file with James City County. Certain ...ind disturbance, tree clearing, location of structures, placeme... ted development activities may apply to your lot. Accordingly, ...) to contact the James City County Code Compliance Office or ... r to commencing any clearing or development activity on any l...

All Copy Please

5-37-91

MC003
PC 184
Grace Covenant
Presbyterian church

Settlers Mill Inc. to
Grace Covenant
P-II 671/5114

Mecca sold
P-I, II, III to
Venture Investments
336/796

5 lots

45 PAGE 9

OWNER'S CONSENT & DEDICATION

THIS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE WISHES AND DESIRES OF THE UNDERSIGNED OWNERS AND PROPRIETORS.

TITLE TO THE LAND SHOWN HEREON IS VESTED IN MECCA DEVELOPMENT CORPORATION BY DEED DATED APRIL 9TH, 1986, RECORDED IN DB 301, AT PAGE 35 ON MAY 2, 1986 (SEE PB 44, PAGE 54.)

BY _____, PRESIDENT

STATE OF VIRGINIA

I, Deborah Hare, A NOTARY PUBLIC DO CERTIFY THAT THE PERSONS WHOSE NAMES ARE SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN MY CITY AND STATE AFORESAID.

GIVEN UNDER MY HAND THIS 25th DAY OF March, 1987.

MY COMMISSION EXPIRES 7/17/88 Deborah Hare

CLERK'S CERTIFICATE
STATE OF VIRGINIA, COUNTY OF JAMES CITY

IN THE CLERK'S OFFICE OF THE CIRCUIT COURT FOR THE COUNTY OF JAMES CITY THE 1st DAY OF April, 1987. THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORD AS THE LAW DIRECTS.

TESTE: _____, CLERK.

PLAT BOOK: 45, PAGE: 9.

CERTIFICATE OF APPROVAL

THIS SUBDIVISION KNOWN AS: PLAT OF PARCELS I, II, AND III OF PROPERTY OF MECCA DEVELOPMENT CORPORATION IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE COMMITTED TO RECORD.

DATE 2-20-87 _____ HIGHWAY DEPARTMENT
DATE 2-20-87 _____ HEALTH OFFICER
DATE 3/23/87 _____ AGENT OF GOVERNING BODY

ENGINEER'S & SURVEYOR'S STATEMENT

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

GIVEN UNDER MY HAND THIS 20th DAY OF February, 1987.

BY: _____
PAUL C. SMALL, P.E., C.L.S.

GENERAL NOTES:

1. SITE IS A PORTION OF JCC TAX PARCEL (46-2)(1-24).
2. THIS IS A SUBDIVISION OF A PORTION OF THE PROPERTY CONVEYED TO MECCA DEVELOPMENT CORP. AS SHOWN ON A PLAT TITLED "PLAT FOR CONVEYANCE OF 27.84 ACRES± FROM ROBERT T. ARMISTEAD, ET ALS TO MECCA DEVELOPMENT CORPORATION."

200 0 200
SCALE IN FEET

AREA TABULATION

	SF	ACRES
PARCEL I	628,022	14.4174
PARCEL II	317,479	7.2883
PARCEL III	186,475	4.2809
20' R/W DEDICATION	21,574	0.4953
TOTAL AREA SUBDIVIDED	1,153,550	26.4819

LOCATION MAP
SCALE: 1"=2000'

(ROBERT T. ARMISTEAD ET AL. (M.B.C., PG. 182) 105.68 AC.±)

PARCEL I
628,022 S.F. ±
14.4174 AC. ±

PARCEL II
317,479 S.F. ±
7.2883 AC. ±

PARCEL III
186,475 S.F. ±
4.2809 AC.±

church

(5 Lots)

LAKEWOOD SUBDIVISION
A.K.A. MARL HILLS
PB 20, Pg 48

PROPOSED 20' R/W DEDICATION

PETROLEUM ROAD EASEMENT

50' STRIP FOR DEDICATION TO VDH&T

JAMESTOWN ROAD S.R. 31 110' R/W

CURVE TABLE

LOT NO.	DELTA	RADIUS	LENGTH	TANGENT	CHORD	CHORD BEARING
1	11°28'32"	781.42'	156.51'	78.62'	156.25'	N28°22'56"W
2	10°29'36"	684.50'	125.36'	62.86'	125.19'	N27°53'28"W
3	01°24'31"	684.50'	16.83'	8.42'	16.83'	N33°50'32"W
4	12°18'21"	352.31'	77.82'	39.06'	77.67'	N20°23'36"W

Received for record this 2:15 day of April, 1987
P.B. No. 336 page 796
Beatrice S. Ward Clerk

AES, a professional corporation
1761 Jamestown Road, Williamsburg, Va. 23185
804-253-0040
Engineering, Planning, Surveying

PLAT OF
PARCELS I, II & III
PROPERTY OF
MECCA DEVELOPMENT CORPORATION
JAMES CITY COUNTY VIRGINIA

COMMONWEALTH OF VIRGINIA PAUL C. SMALL 1310 LAND SURVEYOR

No.	DATE	REVISION / COMMENT / NOTE	BY
1		ADDED 20' H.D.H.&T. DEDICATION	

Project No.
PLAT

OWNER'S CERTIFICATE

THE SUBDIVISION OF LAND SHOWN ON THIS PLAT AND KNOWN AS SETTLERS MILL, SECTION 2B IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE DESIRE OF THE UNDERSIGNED OWNER, PROPRIETORS AND OR TRUSTEES.

4-8-92 — DATE

LARRY M. SCHAFFLE
PRESIDENT, SETTLERS MILL INC.

CERTIFICATE OF NOTARIZATION

STATE OF VIRGINIA

CITY/COUNTY OF Williamsburg, I, Anita Saunders A NOTARY PUBLIC IN AND FOR THE CITY/COUNTY AND STATE AFORESAID, DO HEREBY CERTIFY THAT THE PERSONS WHOSE NAMES ARE SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN THE CITY/COUNTY AFORESAID. GIVEN UNDER MY HAND THIS 8th DAY OF April, 1992. MY COMMISSION EXPIRES 3/31/93

Anita Saunders
SIGNATURE

SOURCE OF TITLE

TITLE TO LAND SHOWN HEREON IS VESTED IN SETTLERS MILL, INC. BY DEED DATED JUNE 1, 1990, RECORDED IN DB 476, AT PAGE 147, AND BY DEED DATED JULY 31, 1990, RECORDED IN DB 483, AT PAGE 448 IN THE CLERKS OFFICE OF THE CIRCUIT COURT OF THE COUNTY OF JAMES CITY, VIRGINIA.

ENGINEER OR SURVEYOR'S CERTIFICATE

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

APRIL 7, 1992 — DATE

G. T. WELSH, JR. C.L.S.

CERTIFICATE OF APPROVAL

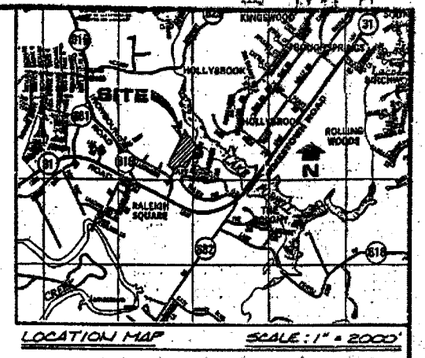
THIS SUBDIVISION IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE ADMITTED TO RECORD.

