

**Doddridge County Sheriff
Flood Plain Ordinance Fund**


1001
69-217/515

DATE July 2, 2013

PAY TO THE ORDER OF HERALD RECORD

\$ 135.24

One Hundred Thirty-Five Dollars-----

DOLLARS  Security features included. Details on back.



Ralph Sanderson
Beth A. Rogers
MP

#13-002 (Lett) #13-003 (King)
MEMO #13-006 (Antereo/
#13-005 (Antem

⑈001001⑈ ⑈051502175⑈ ⑈119649⑈

BLUE TRADITIONAL

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Don Davis
CR 25
Salem, wV 26426

COMPLETE THIS SECTION ON DELIVERY

A. Signature Agent
Armintha Davis Addressee
B. Received by (Printed Name) C. Date of Delivery
Armintha Davis
D. Is delivery address different from item 1? Yes
If YES, enter delivery address below: No

3. Service Type
 Certified Mail Express Mail
 Registered Return Receipt for Merchandise
 Insured Mail C.O.D.

4. Restricted Delivery? (Extra Fee) Yes

2. Article Number (Transfer from service label) 7012 1010 0001 4282 8034

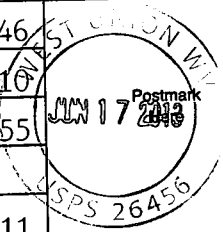
**U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT**
(Domestic Mail Only - No Insurance Coverage Provided)

For delivery information visit our website at www.usps.com
OFFICIAL USE

Postage	\$.46
Certified Fee	3.10
Return Receipt Fee (Endorsement Required)	2.55
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	\$ 6.11

Sent To Don Davis
Street, Apt. No., or PO Box No. CR 25
City, State, ZIP+4 Salem, WV 26426

4282 8034 1000 0101 2102



By: BH - MEH - AML
Asst. Chief Tax Deputy

Michael Headley
Sheriff of Doddridge County

The Person paying Money into the Treasury shall forthwith file one of these Receipts with the County Clerk

Doddridge County, West Virginia

No. 4736

Date: June 17, 2013
Customer copy

Received: #13-005 antero resources appalachian

\$5,153.21

In Payment For: 318 Building Permits (LP)

For: 12-Flood Plain Ordinanc Fund #20 Fund

By: BH - MEH - AML
Asst. Chief Tax Deputy

Michael Headley
Sheriff of Doddridge County



ANTERO RESOURCES APPALACHIAN

1625 17th STREET, SUITE 300
DENVER, COLORADO 80202

Vendor Name	Vendor No.	Date	Check Number	Check Total
DODDRIDGE COUNTY COMMISSION	43312	Jun-13-2013	31687	\$5,153.21

VOUCHER	VENDOR INV #	INV DATE	TOTAL AMOUNT	PRIOR PMTS & DISCOUNTS	NET AMOUNT
06-AP-6815	NTRALIZEDFWI	06/13/13	5,153.21	0.00	5,153.21
	THE LAKE CENTRALIZED FWI - FLOODPLAINPRMTAPP				
	TOTAL INVOICES PAID				5,153.21

2013 JUN 14 PM 3:48
 COUNTY CLERK
 DODDRIDGE COUNTY, WV

DETACH AND RETAIN FOR TAX PURPOSES

Doddridge County Flood Plain Application Fee Calculator

Estimated Construction Costs	730,641.35
Amount over \$100,000	630,641.35
Drilling Oil and Gas Well Fee	1,000.00
Deposit for additional charges	1,000.00
\$5 per \$1,000 over \$100,000	3,153.21
Amount Due with application	5,153.21

Expense

Legal Advertisement:
Doddridge County
Floodplain Permit Application

Please take notice that on the 14th day of June, 2013

ANTERO RESOURCES APPALACHIAN filed an application for a Floodplain Permit to develop land located at or about: **BIG ISAAC UNITED METHODIST CHURCH, TAX MAP 12 PARCEL 9.**

The Application is on file with the Clerk of the County Court and may be inspected or copied during regular business hours.

Any interested persons who desire to comment shall present the same in writing by **July 4, 2013.**

Delivered to the:
Clerk of the County Court
118 E. Court Street, West Union, WV 26456.

Beth A Rogers, Doddridge County Clerk
Dan Wellings, Doddridge County Flood Plain Manager

* P. 01 *
* TRANSACTION REPORT *
* JUN-17-2013 MON 02:21 PM *
* FOR: DODDRIDGE CO. CLERK 304 873 1840 *

SEND

DATE	START	RECEIVER	TX TIME	PAGES	TYPE	NOTE	M#	DP
JUN-17	02:20 PM	93048731600	37"	2	FAX TX	OK	469	
TOTAL :						37S PAGES:	2	

Legal Advertisement:
Doddridge County
Floodplain Permit Application

Please take notice that on the 14th day of June, 2013
ANTERO RESOURCES APPALACHIAN filed an
application for a Floodplain Permit to develop land located at or
about: **BIG ISAAC UNITED METHODIST CHURCH, TAX MAP**
12 PARCEL 9.
The Application is on file with the Clerk of the County Court and
may be inspected or copied during regular business hours.
Any interested persons who desire to comment shall present
the same in writing by **July 4, 2013.**

Delivered to the:
Clerk of the County Court
118 E. Court Street, West Union, WV 26456.

Beth A Rogers, Doddridge County Clerk
Dan Wellings, Doddridge County Flood Plain Manager

PERMIT NO. 13-005

DODDRIDGE COUNTY
FLOODPLAIN DEVELOPMENT
PERMIT

Purpose: ROAD

ISSUED TO ANTERO RESOURCES

ADDRESS: 175-D ELK CREEK RD. MT. CLARE, WV 26408

PROJECT ADDRESS: 4038 BIG ISAAC RD.
SALEM, WV 26426

ISSUED BY: Dan Williams, PS

DATE: 07/18/2002013

THIS PERMIT MUST BE POSTED ON THE PREMISES IN A CONSPICUOUS PLACE SO AS TO BE CLEARLY
VISIBLE FROM THE STREET.

DODDRIDGE COUNTY FLOODPLAIN DEVELOPMENT PERMIT APPLICATION

SECTION 1: GENERAL PROVISIONS (APPLICANT TO READ AND SIGN)

1. No work may start until a permit is issued.
2. The permit may be revoked if any false statements are made herein.
3. If revoked, all work must cease until permit is re-issued.
4. Development shall not be used or occupied until a Certificate of Compliance is issued.
5. The permit will expire if no work is commenced within six months of issuance.
6. Applicant is hereby informed that other permits may be required to fulfill local, state, and federal requirements.
7. Applicant hereby gives consent to the Floodplain Administrator/Manager or his/her representative to make inspections to verify compliance.
8. **I, THE APPLICANT CERTIFY THAT ALL STATEMENTS HEREIN AND IN ATTACHMENTS TO THIS APPLICATION ARE, TO THE BEST OF MY KNOWLEDGE, TRUE AND ACCURATE.**

APPLICANT'S SIGNATURE Anthony Smith Antero Resources

DATE 6/14/2013 (304) 673-6196

SECTION 2: PROPOSE DEVELOPMENT (TO BE COMPLETED BY APPLICANT).

IF THE APPLICANT IS NOT A NATURAL PERSON, THE NAME, ADDRESS, AND TELEPHONE NUMBER OF A NATURAL PERSON WHO SHALL BE APPOINTED BY THE APPLICANT TO RECEIVE NOTICE PURSUANT TO ANY PROVISION OF THE CURRENT DODDRIDGE COUNTY FLOODPLAIN ORDINANCE.

APPLICANT'S NAME: _____

ADDRESS: _____

TELEPHONE NUMBER: _____

BUILDER'S NAME: Antero Resources
ADDRESS: 175-D Elk Creek Rd Mount Clare, WV 26408
TELEPHONE NUMBER: (304) 622-3857

ENGINEER'S NAME: Cyrus S. Kump Navitas Engineering, Inc
ADDRESS: 151 Windy Hill Lane Winchester, VA 22602
TELEPHONE NUMBER: (540) 686-6747

PROJECT LOCATION:

NAME OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT) Big Isaac United Methodist Church
ADDRESS OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT) 4038 Big Isaac Road Salem, WV 26426
DISTRICT: Greenbrier District
DATE/FROM WHOM PROPERTY PURCHASED: _____
LAND BOOK DESCRIPTION: _____
DEED BOOK REFERENCE: Will Book 4 Pg 229
TAX MAP REFERENCE: Tax Map 12 Parcel 9
EXISTING BUILDINGS/USES OF PROPERTY: Church
NAME OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY Don Davis Big Isaac United Methodist Church Parsonage
ADDRESS OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY CR 25 Salem, WV 26426
Tx. MP. 12-9 (304) 782-2296

To avoid delay in processing the application, please provide enough information to easily identify the project location.

= This is our lake centralized Fresh Water Impoundment. Site visit completed with Don Wellms.

DESCRIPTION OF WORK (CHECK ALL APPLICABLE BOXES)

A. STRUCTURAL DEVELOPMENT

ACTIVITY

STRUCTURAL TYPE

- | | | | |
|--------------------------|-------------------------|--------------------------|----------------------------------|
| <input type="checkbox"/> | New Structure | <input type="checkbox"/> | Residential (1 – 4 Family) |
| <input type="checkbox"/> | Addition | <input type="checkbox"/> | Residential (more than 4 Family) |
| <input type="checkbox"/> | Alteration | <input type="checkbox"/> | Non-residential (floodproofing) |
| <input type="checkbox"/> | Relocation | <input type="checkbox"/> | Combined Use (res. & com.) |
| <input type="checkbox"/> | Demolition | <input type="checkbox"/> | Replacement |
| <input type="checkbox"/> | Manufactured/Mobil Home | | |

B. OTHER DEVELOPMENT ACTIVITIES:

- | | | | | | | | |
|-------------------------------------|--|--------------------------|--------|--------------------------|----------|--------------------------|------------|
| <input type="checkbox"/> | Fill | <input type="checkbox"/> | Mining | <input type="checkbox"/> | Drilling | <input type="checkbox"/> | Pipelining |
| <input type="checkbox"/> | Grading | | | | | | |
| <input type="checkbox"/> | Excavation (except for STRUCTURAL DEVELOPMENT checked above) | | | | | | |
| <input type="checkbox"/> | Watercourse Altercation (including dredging and channel modification) | | | | | | |
| <input type="checkbox"/> | Drainage Improvements (including culvert work) | | | | | | |
| <input checked="" type="checkbox"/> | Road, Street, or Bridge Construction | | | | | | |
| <input type="checkbox"/> | Subdivision (including new expansion) | | | | | | |
| <input type="checkbox"/> | Individual Water or Sewer System | | | | | | |
| <input checked="" type="checkbox"/> | Other (please specify) | | | | | | |
| | <u>Oil & Gas - Only road within Flood Plain, all cut, No Fill.</u> | | | | | | |

C. STANDARD SITE PLAN OR SKETCH

- ✓1. SUBMIT ALL STANDARD SITE PLANS, IF ANY HAVE BEEN PREPARED.
2. IF STANDARD SITE PLANS HAVE NOT BEEN PREPARED:
SKETCH ON A SEPARATE 8 ½ X 11 INCH SHEET OF PAPER THE SHAPE AND LOCATION OF THE LOT. SHOW THE LOCATION OF THE INTENDED CONSTRUCTION OR LAND USE INDICATING BUILDING SETBACKS, SIZE & HEIGHT. IDENTIFY EXISTING BUILDINGS, STRUCTURES OR LAND USES ON THE PROPERTY.
3. SIGN AND DATE THE SKETCH.

ACTUAL TOTAL CONSTRUCTION COSTS OF THE COMPLETE DEVELOPMENT IRRESPECTIVE OF WHETHER ALL OR ANY PART OF THE SUBJECT PROPOSED CONSTRUCTION PROJECT IS WITHIN THE FLOODPLAIN \$ 730,641.35

D. ADJACENT AND/OR AFFECTED LANDOWNERS:

1. NAME AND ADDRESS OF ALL OWNERS OF SURFACE TRACTS ADJACENT TO THE AREA OF THE SURFACE TRACT (UP & DOWN STREAM) UPON WHICH THE PROPOSED ACTIVITY WILL OCCUR AND ALL OTHER SURFACE OWNERS UP & DOWN STREAM) WHO OWN PROPERTY THAT MAY BE AFFECTED BY FLOODING AS IS DEMONSTRATED BY A FLOODPLAIN STUDY OR SURVEY (IF ONE HAS BEEN COMPLETED).

NAME: Don Davis
 ADDRESS: CR 25 Salem, WV
26456 (304) 782-2296
up stream & Downstream

NAME: _____
 ADDRESS: _____

NAME: _____
 ADDRESS: _____

NAME: _____
 ADDRESS: _____

1. NAME AND ADDRESS OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON ANY ADJACENT PROPERTY AT THE TIME THE FLOODPLAIN PERMIT APPLICATION IS FILED AND THE NAME AND ADDRESS OF AT LEAST ONE ADULT RESIDING IN ANY HOME ON ANY PROPERTY THAT MAY BE AFFECTED BY FLOODING AS IS DEMONSTRATED BY A FLOODPLAIN STUDY OR SURVEY.

NAME: See Above
 ADDRESS: _____

NAME: _____
 ADDRESS: _____

NAME: _____
 ADDRESS: _____

NAME: _____
 ADDRESS: _____

E. CONFIRMATION FORM

THE APPLICANT ACKNOWLEDGES, AGREES, AND CONFIRMS THAT HE/IT WILL PAY WITHIN 30 DAYS OF RECEIPT OF INVOICE BY THE COUNTY FOR ALL EXPENSES RELATIVE TO THE PERMIT APPLICATION PROCESS GREATER THAN THE REQUIRED DEPOSIT FOR EXPENSES INCLUDING:

- (A) PERSONAL SERVICE OF PROCESS BY THE DODDRIDGE COUNTY SHERIFF AT THE RATES PERMITTED BY LAW FOR SUCH SERVICE.
- (B) SERVICE BY CERTIFIED MAIL RETURN RECEIPT REQUESTED.
- (C) PUBLICATION.

- (D) COURT REPORTING SERVICES AT ANY HEARINGS REQUESTED BY THE APPLICANT.
- (E) CONSULTANTS AND/OR HEARING EXPERTS UTILIZED BY DODDRIDGE COUNTY FLOODPLAIN ADMINISTRATOR/MANAGER OR FLOODPLAIN APPEALS BOARD FOR REVIEW OF MATERIALS AND/OR TESTIMONY REGARDING THE EFFICACY OF GRANTING OR DENYING THE APPLICANT'S FLOODPLAIN PERMIT.

NAME (PRINT): Anthony Smith Antero Resources

SIGNATURE: Anthony Smith DATE: 6/14/2013

After completing SECTION 2, APPLICANT should submit form to Floodplain Administrator/Manager or his/her representative for review.

SECTION 3: FLOODPLAIN DETERMINATION (to be completed by Floodplain Administrator/Manager or his/her representative)

THE PROPOSED DEVELOPMENT:

THE PROPOSED DEVELOPMENT IS LOCATED ON:

FIRM Panel: 260
Dated: 10/04/2011

Is **NOT** located in a Specific Flood Hazard Area (Notify applicant that the application review is complete and **NO FLOODPLAIN DEVELOPMENT PERMIT IS REQUIRED**).

Is located in Special Flood Hazard Area.
FIRM zone designation AE
100-Year flood elevation is: 975.9 NGVD (~~MSL~~)

Unavailable

The proposed development is located in a floodway.
FBFM Panel No. _____ Dated _____

See section 4 for additional instructions.

SIGNED *Dan Wellings*

DATE 07/18/2013

SECTION 4: ADDITIONAL INFORMATION REQUIRED (To be completed by Floodplain Administrator/Manager or his/her representative)

The applicant must submit the documents checked below before the application can be processed.

- A plan showing the location of all existing structures, water bodies, adjacent roads, lot dimensions and proposed development.

- Development plans, drawn to scale, and specifications, including where applicable: details for anchoring structures, storage tanks, proposed elevation of lowest floor, (including basement or crawl space), types of water resistant materials used below the first floor, details of flood proffing of utilities located below the first floor and details of enclosures below the first floor. Also _____

- Subdivision or other development plans (If the subdivision or development exceeds 50 lots or 5 acres, whichever is the lesser, the applicant must provide 100-year flood elevations if they are not otherwise available).

- Plans showing the extent of watercourse relocation and/or landform alterations.

- Top of new fill elevation _____ Ft. NGVD (MSL).
For floodproofing structures applicant must attach certification from registered engineer or architect.

- Certification from a registered engineer that the proposed activity in a regulatory floodway will not result in any increase in the height of the 100-year flood. A copy of all data and calculations supporting this finding must also be submitted.

- Manufactured homes located in a floodplain area must have a West Virginia Contractor's License and a Manufactured Home Installation License as required by the Federal Emergency Management Agency (FEMA).

Other:

SECTION 5: PERMIT DETERMINATION (To be completed by Floodplain Administrator/Manager or his/her representative)

I have determined that the proposed activity (type is or is not) in conformance with provisions of the Floodplain Ordinance adopted by the County Commission of Doddridge County on May 21, 2013. The permit is issued subject to the conditions attached to and made part of this permit.

SIGNED Dan Wellisz DATE 07/18/2013

If the Floodplain Administrator/Manager found that the above was not in conformance with the provisions of the Doddridge County Floodplain Ordinance and/or denied that application, the applicant may complete an appealing process below.