4/16/92 — DATE

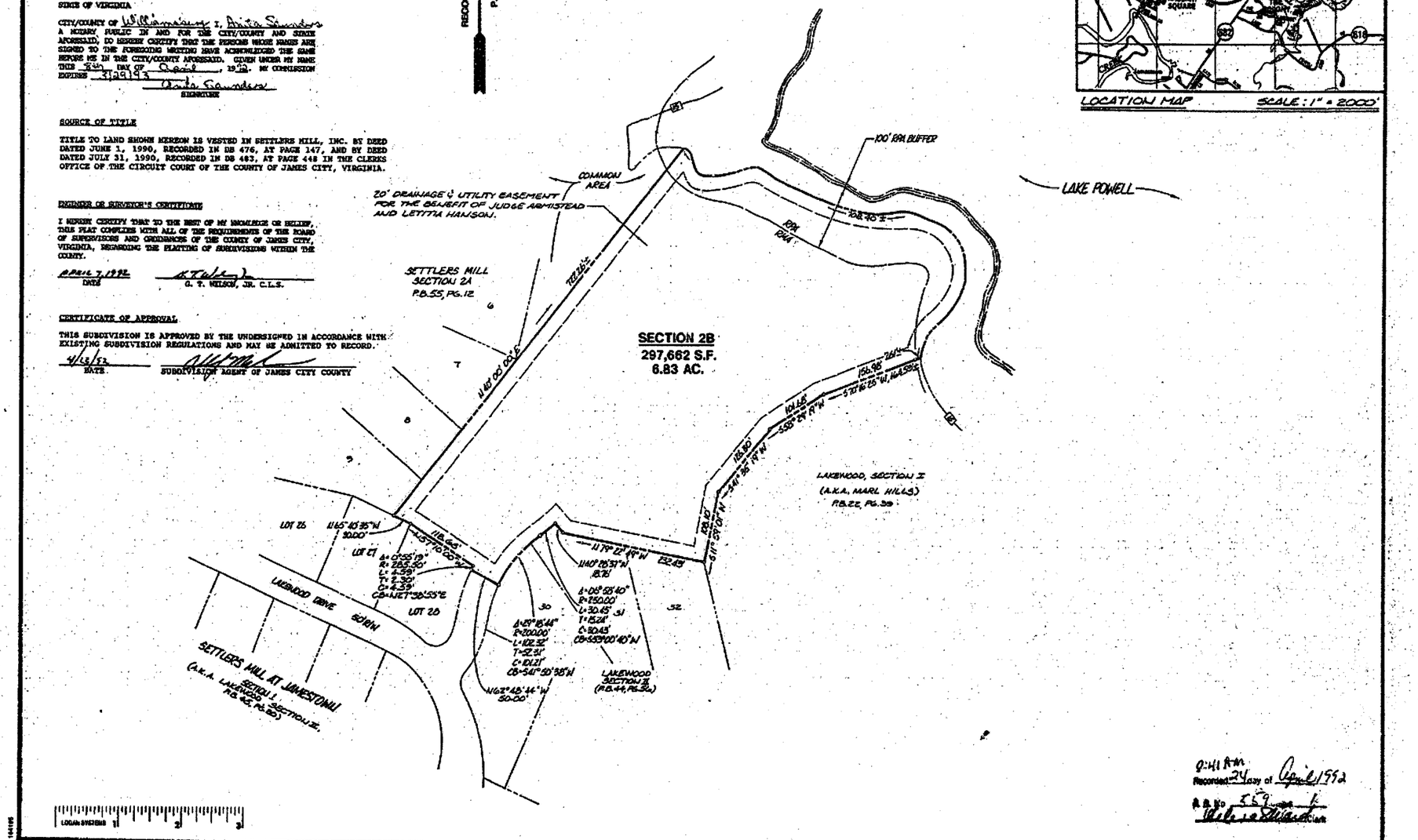
SUBDIVISION AGENT OF JAMES CITY COUNTY

RECORD MERIDIAN N P.B.45, PG.46

100 0 100
SCALE IN FEET



LOCATION MAP SCALE: 1" = 2000'



9:41 A.M.
Recorded 24 day of April 1992
A.B. No 559
Melissa Gilliard Clerk

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

SECTION 2B
SETTLERS MILL
AT JAMESTOWN
OWNER: SETTLERS MILL INC.
JAMESTOWN DISTRICT — JAMES CITY COUNTY — VIRGINIA

COMMONWEALTH OF VIRGINIA
G. T. WELSH, JR.
CERTIFICATE No. 1183
CERTIFIED LAND SURVEYOR

No.	DATE	REVISION / COMMENT / NOTE	BY

Designed	Drawn DJU
Scale 1"=100'	Date APRIL, 1992
Project No.	7407
Drawing No.	PLAT

OWNER'S CONSENT & DEDICATION

THIS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE WISHES AND DESIRES OF THE UNDERSIGNED OWNERS AND PROPRIETORS.

TITLE TO THE LAND SHOWN HEREON IS VESTED IN ROBERT T. ARMISTEAD, ET ALS BY WILL DATED SEPT. 20, 1953 RECORDED IN WB 6 AT PAGE 195

BY _____ BY _____

BY _____ BY _____

STATE OF VIRGINIA, City of Williamsburg

I, Sue J. Clayton, A NOTARY PUBLIC DO CERTIFY THAT THE PERSONS WHOSE NAMES ARE SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN MY CITY AND STATE AFORESAID.

GIVEN UNDER MY HAND THIS 12th DAY OF April, 1986

MY COMMISSION EXPIRES May 9, 1989 Sue J. Clayton Notary Public

STATE OF VIRGINIA, COUNTY OF JAMES CITY

IN THE CLERK'S OFFICE OF THE CIRCUIT COURT FOR THE COUNTY OF JAMES CITY THE 2nd DAY OF May, 1986, THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORD AS THE LAW DIRECTS.

TESTE: Helen S Ward CLERK

PLAT BOOK 42, PAGE 54

CERTIFICATE OF APPROVAL

THIS SUBDIVISION KNOWN AS

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

DATE _____ HIGHWAY ENGINEER _____

DATE _____ HEALTH OFFICER N/A

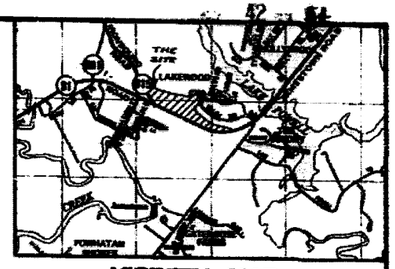
DATE _____ AGENT OF GOVERNING BODY _____