APPEALS: Appealed to the County Commission of Doddridge County? Yes No
Hearing Date: _____
County Commission Decision - Approved Yes No

CONDITIONS: _____

SECTION 6: AS-BUILT ELEVATIONS (To be submitted by APPLICANT before Certificate of Compliance is issued).

The following information must be provided for project structures. This section must be completed by a registered professional engineer or a licensed land surveyor (or attach a certification to this application).

COMPLETE 1 OR 2 BELOW:

- 1 Actual (As-Built) Elevation of the top of the lowest floor (including basement or crawl space is _____ FT. NGVD (MSL)
- 2 Actual (As Built) elevation of floodproofing is _____ FT. NGVD (MSL)

Note: Any work performed prior to submittal of the above information is at risk of the applicant.

SECTION 7: COMPLIANCE ACTION (To be completed by the Floodplain Administrator/Manager or his/her representative).

The Floodplain Administrator/Manager or his/her representative will complete this section as applicable based on inspection of the project to ensure compliance with the Doddridge County Floodplain Ordinance.

INSPECTIONS:

DATE: _____ BY: _____
DEFICIENCIES ? Y/N

COMMENTS _____

SECTION 8: CERTIFICATE OF COMPLIANCE (To be completed by Floodplain Administrator/Manager or his/her representative).

Certificate of Compliance issued: DATE: _____ BY: _____

**CERTIFICATE OF COMPLIANCE
FOR DEVELOPMENT IN SPECIAL FLOOD HAZARD AREA
(OWNER MUST RETAIN)**

PERMIT NUMBER: _____

PERMIT DATE: _____

PURPOSE –

CONSTRUCTION LOCATION: _____

OWNER'S ADDRESS: _____

**THE FOLLOWING MUST BE COMPLETED BY THE FLOODPLAIN
ADMINISTRATOR/MANAGER OR HIS/HER AGENT.**

**COMPLIANCE IS HEREBY CERTIFIED WITH THE REQUIREMENT OF THE
FLOODPLAIN ORDINANCE ADOPTED BY THE COUNTY COMMISSION OF
DODDRIDGE COUNTY ON MAY 21, 2013.**

SIGNED _____ **DATE** _____

STATE OF WEST VIRGINIA,
COUNTY OF DODDRIDGE, TO WIT

I, Virginia Nicholson, Editor of THE
HERALD RECORD, a weekly newspaper
published regularly, in Doddridge County,
West Virginia, Do Hereby Certify Upon
Oath That the Accompanying Legal Notice
Entitled:

Floodplain Permit
Application
Antero Resources
was published in said paper for ... *2*

successive weeks beginning with the issue
of ... *June 18th* 2013 and
ending with the issue of

... *June 25th* 2013 and
that said notice contains ... *168*

WORD SPACE at ... *115* cents a word
amounts to the sum of \$... *19.32*

FOR FIRST PUBLICATION, SECOND
PUBLICATION IS 75% OF THE FIRST
PUBLICATION

\$ *14.49*
and each publication thereafter
\$ *33.81* TOTAL

EDITOR
Virginia Nicholson

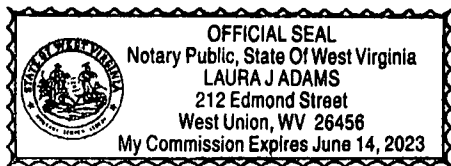
SWORN TO AND SUBSCRIBED
BEFORE ME THIS THE ... *27* ... DAY

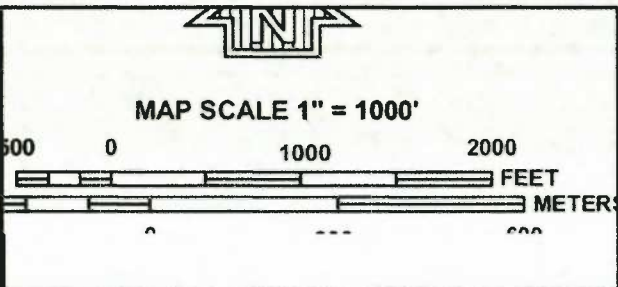
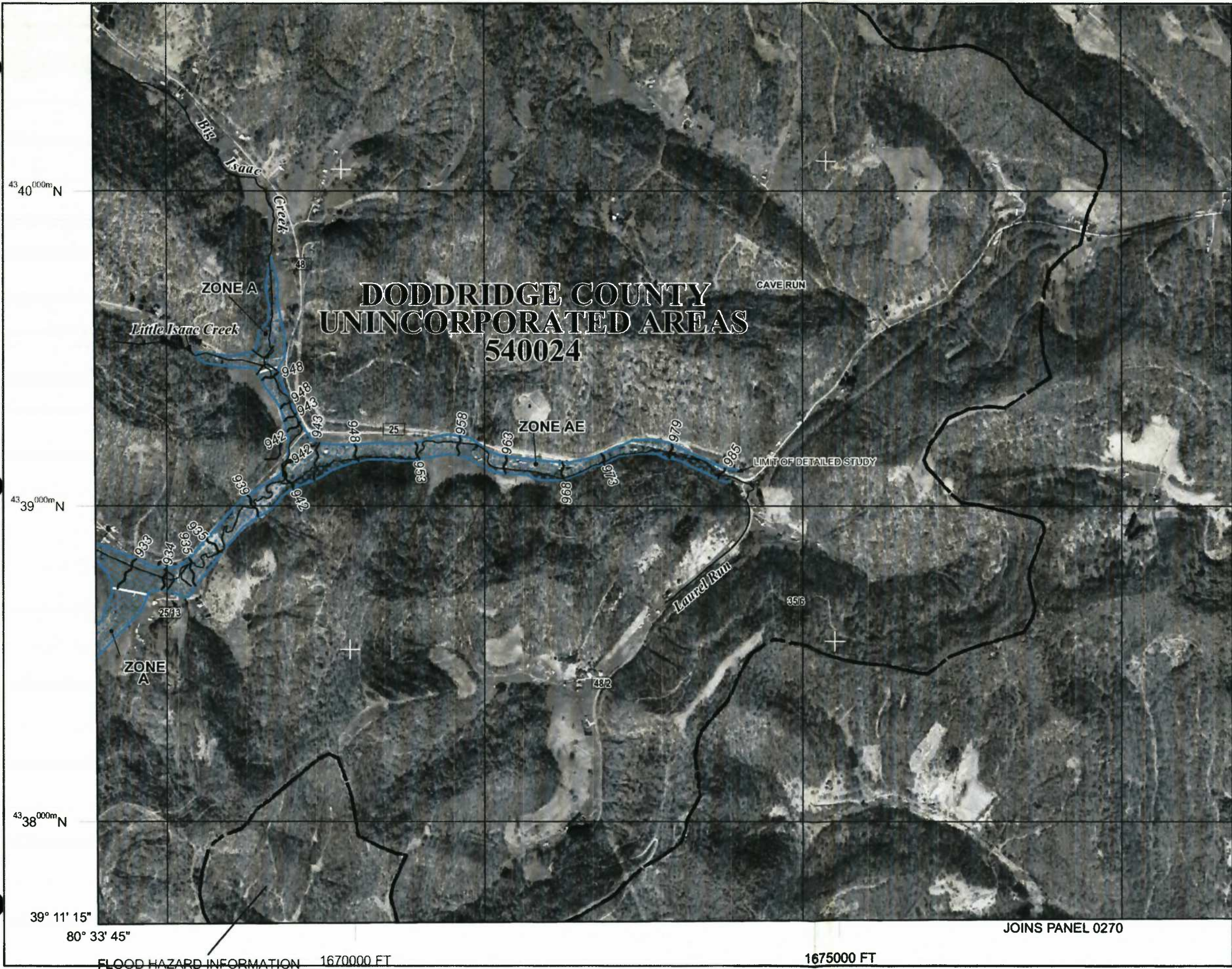
OF ... *June* 2013
NOTARY PUBLIC

Laura J Adams

13-005

Legal Advertisement:
Doddridge County
Floodplain Permit Application
Please take notice that on the 14th day of June, 2013,
ANTERO RESOURCES, APPALACHIAN, filed an
application for a Floodplain Permit to develop land
located at or about: BIG ISAAC UNITED METHODIST
CHURCH, TAX MAP 12, PARCEL 9.
The Application is on file with the Clerk of the County
Court and may be inspected or copied during regular
business hours. Any interested persons who desire to
comment shall present the same in writing by July 4,
2013.
Delivered to the:
Clerk of the County Court:
118 E. Court Street, West Union, WV 26456
Beth A. Rogers, Doddridge County Clerk
Dan Wellings, Doddridge County Flood Plain Manager
6-18-2xb





**DODDRIDGE COUNTY
UNINCORPORATED AREAS
540024**

PANEL 0260C

FIRM
FLOOD INSURANCE RATE MAP
DODDRIDGE COUNTY,
WEST VIRGINIA
AND INCORPORATED AREAS

PANEL 260 OF 325
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	540024	0260	C

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER
54017C0260C
MAP REVISED
OCTOBER 4, 2011

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

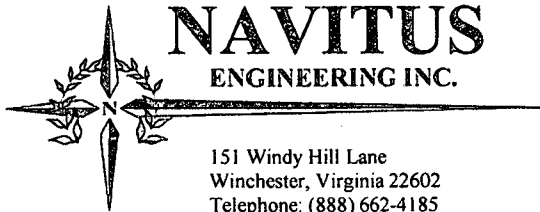
80° 33' 45"

JOINS PANEL 0270

FLOOD HAZARD INFORMATION 1670000 FT

1675000 FT

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



June 13, 2013

Doddridge County Commission
118 East Court Street
West Union, WV 26456

Attn: Dan Wellings, Doddridge County Floodplain Administrator

Re: Lake Centralized Freshwater Impoundment - Floodplain Analysis

Dear Mr. Wellings:

Navitus Engineering has completed a floodplain analysis for the access road entrance to the Lake Centralized Freshwater Impoundment Facility along County Route 25, south of Salem, in Doddridge County, West Virginia. The entrance to the proposed site is located within FEMA Flood Zone AE, as shown on the Flood Insurance Rate Maps (FIRM) from the National Flood Insurance Program (NFIP), Map Number 54017C0260C dated October 4, 2011. Being that the site entrance is located in a Flood Zone AE, base flood elevations for this area have been established and detailed study information was found within the Flood Insurance Study for Doddridge County, dated October 4, 2011.

A hydrologic and hydraulic analysis was performed as outlined in the current Doddridge County Floodplain Ordinance, enacted May 21st, 2013. Using field shot data, 10-foot interval topography converted from 3 meter West Virginia GIS Technical Center DEM data, and information taken from USGS 7.5 Minute Series Topographic Maps, a drainage analysis was performed for the Laurel Run drainage shed. Calculated peak flows for the 100-year storm event were checked for accuracy with the Flood Insurance Study. A HEC-RAS river analysis was conducted for a section of Laurel Run adjacent to the Lake site entrance area and Base Flood Elevations (BFE) were established. The resulting BFEs were compared against the BFE's within the Flood Insurance Study for Doddridge County for accuracy and were used to establish adjusted floodplain boundaries for the segment of Laurel Run being studied. These boundaries are shown on the attached Floodplain Exhibit of this development site. In addition to establishing BFEs, a proposed conditions analysis was performed to determine the impacts of the proposed access road entrance. All associated construction activities within the floodplain zone include only excavation and there is no fill proposed within the flood limits. The proposed grading was added into the cross sections and the manning's "n" values were adjusted in the proposed conditions of the model. The model was evaluated with these changes to determine the impacts of the proposed access road. The results of this analysis indicate that the proposed access road improvements will cause negligible impacts to the BFEs in this area and no upstream or downstream properties will be impacted.

Attached are the following documents associated with this submission:

- A Floodplain Analysis of Laurel Run documenting the methods used for the analysis, drainage computations, cross sections, and a narrative to describe the analysis. Included with this analysis are exhibits that identify the existing and proposed 100-year floodplain.

- The Lake Centralized Freshwater Impoundment Site Plan, prepared by Navitus Engineering, Inc. which includes additional site design and construction specifications.
- The WVDEP Office of Oil and Gas Certificate of Approval (COA #17-FWC-00007)
- WVDOH Encroachment Permit (MM-109 Permit #04-2013-0393)
- Access Road agreement with Big Isaac United Methodist Church
- Project Cost Estimate
- Floodplain Permit Application Fee (\$5,153.21)
- Doddridge County Improvement Location Permit Application

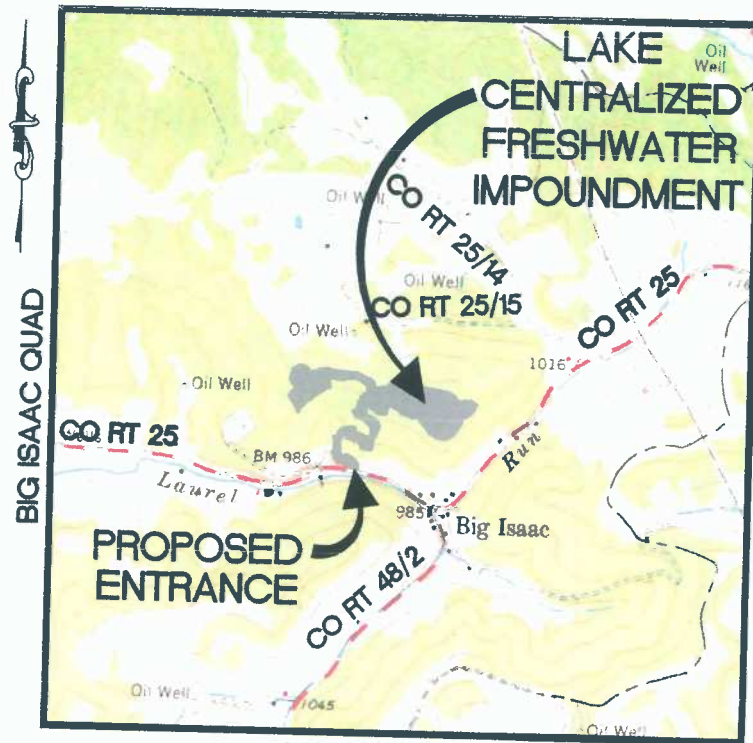
Should any questions or comments arise during the review, please let us know and we will work to address them. Please let me know if you should need additional information. You can reach me by phone (540) 336-9486 or email: dmurphy@navituseng.com.

Sincerely,
Navitus Engineering, Inc.



Daniel E. Murphy

FLOODPLAIN ANALYSIS OF
LAUREL RUN
LAKE
CENTRALIZED FRESHWATER IMPOUNDMENT



VICINITY MAP
1" = 2,000'



NAVITUS
ENGINEERING INC.

151 Windy Hill Lane
Winchester, VA 22602
Telephone: (888) 662-4185
www.navituseng.com

Prepared For:



981 East Washington Avenue
Ellenboro, WV 26346
(304) 869-3405

Contacts:

Aaron Kunzler, Construction Supervisor
(405) 227-8344
Anthony Smith, Field Engineer
(304) 673-6196
Burt Simcox, Land Agent
(304) 282-9372
Chris Brown, Water Resources
(304) 877-8233

Engineering — Survey — Environmental — GIS

Designed By:
Navitus Engineering Inc.

Project Manager:
Dan Murphy
dmurphy@navituseng.com

Surface Owner (s)
Antero Resources Appalachian
Corporation & Big Isaac United
Methodist Church

Tax Parcel:
Map 12 Parcel 19 & Parcel 32
Location:
Greenbrier District, Doddridge County
West Virginia



Date: June 13, 2013

FN# ANT019

1. Objective

The objective of this floodplain analysis was to establish boundaries for the existing and proposed conditions of the 100 year base flood elevations (BFE). The proposed condition includes the installation of an access road for a centralized freshwater impoundment where the entrance off of County Route 25 is within the FEMA floodplain.

2. Existing Conditions

2.1. Property Description

This site is located in Doddridge County, West Virginia along Laurel Run and County Route 25 south of Salem. The proposed access road entrance is located on the north side of County Route 25.

2.2. Floodplain Delineation

The approximate limit of the 100-year floodplain (a flood event that has a 1% chance of being equaled or exceeded in any given year) is shown on FEMA Flood Insurance Rate Map (FIRM) for Doddridge County on panels 54017C0260C effective October 4, 2011. This floodplain is located in flood zone designation "AE" as shown on the FIRM, and there has been a detailed study analysis with whole foot base flood elevations established within the Doddridge County Flood Insurance Study (FIS) effective October 4, 2011.

2.3. Floodplain Ordinance

This site is administered under the Doddridge County Floodplain Ordinance. Per Section 4.3 of the ordinance, when a site is located in FEMA Flood Zone designation "AE" no new construction or development shall be allowed unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the elevation of the 100-year flood more than one (1) foot at any point.

Per Section 5.1 of this ordinance, permits are required for the construction of the entrance to the centralized freshwater impoundment. The format of the permit will coincide with the requirements set forth in Section 5.2 of the ordinance.

Per Section 6.1.E of this ordinance, any fill associated with the project shall be only used in manner which does not affect upstream and downstream properties. The access road entrance has been designed with this in mind and the entrance construction will consist only of excavation and proposes no fill within Flood Zone "AE". Impacts to the 100 year are demonstrated later in this report, however, the entrance road did not cause a rise in the base flood elevations.