ENGINEER'S & SURVEYOR'S CERTIFICATE

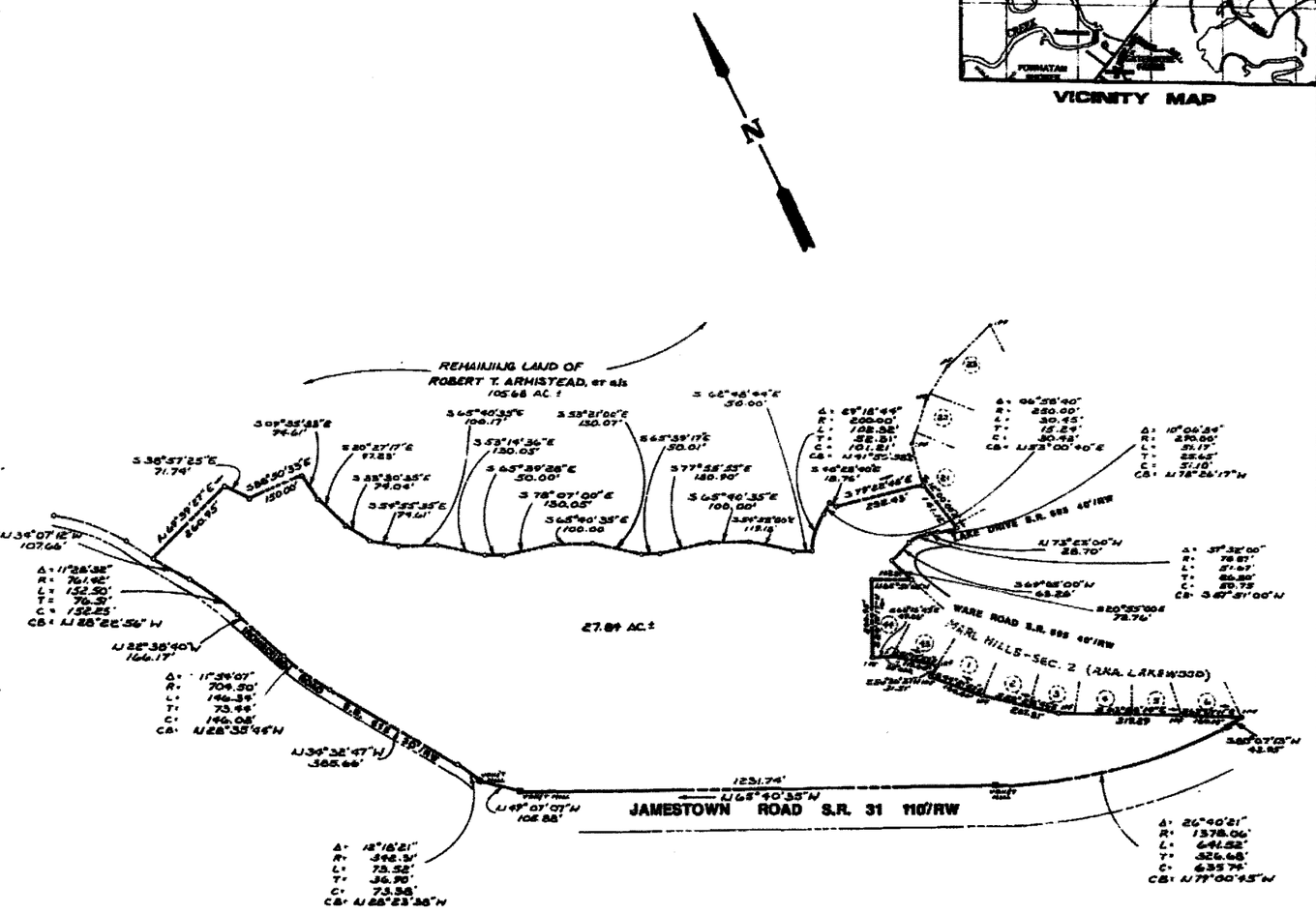
I HEREBY CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL OF THE REQUIREMENTS OF THE BOARD OF SUPERVISORS AND ORDINANCES OF THE COUNTY OF JAMES CITY, VIRGINIA, REGARDING THE PLATTING OF SUBDIVISIONS WITHIN THE COUNTY HAVE BEEN COMPLIED WITH.

GIVEN UNDER MY HAND THIS 11th DAY OF April, 1986

BY: Paul C. Small



VICINITY MAP



AES. a professional corporation

1761 Jamestown Road, Williamsburg, Va. 23185

804-253-0040

Engineering, Planning, Surveying

PLAT FOR CONVEYANCE OF 27.84 AC.±

FROM: ROBERT T. ARMISTEAD, ET ALS

TO: MECCA DEVELOPMENT CORPORATION

JAMES CITY COUNTY VIRGINIA

COMMONWEALTH OF VIRGINIA — PAUL C. SMALL — No. 1247 — LAND SURVEYOR

2:05 p.m. Recorded this 2nd day of May, 1986 in D.B. 401, page 35 Helen S. Ward Clerk

No.	DATE	REVISION / COMMENT / NOTE	BY

Designed	Drawn C.A.H.
Scale 1"=200'	Date APR. 1986
Project No. 6240	
Drawing No.	
PLAT	

5 sheets

0 50 100
SCALE IN FEET

N

INSERT
SCALE: 1"=50'

MH #6 (EXIST.)
RIM = 70.99
INV. = 61.78

MATCH LINE

(SEE INSERT ABOVE) MATCH LINE

LAKEWOOD, SEC. 2
LOTS 1-29
P.B. 45, PG. 80
A.K.A. SETTLERS MILL
AT JAMESTOWN, SEC. 1

LOT 29
N/F PARR
(47-4)(8-29)

LOT 2
N/F
DARR
(47-4)(1-44)
D.B. 210, PG. 398

LOT 1
N/F
SUTLIVE
(47-4)(1-43)
D.B. 216, PG. 23
D.B. 210, PG. 398

LOT 1
N/F
ELLIOTTE
(47-4)(3-1)

LAKEWOOD SUBDIVISION
A.K.A. MARL HILLS
P.B. 20, PG. 48 (SEC. 1)
& P.B. 22, PG. 39 (SEC. 2)

LOT 2
N/F
HOLLY
(47-4)(3-2)

LOT 3
N/F
BALZAT
(47-4)(3-3)

LOT 4
N/F
RODGERS
(47-4)(3-4)

LOT 5
N/F
JONES
(47-4)(3-5)

LOT 6
N/F
SCHNEDTTE
(47-4)(3-6)

LOT 7
N/F
SIUGLEY
(47-4)(3-7)

Δ = 26°18'32"
R = 300.00'
L = 137.75'
T = 70.11'
C = 136.55'
CB = N11°10'09"E

2-45° ELBOWS

2" PVC SCH. 40 FORCE MAIN

S66°15'43"E 22.08'

S51°15'53"E 119.65'

(SEE NOTE #9)

15' SIDE BUILDING SETBACK

N56°36'37"E 31.51'

S44°21'53"E 144.40'
90.74'

35' REAR BUILDING SETBACK

S52°28'46"E 60.00'

15' SIDE BUILDING SETBACK

35' REAR BUILDING SETBACK

207.81'
147.81'

S63°20'14"E 319.29'

S63°07'11"E 160.14'

S80°07'13"W 42.95'

Δ = 26°40'21"
R = 1378.06'
L = 641.52'
T = 326.68'
C = 635.74'
CB = N79°00'45"W

15' VIRGINIA POWER EASEMENT D.B. 391, PG. 353

10' EASMT. FOR GRINDER PUMP FORCE MAIN

GRINDER PUMP CONNECTION

40' SCENIC RESTRICTED ACCESS EASEMENT

BUILDING SETBACK

FRONT BLDG. SETBACK

EXISTING TREELINE

LOT 1
29,008 S.F.
0.6659 Ac.

LIMITS OF CLEARING & GRADING BY THIS PROJECT

LAKEWOOD DRIVE
RTE. 1691
100' R/W TYP.

210.00'

LOT 2
43,250 S.F.
0.9929 Ac.

LOT 3
33,449 S.F.
0.7679 Ac.

LOT 4
30,918 S.F.
0.7098 Ac.

LOT 5
49,848 S.F.
1.1444 Ac.

40' x 15' EASEMENT FOR USE IN COMMON BY OWNERS OF LOTS 2 & 3 FOR JOINT DRIVEWAY ACCESS (SEE DETAIL)

40' x 50' EASEMENT FOR USE IN COMMON BY OWNERS OF LOTS 4 & 5 FOR JOINT DRIVEWAY ACCESS

70' FRONT BLDG. SETBACK

70' FRONT BLDG. SETBACK LINE

GRINDER PUMP CONNECTION

2" PVC SCH. 40 FORCE MAIN

DETENTION BASIN EASEMENT

EXISTING DETENTION BASIN

U.G. POWER LINE

VEPCO POLE #VF-84

VEPCO ONLY POLE # 51764

40' SCENIC RESTRICTED ACCESS EASMT.

50' SCENIC RESTRICTED ACCESS EASMT.

EXISTING TREELINE

FUTURE WATER SERVICE CONNECTION (TYPICAL 5 PLACES)

EXISTING 8" JCSA WATER LINE

1-2" 90° ELBOW

EXISTING 3-14" OVAL RCP

18" RCP

N65°40'35"W 821.74'

GRINDER PUMP CONNECTION

10' EASEMENT FOR GRINDER PUMP FORCE MAIN

GRINDER PUMP CONNECTION

2" PVC SCH. 40 FORCE MAIN

15' VIRGINIA POWER EASEMENT D.B. 391, PG. 353

JAMESTOWN ROAD

S.R. 31

110' R/W

LIMITS OF CLEARING & GRADING BY THIS PROJECT

PROVIDE SILT FENCE ALONG DOWN SLOPE SIDE OF FORCE MAIN CONSTRUCTION

EXISTING 12" JCSA WATERLINE

N/F
MICHAEL C. & KENNSET F. TELLER (47-3)(1-38)

N/F
LYMAN E. & DOROTHY HALL
(47-4)(1-11)

N/F
ROSA ARMISTEAD EST.
(46-2)(1-24)

NOTE: PROVIDE EC-2 MATTING ON ALL 25% AND GREATER SLOPES DISTURBED BY THE FORCE MAIN CONSTRUCTION.

LAKEWOOD DRIVE
LOTS 1-29
P.B. 45, PG. 80
A.K.A. SETTLERS MILL
AT JAMESTOWN, SEC. 1

LAKEWOOD DRIVE
RTE. 1691
100' R/W TYP.

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE JAMES CITY SERVICE AUTHORITY STANDARDS AND SPECIFICATIONS.

2. ALL WATER AND SEWER FACILITIES SHALL BE DEDICATED TO THE JAMES CITY SERVICE AUTHORITY.

3. THE DEVELOPER SHALL BE RESPONSIBLE FOR INSTALLING WATER SERVICE LINES UPON APPLICATION AND PAYMENT OF FEES BY INDIVIDUAL LOT OWNERS.

4. TOPOGRAPHY SHOWN IS TAKEN FROM AERIAL TOPO AVAILABLE FROM THE FILES OF THE SURVEYOR, AND DOES NOT REPRESENT CURRENT SURVEYS ON THE GROUND. THE ELEVATION DATUM IS USGS SEA LEVEL.

5. ACCESS DRIVEWAYS SHALL NOT BE PERMITTED ACROSS THE SCENIC/RESTRICTED ACCESS EASEMENT, AND CLEARING SHALL BE PROHIBITED EXCEPT FOR WIND FALLS AND DEAD FALLS. UTILITY SERVICE LINES MAY CROSS THE SCENIC EASEMENT AT APPROXIMATELY RIGHT ANGLES TO ROUTE 131.

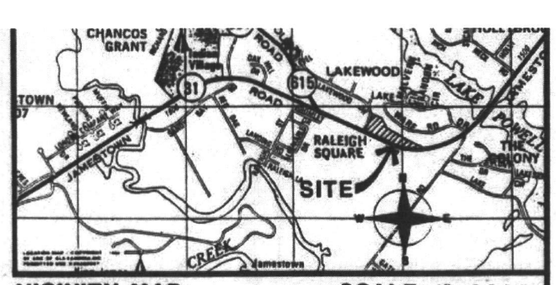
6. CONTRACTOR SHALL CONFIRM FIELD LOCATION OF FORCE MAIN PRIOR TO CONSTRUCTION AND INSTALLATION OF DRIVEWAY CULVERT PIPES.

7. THE DEVELOPER DOES NOT INTEND TO CONSTRUCT DRIVEWAYS UNDER THIS DEVELOPMENT PLAN. HOWEVER, IN THE EVENT HE CHANGES HIS MIND, THEN HE HIS SUCCESSORS OR ASSIGNS WILL CONSTRUCT DRIVEWAYS IN A MANNER THAT FULLY COMPLIES WITH THE GENERAL PERFORMANCE STANDARDS OF THE CHESAPEAKE BAY PRESERVATION ORDINANCE; SUCH CONSTRUCTION TO INCLUDE BUT NOT BE LIMITED TO: PLACEMENT OF STRAW BALE OR ROCK CHECK DAMS EVERY 50' IN DRIVEWAY SIDE DITCHES, SOLID SODDING OF ALL DISTURBED AREAS EXCEPT FOR DRIVEWAY SURFACE IMMEDIATELY FOLLOWING CONSTRUCTION, MINIMIZATION OF DISTURBANCE AND CLEARING OF INDIGENOUS VEGETATION, LIMITING IMPERVIOUS COVER, CONSTRUCTION OF DRIVEWAYS WITH FINISHED AVERAGE SLOPES OF LESS THAN 25%, AND OTHER SIMILAR MEASURES.

8. SEE SHEET 2 OF 3 FOR EROSION CONTROL NOTES.

9. ACCESS TO LOT 1 WILL BE RIGHT INGRESS/EGRESS ONLY. NO BREAK IN THE MEDIAN WILL BE ALLOWED.

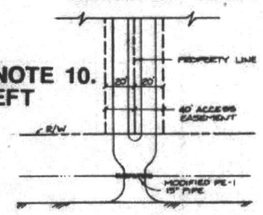
10. COMMON DRIVEWAYS FOR LOTS 2,3,4, AND 5 SHALL BE HARD SURFACED WITH CONCRETE OR ASPHALT, WITH THE DESIGN CROSS SECTION SUBJECT TO APPROVAL BY THE COUNTY, PRIOR TO ISSUANCE OF ANY CERTIFICATE OF OCCUPANCY FOR USE OF THESE LOTS. ADEQUATE PROVISIONS SHALL BE PROVIDED TO DIVERT DRIVEWAY DRAINAGE TO THE ROADSIDE DITCHES AT THE TIME OF PAVING OF THE DRIVEWAYS.



VICINITY MAP SCALE: 1"=2000'

AREAS WITH SLOPES GREATER THAN 25%

SEE NOTE 10. AT LEFT



ACCESS EASEMENT AND DRIVEWAY DETAIL
N.T.S.

Designed	Drawn
Checked	Date
Scale	Project

DEVELOPMENT PLAN

OWNER'S CONSENT & DEDICATION

THIS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE DESIRES OF THE UNDERSIGNED OWNERS AND PROPRIETORS.

TITLE TO THE LAND SHOWN HEREON IS VESTED IN MECCA DEVELOPMENT CORPORATION BY DEED DATED April 9th, 198_ RECORDED IN DB ___ PAGE ___ on May 5, 1984 (PLAT PB. 42, PG. 56)

BY ______________________

STATE OF VIRGINIA,

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

GIVEN UNDER MY HAND THIS ___ DAY OF June, 1986

MY COMMISSION EXPIRES May 17, 1988

STATE OF VIRGINIA, COUNTY OF JAMES CITY

IN THE CLERK'S OFFICE OF THE CIRCUIT COURT FOR THE COUNTY OF JAMES CITY THE 16 DAY OF January 1987. THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORD AS THE LAW DIRECTS.

TESTE: Helen Sweat, CLERK

PLAT BOOK 44, PAGE 56.

CERTIFICATE OF APPROVAL

THIS SUBDIVISION KNOWN AS ______________ IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE COMMITTED TO RECORD.