Per Section 6.1.I of this ordinance, no material or equipment storage shall be allowed within the vicinity of the entrance. The storage of all material and equipment shall be onsite and away from the entrance.

Per Section 6.1.K of this ordinance, an entrance culvert is proposed at the entrance to allow adequate drainage to the existing road side ditch.

All other specific requirements covered in Section 6.1 of this ordinance are not applicable to this design. (Sections 6.1.A, 6.1.B, 6.1.C, 6.1.D, 6.1.F, 6.1.G, 6.1.H, 6.1.J, and 6.1.L)

The developer shall conform with all administrative procedures as outline in Article 7 of this ordinance.

2.4. Laurel Run Characteristics

Laurel Run is located in the Greenbrier District of Doddridge County and flows in a southwesterly direction. The drainage area flowing to Laurel Run at the access road entrance location is approximately 1,010 acres of forested and agricultural land with an average basin slope of 35.85%.

3. Analysis Information

3.1. HEC-RAS

A HEC-RAS hydraulic analysis was performed for the portion of the Laurel Run that has an impact on the BFE's across the property. HEC-RAS is designed to perform one-dimensional hydraulic calculations for a full network of natural and constructed channels. The steady flow system is designed for applications in floodplain management and flood insurance studies.

3.2. Analysis Limits

The analysis information is based upon two foot interval aerial shot topography by Blue Mountain Aerial Mapping. The upstream analysis limit for Laurel Run is located approximately 956 feet upstream from the proposed entrance location and represents the 63+14.305 section. The downstream analysis limit for Laurel Run is located approximately 5,357 feet downstream of the proposed entrance location and represents the 10+00.000 section. These limits were selected so that the HEC-RAS model would accurately determine the base flood elevations on site and off site.

3.3. Flow Data

The hydrologic analysis utilized USDA soil surveys for computation of drainage shed curve numbers, aerial topography and 3 meter West Virginia GIS Technical Center DEM to determine the drainage area(s) and time of concentration path(s). The peak 100-year discharge within the inundation area was determined through TR-55 SCS methodology.

Time of concentration paths were calculated utilizing the SCS lag method. The hydrologic calculations for the drainage area were performed using HEC-HMS. See the table below for a summary of the flow conditions and see Supplement 1 for the complete Drainage Computations.

Stream	Drainage Area	Flow (cfs)	Note
Laurel Run	1,022.72 Ac.	1,496.7	Upper Reach
Laurel Run	1,190.39Ac.	1,659.5	Lower Reach

3.4. Cross Section Data

The cross sections were employed at significant changes in site features. This includes major bends in the stream channel, areas of major contraction and expansion of the floodplain area, upstream and downstream of existing culverts, and at building obstructions (cross sections were compiled using Aerial Mapping by Blue Mountain Aerial Mapping).

3.5. Manning's n-value

The channel and overbank areas were assigned manning's n-values based on photographs and close inspection of existing aerial photography. The chart below describes the manning's n values used in this study.

Manning's n value	Description	Portion Used
.035	Clean, straight, full, no rifts or deep pools, some stones and weeds	Main Channel
.04	Clean, winding, some pools and shoals	Main Channel
.013	Asphalt-smooth	Floodplains
.033	Gravel-Dry rubble or riprap	Floodplains
.035	High grass	Floodplains
.05	Scattered brush, heavy weeds	Floodplains
.06	Light Brush and trees, in summer	Floodplains
.1	Heavy stand of timber, few down trees, little undergrowth, flow below branches	Floodplains

4. Results

4.1. Existing Conditions

Since the site is in Zone "AE" floodplain area as shown on the FIRM, there has been a detailed study analysis with whole foot base flood elevations established within the Doddridge County Flood Insurance Study (FIS) effective October 4, 2011. An existing conditions model was prepared based upon aerial topography and existing drainage

computations. This information was processed in HEC-RAS to determine the existing conditions of the Base Flood Elevations and then compared with the FIS for accuracy.

4.2. Proposed Conditions

The proposed conditions model was based on the proposed topography for the site access road. This information was added into the existing conditions cross sections, and then was processed in HEC-RAS to determine the proposed conditions of the Base Flood Elevations. A summary of elevation changes showing the existing and proposed BFEs at the various cross sections has been provided below. As shown in the table, the proposed development will not increase the existing BFEs within the project area or upstream and downstream of the entrance location.

LAKE FLOODPLAIN STUDY				
SUMMARY OF COMPUTED ELEVATIONS				
CROSS SECTION STATION	RIVER NAME	100 YEAR BASE FLOOD ELEVATION		
		EXISTING CONDITIONS MODEL	PROPOSED CONDITIONS MODEL	PROPOSED DIFFERENCE
6314.305	Laurel Run Upper	984.0	984.0	0.0
6232.875	Laurel Run Upper	983.1	983.1	0.0
6088.039	Laurel Run Upper	982.1	982.1	0.0
5772.495	Laurel Run Upper	978.5	978.5	0.0
5494.591	Laurel Run Upper	976.4	976.4	0.0
5357.523	Laurel Run Upper	975.9	975.9	0.0
5335.512	Laurel Run Upper	975.9	975.9	0.0
5187.560	Laurel Run Upper	974.9	974.9	0.0
5118.449	Laurel Run Upper	974.6	974.6	0.0
5070.286	Laurel Run Upper	973.2	973.2	0.0
4998.406	Laurel Run Upper	972.5	972.5	0.0
4765.350	Laurel Run Upper	969.8	969.8	0.0
4431.983	Laurel Run Upper	968.3	968.3	0.0
4266.832	Laurel Run Upper	966.7	966.7	0.0
3949.469	Laurel Run Upper	964.1	964.1	0.0
3900.631	Laurel Run Upper	963.9	963.9	0.0
3853.996	Laurel Run Upper	963.1	963.1	0.0
3791.489	Laurel Run Upper	962.2	962.2	0.0
3691.713	Laurel Run Upper	959.9	959.9	0.0
3675.796	Laurel Run Upper	959.8	959.8	0.0
3657.812	Laurel Run Upper	959.6	959.6	0.0
3632.733	Laurel Run Upper	959.3	959.3	0.0
3465.882	Laurel Run Upper	959.0	959.0	0.0
3309.640	Laurel Run Upper	958.8	958.8	0.0

3269.177	Laurel Run Upper	958.7	958.7	0.0
3243.083	Laurel Run Upper	956.7	956.7	0.0
3206.856	Laurel Run Upper	956.3	956.3	0.0
3119.439	Laurel Run Upper	954.7	954.7	0.0
2947.900	Laurel Run Upper	953.1	953.1	0.0
2616.159	Laurel Run Upper	949.4	949.4	0.0
2447.349	Laurel Run Upper	947.9	947.9	0.0
2242.734	Laurel Run Upper	945.7	945.7	0.0
1937.711	Laurel Run Upper	943.9	943.9	0.0
1633.916	Laurel Run Upper	942.6	942.6	0.0
1559.375	Laurel Run Upper	942.4	942.4	0.0
1517.572	Laurel Run Upper	942.4	942.4	0.0
1393.455	Laurel Run Upper	942.4	942.4	0.0
1327.528	Laurel Run Upper	942.4	942.4	0.0
1246.668	Laurel Run Upper	942.4	942.4	0.0
1158.443	Laurel Run Upper	942.4	942.4	0.0
1055.088	Laurel Run Upper	942.4	942.4	0.0
1000.000	Laurel Run Upper	942.3	942.3	0.0
2531.399	Big Isaac Lower	946.7	946.7	0.0
2364.929	Big Isaac Lower	944.8	944.8	0.0
2037.082	Big Isaac Lower	942.9	942.9	0.0
1730.807	Big Isaac Lower	942.4	942.4	0.0
1669.175	Big Isaac Lower	942.4	942.4	0.0
1539.840	Big Isaac Lower	942.4	942.4	0.0
1419.259	Big Isaac Lower	942.4	942.4	0.0
1318.016	Big Isaac Lower	942.4	942.4	0.0
1266.884	Big Isaac Lower	942.4	942.4	0.0
1172.189	Big Isaac Lower	942.4	942.4	0.0
1096.461	Big Isaac Lower	942.4	942.4	0.0
1000.000	Big Isaac Lower	942.3	942.3	0.0
1335.848	Meathouse Fork	942.1	942.1	0.0
1191.458	Meathouse Fork	942.0	942.0	0.0

5. Conclusion

The results of this floodplain analysis indicate that there will be no changes in the 100 year base flood elevation and no impacts to upstream and downstream properties along Laurel Run.