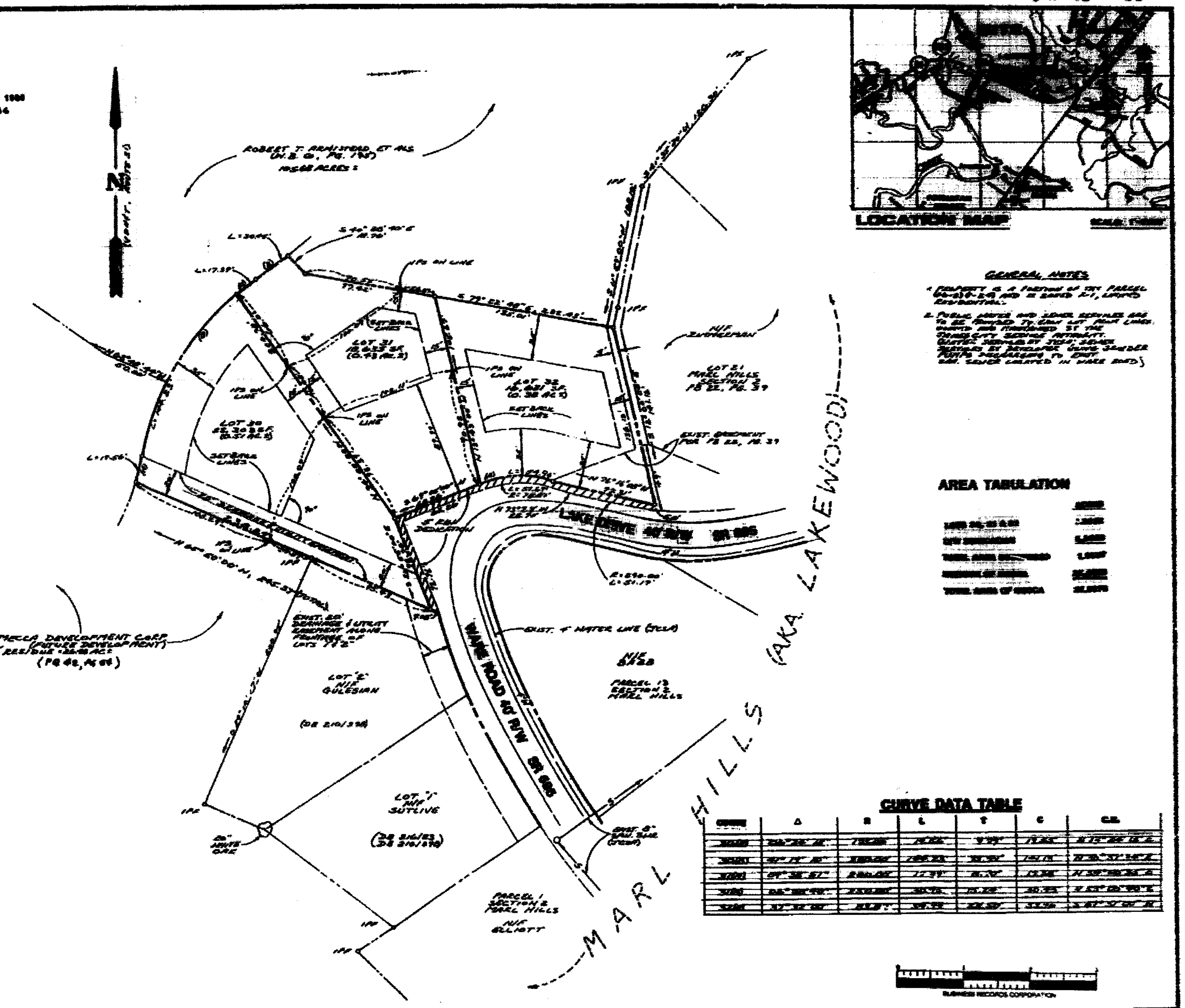
5-22-86	______________ DEPT.
DATE	
23 May 86	______________
DATE	
Jun 6, 1986	______________
DATE	AGENT OF ______________

ENGINEER'S & SURVEYOR'S CERTIFICATE

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

GIVEN UNDER MY HAND THIS 22nd DAY OF May, 1986

BY: Paul C. Small
PAUL C. SMALL, P.E., C.L.S.



AES, a professional corporation
1761 Jamestown Road, Williamsburg, Va. 23185
804-253-0040
Engineering, Planning, Surveying

PLAT OF
LAKEWOOD
SECTION II
LOTS 30, 31, 32
OWNER/DEVELOPER: MECCA DEVELOPMENT CORP.
JAMES CITY COUNTY — VIRGINIA

COMMONWEALTH OF VIRGINIA — PAUL C. SMALL — No. 1247 — LAND SURVEYOR

10:45 am
Recorded 16th day of Jan 1987
D.B. No. 329 page 725
Helen Sweat, clerk

No.	DATE	REVISION / COMMENT / NOTE ..	BY

Project No. 6248
Drawing No. 2
PLAT

5 lots

SOURCE OF TITLE:
THE LAND EMBRACED WITHIN THIS SUBDIVISION WAS CONVEYED TO GRACE COVENANT PRESBYTERIAN CHURCH BY DEED DATED DECEMBER 3, 1986 AND RECORDED IN DEED BOOK 325, PAGE 560 IN THE CLERK'S OFFICE, JAMES CITY COUNTY CIRCUIT COURT.

OWNER'S CONSENT:
THIS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE WISHES AND DESIRES OF THE UNDERSIGNED OWNERS.

STUART FERGUSON *Stuart W. Ferguson* DATE 8-30-89
ROBERT D. HOPPER *Robert D. Hopper* DATE 8-29-89
JERRY L. WOODSON *Jerry L. Woodson* DATE 8-30-89

I, *Ethel A. Hazelwood* A NOTARY PUBLIC, DO CERTIFY THAT THE PERSONS WHOSE NAMES ARE SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN MY CITY AND STATE AFORESAID, GIVEN UNDER MY HAND THIS *31st* DAY OF *August*, 1989. MY COMMISSION EXPIRES *December 4, 1990*.

ENGINEER'S CERTIFICATE:
I CERTIFY TAHT TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL OF THE REQUIREMENTS OF THE BOARD OF SUPERVISORS AND ORDINANCES OF JAMES CITY COUNTY REGARDING THE PLATTING OF SUBDIVISIONS WITHIN THE COUNTY HAVE BEEN COMPLIED WITH.
L.V. WOODSON, CLS 1201 *[signature]* DATE 9-5-89
APPROVED JAMES CITY COUNTY HEALTH DEPARTMENT *[signature]*
APPROVED VIRGINIA DEPARTMENT OF TRANSPORTATION *F. N. Hall* 9-5-89

THIS SUBDIVISION IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING REGULATIONS AND MAY BE COMMITTED TO RECORD AS THE LAW REQUIRES.
FOR JAMES CITY COUNTY *[signature]* DATE 9/6/89

STATE OF VIRGINIA, COUNTY OF JAMES CITY:
IN THE CLERK'S OFFICE OF THE CIRCUIT COURT, THIS *22* DAY OF *Sept* 1989 THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORDS AS THE LAW DIRECTS.
TESTE: *[signature]* PLAT BOOK *51* PAGE *40*