APPENDIX




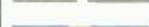
Exhibit A	FIRM Panel 54017C0260C
Exhibit B	Overall Plan
Exhibit C	Existing Conditions Plan
Exhibit D	Proposed Conditions Plan
Supplement 1	Drainage Computations
Supplement 2	HEC-RAS Analysis –Existing Conditions Summary
Supplement 3	HEC-RAS Analysis –Proposed Conditions Summary w/ Cross Sections

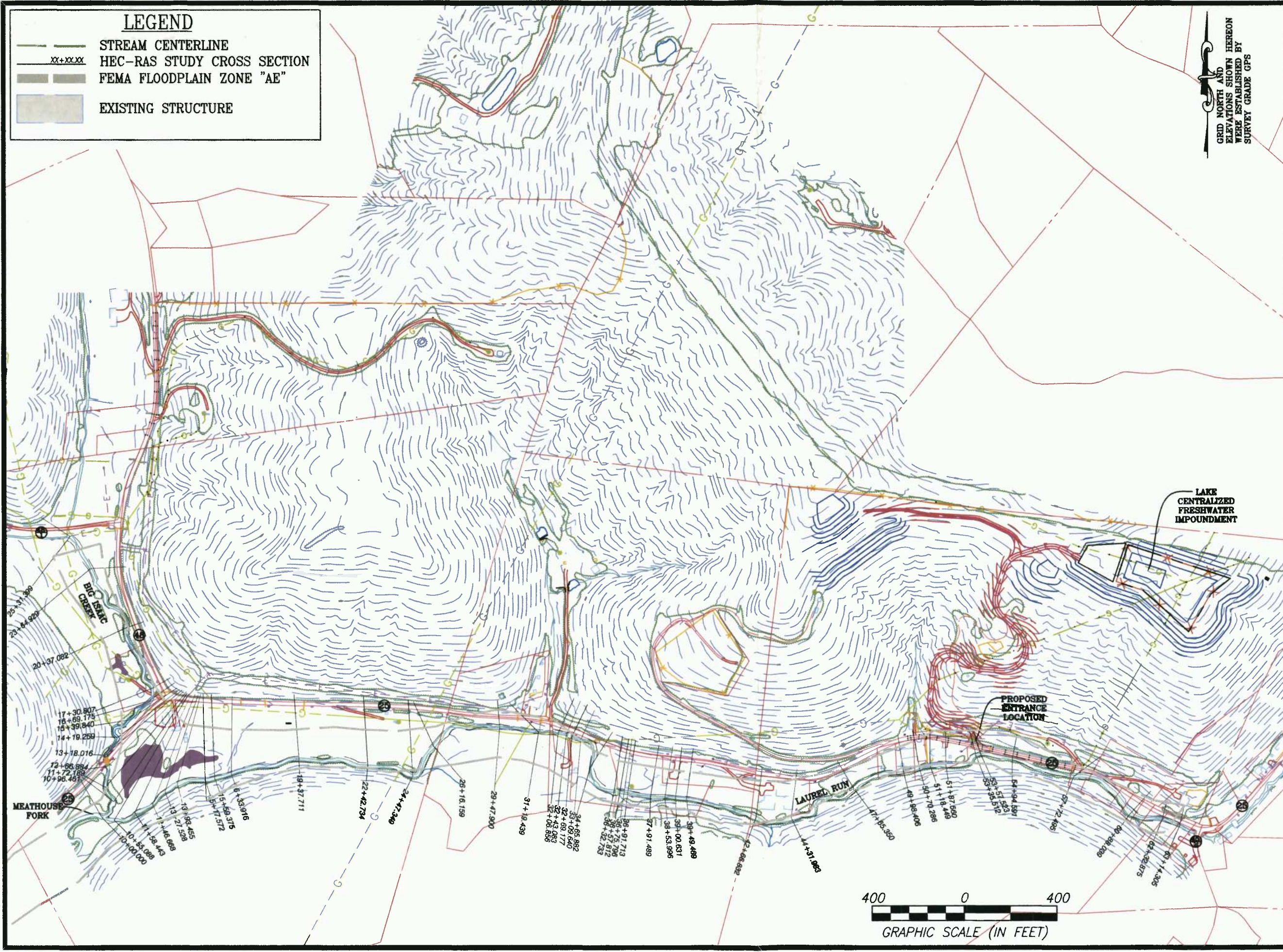
Exhibit A

FIRM Panel 54017C0260C

Exhibit B
Overall Plan

LEGEND

-  STREAM CENTERLINE
-  HEC-RAS STUDY CROSS SECTION
-  FEMA FLOODPLAIN ZONE "AE"
-  EXISTING STRUCTURE



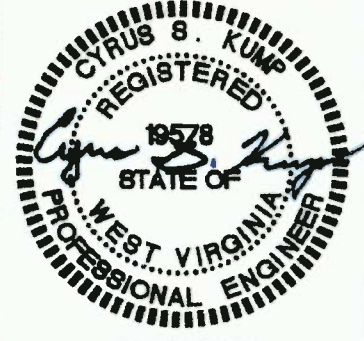
GRID NORTH AND ELEVATIONS SHOWN HEREON WERE ESTABLISHED BY SURVEY GRADE GPS



NAVITUS
ENGINEERING INC.

151 Windy Hill Lane
Winchester, Virginia 22602
Telephone: (888) 662-4185
www.navituseng.com

Engineering • Survey • Environmental • GIS



06/13/2013

ANTERO RESOURCES
THIS DOCUMENT WAS PREPARED FOR:
ANTERO RESOURCES APPALACHIAN CORP

OVERALL CONDITIONS PLAN
LAKE CENTRALIZED FRESHWATER IMPOUNDMENT
GREENBRIER DISTRICT
DODDRIDGE COUNTY, WV

SCALE: 1" = 400'

LAKE
JOB NO. ANT019

DATE: 06/13/2013

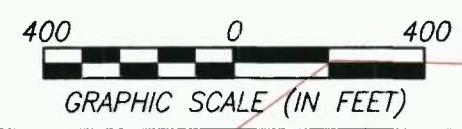

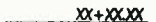





Exhibit C
Existing Conditions Plan

LEGEND

-  STREAM CENTERLINE
-  HEC-RAS STUDY CROSS SECTION
-  FEMA FLOODPLAIN ZONE "AE"
-  EXISTING 100-YR FLOODPLAIN
-  FLOOD PROTECTION SETBACK

TM 12-19
 ANTERO RESOURCES APPALACHIAN CORPORATION
 DB 56 PG 482
 55.86 AC

GRID NORTH AND ELEVATIONS
 SHOWN HEREON WERE
 ESTABLISHED BY SURVEY GRADE
 GPS

NAVITUS
 ENGINEERING INC.

151 Windy Hill Lane
 Winchester, Virginia 22602
 Telephone: (888) 662-4185
 www.navituseng.com

Engineering Survey Environmental GIS

CYRUS S. KUMP
 REGISTERED
 1978
 STATE OF
 WEST VIRGINIA
 PROFESSIONAL ENGINEER

06/13/2013

ANTERO
 RESOURCES

FOR:
 THIS DOCUMENT
 WAS PREPARED
 BY:
 ANTERO RESOURCES
 APPALACHIAN CORP

EXISTING CONDITIONS PLAN

LAKE
 CENTRALIZED FRESHWATER
 IMPOUNDMENT
 GREENBRIER DISTRICT
 DODDRIDGE COUNTY, WV

SCALE: 1" = 50'