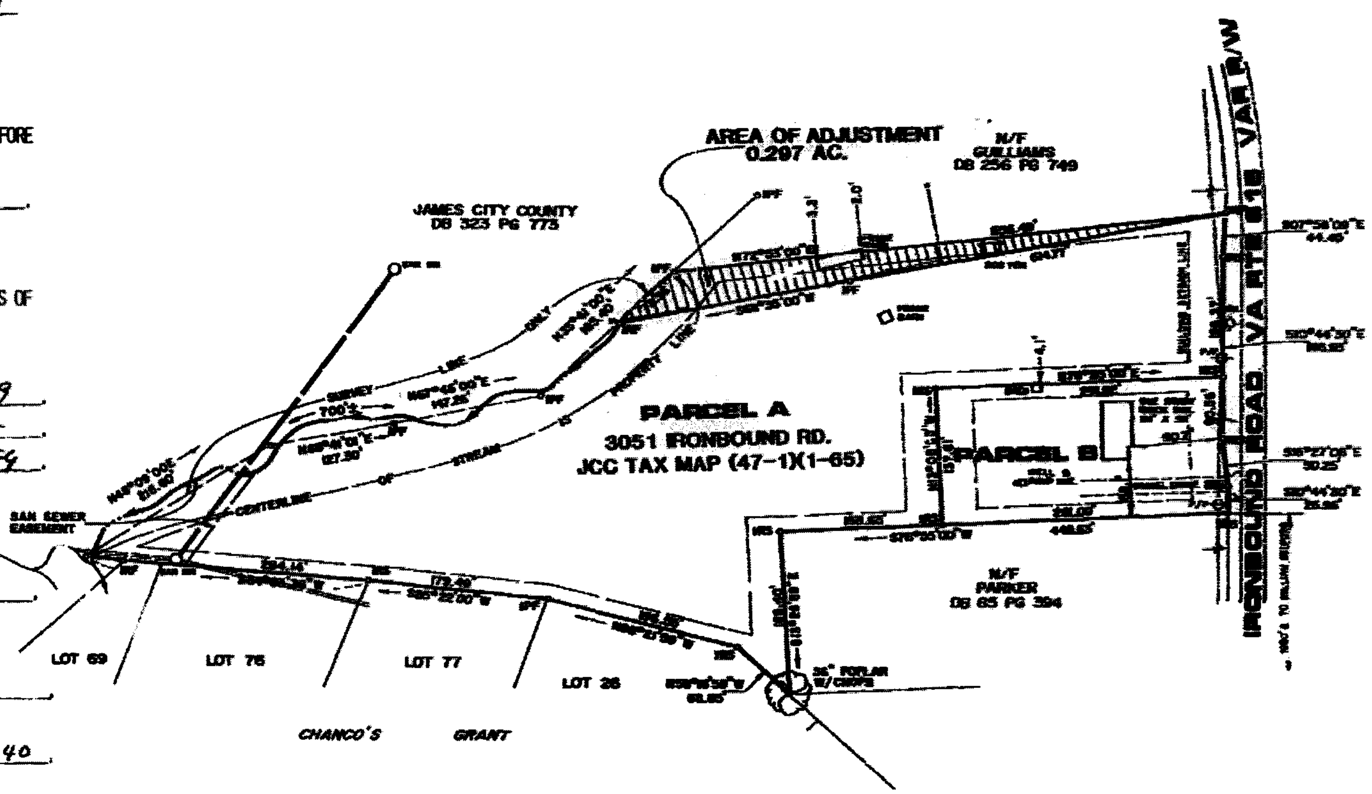
James E. Gulliams Sr. *9-19-89*
James E. Gulliams, Sr. Date
Rose M. Gulliams *9-19-89*
Rose M. Gulliams Date

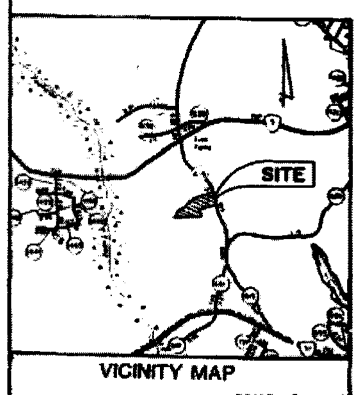
CERTIFICATE OF NOTARIZATION

State of Virginia, County of James City

I, *M Anderson Bradshaw* a Notary Public in and for the County aforesaid, do hereby certify that the persons whose names are signed to the foresaid writing have acknowledged the same before me in the County aforesaid. Given under my name this *17th* day of *Sept* 1989. My Commission expires *May 4, 1993*.

M Anderson Bradshaw





A COPY OF THIS PLAT IS ON FILE IN THE JAMES CITY COUNTY HEALTH DEPARTMENT WHICH SHOWS THE APPROVED LOCATION OF SEWAGE DISPOSAL SITE(S) FOR EACH LOT IN THE SUBDIVISION.

Recorded *22nd* day of *Sept.* 1989 *1:12 p.m.*
D.B. No. *448* page *350*

AREA TABULATION

AREA PARCEL A	227,429 SF	5.221 AC
AREA PARCEL B	40,004 SF	0.918 AC
FORMER AREA PARCEL A	267,433 SF	6.139 AC
AREA OF ADJUSTMENT	12,956 SF	0.297 AC

BUILDING RESTRICTIONS

PROPERTY IS ZONED LIMITED AGRICULTURAL DISTRICT. A-2. LOTS ARE SERVED BY PUBLIC WATER AND SEWER. MINIMUM LOT SIZE ALLOWABLE = 30,000 SF, 0.689 AC.

FRONTAGE REQUIREMENTS:

-- LOTS UP TO 43,560 SF SHALL HAVE A MINIMUM WIDTH AT THE SETBACK LINE OF 100 FEET.

-- LOTS OVER 43,560 SF SHALL HAVE A MINIMUM WIDTH AT THE SETBACK LINE OF 150 FEET.

YARD REGULATIONS:

FRONT: 35' MINIMUM
SIDES: 15' MINIMUM FOR EACH SIDE YARD
REAR: 35' MINIMUM

SCALE: 1" = 100'

REFERENCES:

DB 85	PG 392
94	697
152	633
256	749
323	773
325	560
389	660
PB 42	PG 60
44	19
44	26
45	59
47	66

STATE HWY PB 5 PG 74

THIS PROPERTY DOES NOT LIE WITHIN HUD DEFINED FLOOD ZONE A.

L. V. WOODSON & ASSOCIATES, INC.
ENGINEERS, SURVEYORS & PLANNERS
WILLIAMSBURG, VIRGINIA

A PLAT OF SUBDIVISION FOR
GRACE COVENANT PRESBYTERIAN CHURCH
JAMES CITY COUNTY VIRGINIA

A4206
A4206-1

5 Plats / Grace Cov.

MC003+
PC184

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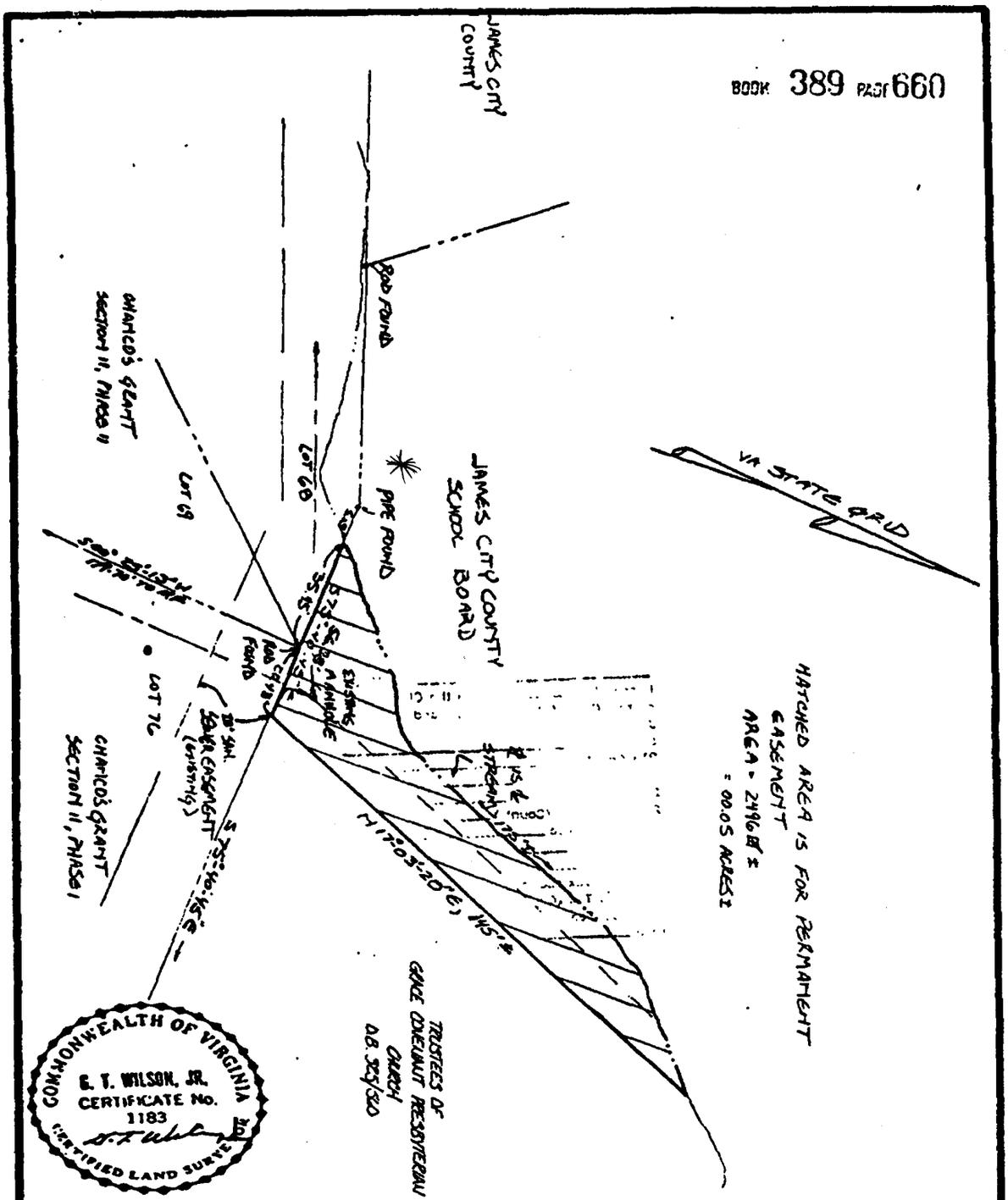
BOOK 389 PAGE 660



AES, a professional corporation — engineers, surveyors, planners — Williamsburg, Virginia

PLAT SHOWING SANITARY SEWER EASEMENT FROM TRUSTEES OF GRACE COVENANT PRESBYTERIAN CHURCH TO JAMES CITY SERVICE AUTHORITY

JAMESTOWN DISTRICT — JAMES CITY COUNTY — VIRGINIA

Scale: 1" = 30'	Ref.:	Date: 11 / 30 / 87	Job No. 5830-31 A

REVISION - NAME CHANGE 2/3/88
REVISION - NAME CHANGE 3/31/88

11/30/1987

pipe is noted

5 lots
Grace Cov

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5 lots

THIS DEED, made this 9th day of April, 1986, by and between ROBERT T. ARMISTEAD, a/k/a R. T. ARMISTEAD, and SARAH H. ARMISTEAD, his wife, and LETITIA HANSON, widow, parties of the first part, and MECCA DEVELOPMENT CORPORATION, a Texas corporation, party of the second part.

W I T N E S S E T H

THAT FOR AND IN CONSIDERATION of the sum of TEN DOLLARS ($10.00) cash in hand paid by the party of the second part to the parties of the first part, and other good and valuable consideration, the receipt of which is hereby acknowledged, the said parties of the first part do hereby bargain, sell, grant and convey with General Warranty and English Covenants of Title unto MECCA DEVELOPMENT CORPORATION, a Texas corporation, the following described property, to-wit:

SEE ATTACHED SCHEDULE "A".

WITNESS the following signatures and seals:

_____ (SEAL)
ROBERT T. ARMISTEAD, a/k/a
R. T. ARMISTEAD

Sarah H. Armistead (SEAL)
SARAH H. ARMISTEAD

_____ (SEAL)
LETITIA HANSON

STATE OF VIRGINIA AT LARGE
CITY OF WILLIAMSBURG, to-wit:

The foregoing instrument was acknowledged before me this 2nd day of May, 1986, by ROBERT T. ARMISTEAD,

Returned to McGuire Woods and Battle, Williamsburg, VA, 5-15-86

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a/k/a R. T. ARMISTEAD, and SARAH H. ARMISTEAD, his wife.

My commission expires: May 9, 1989.

Sue J. Clayton
NOTARY PUBLIC

STATE OF VIRGINIA AT LARGE
CITY OF WILLIAMSBURG, to-wit:

The foregoing instrument was acknowledged before me this 11th day of April, 1986, by LETITIA HANSON, widow.

My commission expires: May 9, 1989.

Sue J. Clayton
NOTARY PUBLIC

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SCHEDULE "A"

All that certain piece or parcel of real property situate, lying and being in James City County, Virginia, containing 27.84 acres±, being set out and shown on a certain plat of survey entitled, "PLAT FOR CONVEYANCE OF 27.84 AC.± FROM ROBERT T. ARMISTEAD, ET ALS TO MECCA DEVELOPMENT CORPORATION, JAMES CITY COUNTY, VIRGINIA", dated April, 1986, made by AES, a Professional Corporation, Engineering, Planning, Surveying, which plat is attached hereto and made a part hereof and to which plat reference is here made for a more accurate description of the property hereby conveyed.

This conveyance is subject to all restrictions, covenants, easements and other matters of record or apparent on the ground.

And being further subject to the following provision:

The streets and entrances shown on a plat entitled, "PROPOSED LOCATION OF ROADS AND DRAINAGE & UTILITY EASEMENTS FOR CONVEYANCE OF 27.84 ACRES TO MECCA DEVELOPMENT CORPORATION", to be recorded contemporaneously herewith as Schedule "B", shall provide access to the remaining property of the parties of the first part, and the utility easements shown thereon shall be for the mutual benefit of the property hereby conveyed and the said remaining property, the owners of which shall have the right to connect to any utilities installed on the property hereby conveyed.

By accepting this Deed, the party of the second part agrees that the streets and utilities shall be constructed on or before April 1, 1987, so as to be adequate to service said remaining property with the standards of the Virginia Department of Highways and be dedicated to the Commonwealth of Virginia.

The parties of the first part further agree that if during the course of construction it is necessary to make changes in the location of the entrances, streets or utility easements which will not interfere with their access thereto, then the said parties of the first part, or their successors, shall

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execute an agreement approving said changes in location.

Being a portion of the same property conveyed to Rosa L. Armistead and Frank Armistead by Deed dated June 7, 1920, recorded in James City Deed Book 19, page 238; the said Frank Armistead having departed this life on September 2, 1952, and by his Will dated September 19, 1921, recorded in Williamsburg Will Book 6, page 431, he devised his interest in said property to Rosa L. Armistead, his wife; the said Rosa L. Armistead having departed this life on August 11, 1956, and by her Will dated September 20, 1953, recorded in James City Will Book 6, page 195, she devised the said property to R. T. Armistead and Letitia Hanson; R. T. Armistead being the same person as Robert T. Armistead, the grantor herein.