LAKE
 JOB NO. ANT019
 DATE: 06/13/2013

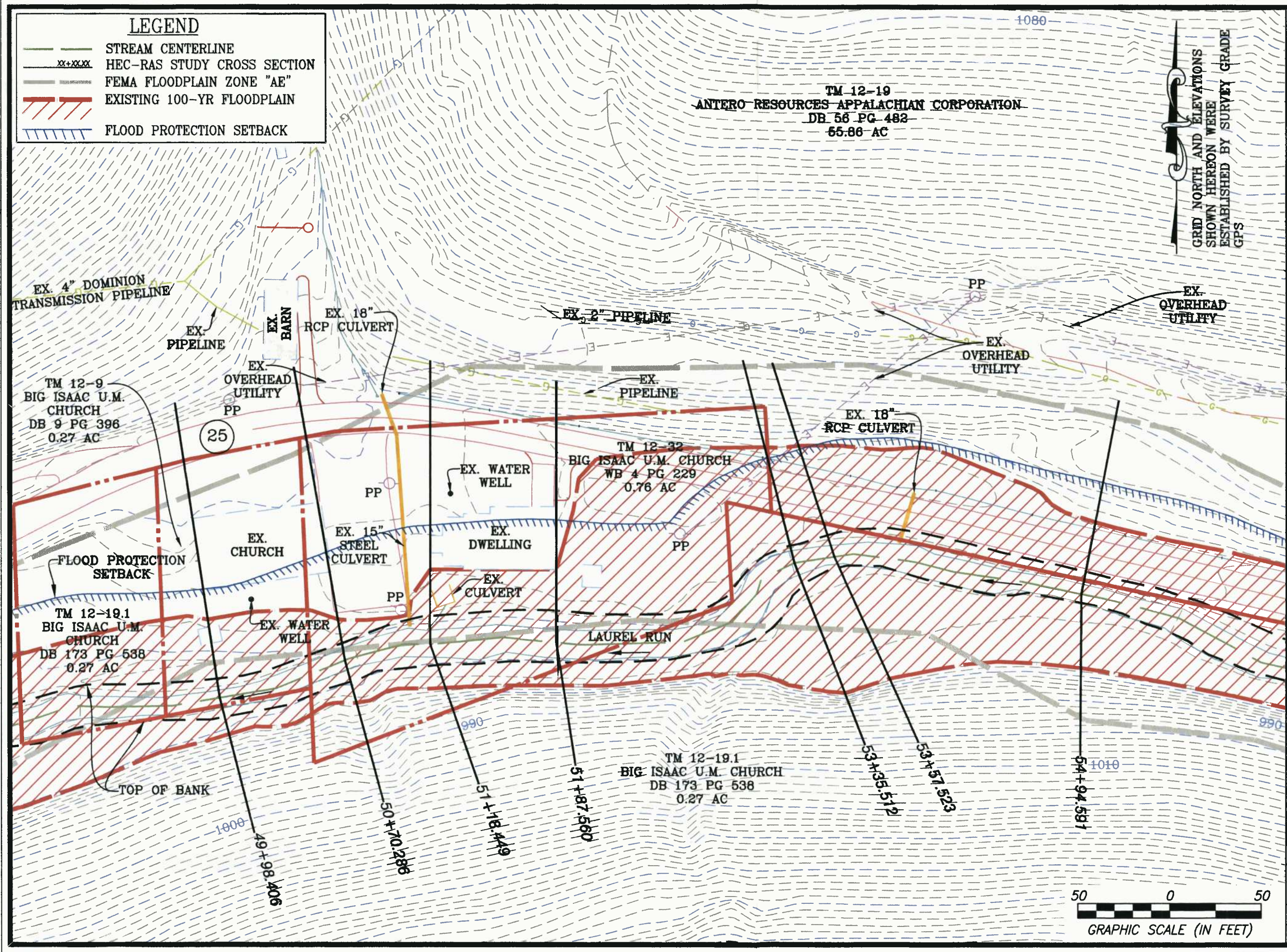

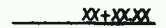



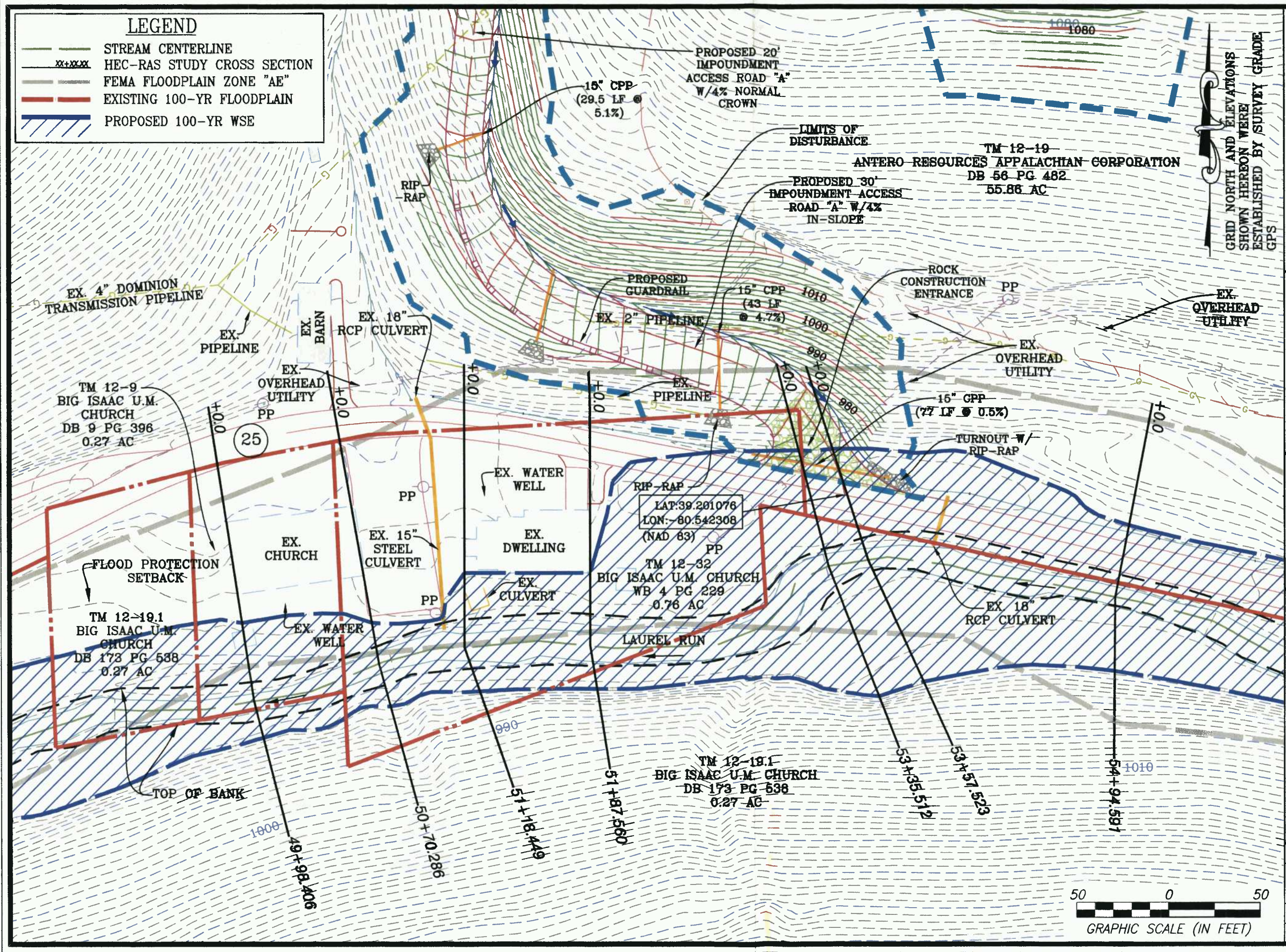


Exhibit D
Proposed Conditions Plan

LEGEND

-  STREAM CENTERLINE
-  HEC-RAS STUDY CROSS SECTION
-  FEMA FLOODPLAIN ZONE "AE"
-  EXISTING 100-YR FLOODPLAIN
-  PROPOSED 100-YR WSE



GRID NORTH AND ELEVATIONS SHOWN HEREON WERE ESTABLISHED BY SURVEY GRADE GPS

TM 12-19
ANTERO RESOURCES APPALACHIAN CORPORATION
DB 56 PG 482
55.86 AC

TM 12-9
BIG ISAAC U.M. CHURCH
DB 9 PG 396
0.27 AC

TM 12-19.1
BIG ISAAC U.M. CHURCH
DB 173 PG 588
0.27 AC

TM 12-32
BIG ISAAC U.M. CHURCH
WB 4 PG 229
0.76 AC

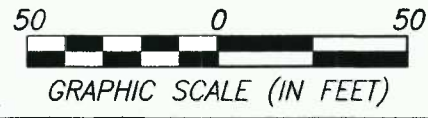
TM 12-19.1
BIG ISAAC U.M. CHURCH
DB 173 PG 538
0.27 AC



ANTERO RESOURCES
THIS DOCUMENT WAS PREPARED FOR:
ANTERO RESOURCES APPALACHIAN CORP

PROPOSED CONDITIONS PLAN
LAKE
CENTRALIZED FRESHWATER
IMPOUNDMENT
GREENBRIER DISTRICT
DODDRIDGE COUNTY, WV

SCALE: 1" = 50'
LAKE
JOB NO. ANT019
DATE: 06/13/2013



NAVITUS
ENGINEERING INC.