VIRGINIA: City of Williamsburg and County of James City, to-wit:
In the Clerk's Office of the Circuit Court for the City of Williamsburg and County of James City the 22 day of May 19 81
This deed was presented with the certificate annexed and admitted to record at 2:05 o'clock The taxes imposed by Sect 58-54 (a) and (b) of the code have been paid
STATE TAX $ 375.90 LOCAL TAX $ 125.30 ADDITIONAL TAX $ 25.00
Teste: Helen S Ward, Clerk
By: Deputy Clerk

PLAT RECORDED IN P.B. NO. 300 PAGE 39

PLAT RECORDED IN P.B. NO. 42 PAGE 54

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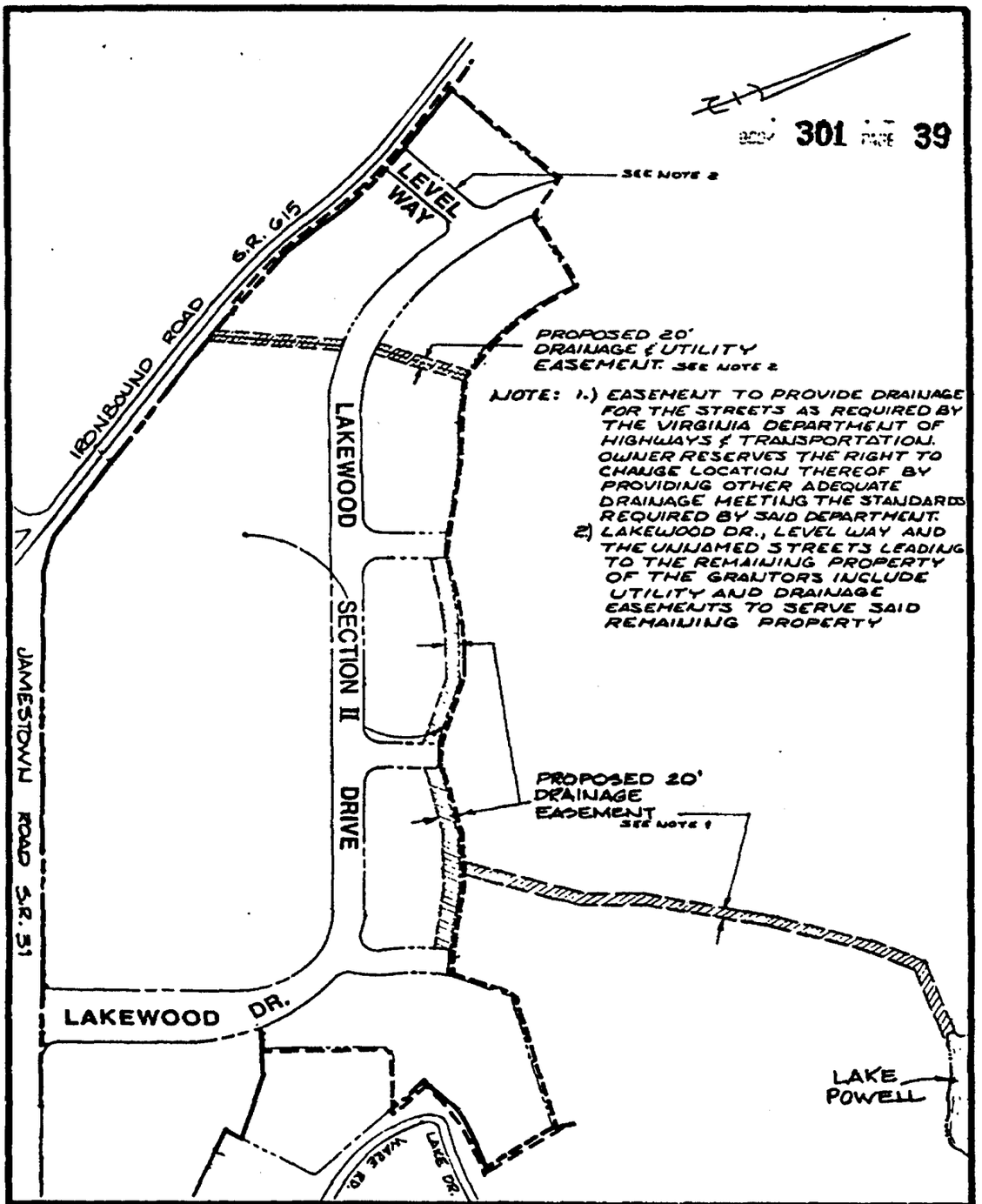
SCHEDULE "B"



NOTE: 1.) EASEMENT TO PROVIDE DRAINAGE FOR THE STREETS AS REQUIRED BY THE VIRGINIA DEPARTMENT OF HIGHWAYS & TRANSPORTATION. OWNER RESERVES THE RIGHT TO CHANGE LOCATION THEREOF BY PROVIDING OTHER ADEQUATE DRAINAGE MEETING THE STANDARDS REQUIRED BY SAID DEPARTMENT.
2) LAKEWOOD DR., LEVEL WAY AND THE UNNAMED STREETS LEADING TO THE REMAINING PROPERTY OF THE GRANTORS INCLUDE UTILITY AND DRAINAGE EASEMENTS TO SERVE SAID REMAINING PROPERTY

AES, a professional corporation — engineers, surveyors, planners — Williamsburg, Virginia

PROPOSED LOCATION OF ROADS AND DRAINAGE & UTILITY EASEMENTS FOR CONVEYANCE OF 27.84 ACRES TO MECCA DEVELOPMENT CORPORATION

Scale: 1"=200'	Ref.:	Date: 4/24/86	Job No. 6240

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015802 BOOK 0814 PAGE 0140 BOOK 57 PAGE 814

VIRGINIA: IN THE CIRCUIT COURT FOR THE CITY OF WILLIAMSBURG AND COUNTY OF JAMES CITY

5 lots

DONALD H. SCHALLER, et al

Complainants,

v. **Chancery No. 11692**

JOHN F. SAWIN BUILDER, INC.,
a Virginia Corporation

Respondent.

ORDER

THIS DAY CAME Donald H. Schaller, Catharina S. Schaller, Settlers Mill Association and John F. Sawin Builder, Inc., by counsel, and represented unto this Honorable Court that agreement had been reached concerning a permanent injunction in this matter.

It appearing to the Court that the original plat of the propery which is the subject of this suit contains language which imposes a restriction prohibiting access or the construction of any driveway over the area designed as "Scenic/Restricted Access Easement" on said plat, it is hereby ORDRED that John F. Sawin Builder, Inc. is permanently enjoined from clearing any portion of the Scenic/Restricted Access Easement area included within Lot 2 as depicted on that certain plat entitled "PLAT OF FIVE LOTS ON JAMESTOWN ROAD, OWNED BY: VENTURE INVESTMENTS, INC., JAMES CITY COUNTY, VIRGINIA" dated May 15, 1991 and recorded in James City County Plat Book 55, Page 60. It is further ORDERED that John F. Sawin Builder, Inc. is

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permanently enjoined from constructing a driveway from Lakewood Drive over the Scenic/Restricted Access Easement to Lot 2.

The Clerk is directed to spread a copy of this Order in the current Deed Book to be indexed in the name of John F. Sawin Builder, Inc. as Grantor and file this matter with the ended causes.

ENTER this 29 day of October, 1996.

William C. Plummer
JUDGE

I ASK THIS:

S. M. Franck

S. M. FRANCK, ESQUIRE
ANDERSON, FRANCK & DAVIS, P. C.
1200 Old Colony Lane
Williamsburg, Virginia 23185
(804) 229 7322

SEEN:

WILLIAM F. MILLER, ESQUIRE
Post Office Box CK
Williamsburg, Virginia 23187
(804) 229 5464