151 Windy Hill Lane
Winchester, Virginia 22602
Telephone: (888) 662-4185
www.navituseng.com

Engineering Survey Environmental GIS

Supplement 1
Drainage Computations

Project: Lake

Simulation Run: Existing

Start of Run: 06May2013, 00:00

Basin Model: Existing

End of Run: 07May2013, 00:05

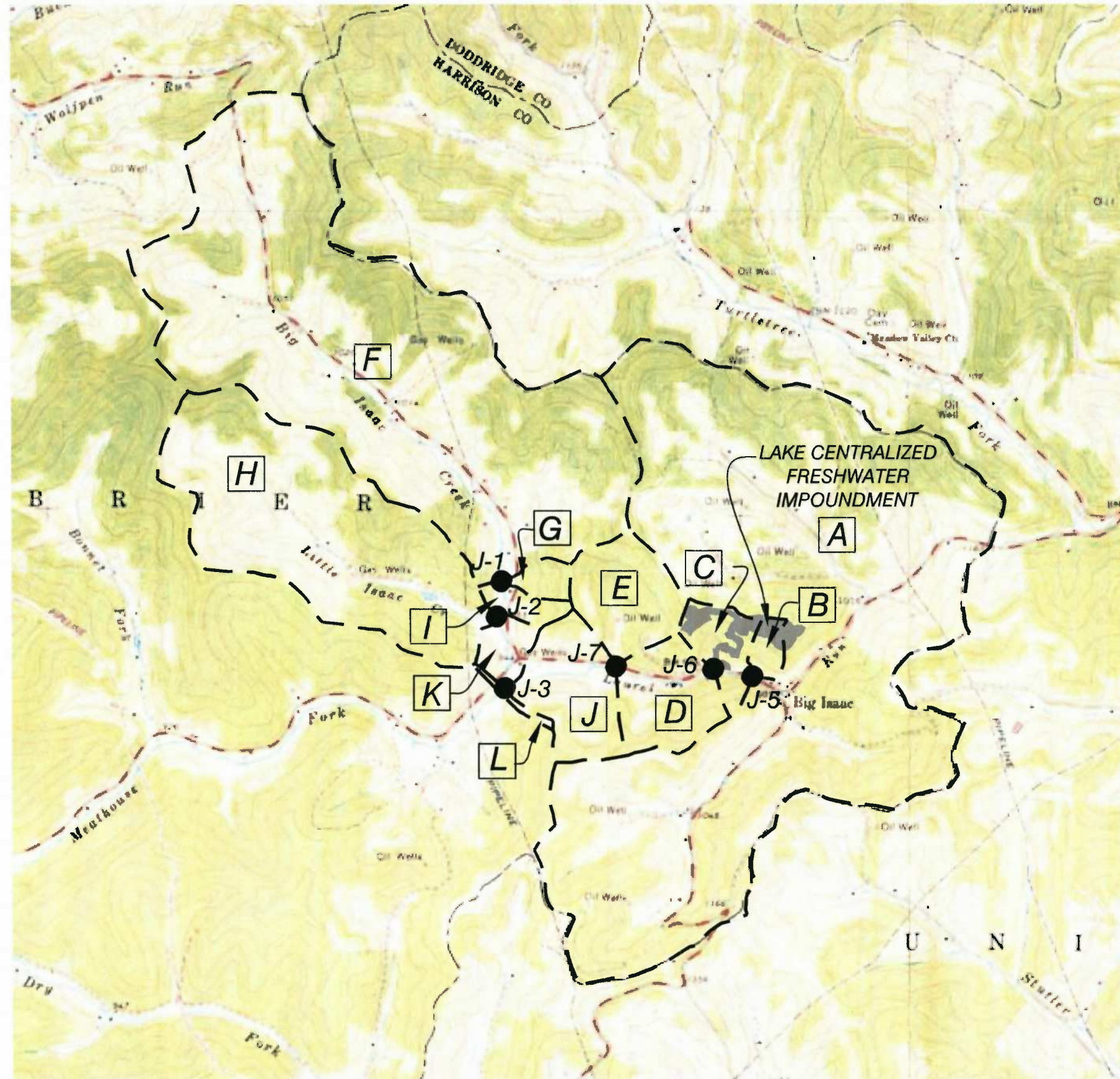
Meteorologic Model: 100 YR

Compute Time: 06May2013, 10:43

Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Upper Laurel	1.579	1489.6	04Dec2012, 12:20	180.5
Upper Laurel 1	0.019	38.7	04Dec2012, 12:00	2.4
Junction-5	1.598	1496.7	04Dec2012, 12:20	182.8
Upper Laurel 2	0.053	98.2	04Dec2012, 12:00	6.1
Junction-6	1.651	1516.8	04Dec2012, 12:20	189
Upper Laurel 3	0.108	174.7	04Dec2012, 12:05	12.9
Middle Laurel	0.101	142.9	04Dec2012, 12:05	10.7
Junction-7	1.86	1659.5	04Dec2012, 12:15	212.6
Upper Big Isaac	1.167	925.8	04Dec2012, 12:25	128
Middle Big Isaac	0.021	42.6	04Dec2012, 12:00	2.6
Junction-1	1.188	932.4	04Dec2012, 12:25	130.6
Little Isaac	0.498	504.9	04Dec2012, 12:15	54.9
Lower Big Isaac	0.024	39	04Dec2012, 12:00	2.6
Junction-2	1.71	1390	04Dec2012, 12:20	188.1
Lower Laurel	0.119	203.2	04Dec2012, 12:00	13.2
Upper Meathouse	0.031	55.5	04Dec2012, 12:00	3.7
Junction-3	3.72	3083.6	04Dec2012, 12:15	417.6
Lower Meathouse	0.006	10.2	04Dec2012, 12:00	0.6
Outlet	3.726	3086.5	04Dec2012, 12:15	418.2

DRAINAGE MAP



USGS 7.5 BIG ISAAC QUAD MAP

WEST VIRGINIA STATE PLANE
 COORDINATE SYSTEM
 NORTH ZONE, NAD83
 ELEVATION BASED ON NAVD88
 ESTABLISHED BY SURVEY GRADE GPS
 & OPUS POST-PROCESSING

KEY	HYDROLOGIC ELEMENT	DRAINAGE AREA (SQ. MI.)
A	UPPER LAUREL	1.579
B	UPPER LAUREL 1	0.019
C	UPPER LAUREL 2	0.053
D	UPPER LAUREL 3	0.108
E	MIDDLE LAUREL	0.101
F	UPPER BIG ISSAC	1.167
G	MIDDLE BIG ISAAC	0.021
H	LITTLE ISAAC	0.498
I	LOWER BIG ISAAC	0.024
J	LOWER LAUREL	0.119
K	UPPER MEATHOUSE	0.031
L	LOWER MEATHOUSE	0.006
	TOTAL	3.726

J-1	JUNCTION 1
J-2	JUNCTION 2
J-3	JUNCTION 3
J-5	JUNCTION 5
J-6	JUNCTION 6
J-7	JUNCTION 7



151 Windy Hill Lane
 Winchester, Virginia 22602
 Telephone: (888) 662-4185
 www.navituseng.com

Engineering Survey Environmental GIS



06/13/2013



DRAINAGE MAP

LAKE
CENTRALIZED FRESHWATER
IMPOUNDMENT
 GREENBRIER DISTRICT
 DODDRIDGE COUNTY, WV

SCALE: 1" = 2000'

LAKE
 JOB NO. ANT019
 DATE: 06/13/2013

Supplement 2

HEC-RAS Analysis –Existing Conditions Summary

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X      X  XXXXXX   XXXX      XXXX      XX      XXXX
X      X  X       X   X      X  X      X  X      X
X      X  X       X   X      X  X      X  X      X
XXXXXXXX XXXX     X       XXX  XXXX     XXXXXX     XXXX
X      X  X       X   X      X  X      X  X      X
X      X  X       X   X      X  X      X  X      X
X      X  XXXXXX   XXXX     X   X     X   X     XXXXXX
```

PROJECT DATA

Project Title: MEATHOUSE
Project File : EntranceStudy.prj
Run Date and Time: 5/1/2013 6:15:59 AM

Project in English units

PLAN DATA

Plan Title: Lake Existing
Plan File : x:\Navitus Jobfiles\Antero Resources\ANT019-Lake\Engineering\Drainage Comp\Floodplain\Entrance
Study\Computations\HEC-RAS\EntranceStudy.p02

Geometry Title: Lake
Geometry File : x:\Navitus Jobfiles\Antero Resources\ANT019-Lake\Engineering\Drainage
Comp\Floodplain\Entrance Study\Computations\HEC-RAS\EntranceStudy.g02

Flow Title : EX MEATHOUSE
Flow File : x:\Navitus Jobfiles\Antero Resources\ANT019-Lake\Engineering\Drainage
Comp\Floodplain\Entrance Study\Computations\HEC-RAS\EntranceStudy.f01

Plan Summary Information:

Number of:	Cross Sections =	56	Multiple Openings =	0
	Culverts =	1	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3

Flow tolerance factor = 0.001 EntranceStudy.rep

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: EX MEATHOUSE
Flow File : x:\Navitus Jobfiles\Antero Resources\ANT019-Lake\Engineering\Drainage Comp\Floodplain\Entrance Study\Computations\HEC-RAS\EntranceStudy.f01

Flow Data (cfs)

River	Reach	RS	100 YR
BIG ISAAC	LOWER	2531.399	1390
LAKE SOUTH BREAC	LAKE SOUTH BREAC	1840.360	1
LAUREL RUN	UPPER	6314.305	1489.6
LAUREL RUN	UPPER	5494.591	1489.6
LAUREL RUN	UPPER	3119.439	1659.5
LAUREL RUN	MIDDLE	5494.591	1489.6
LAUREL RUN	MIDDLE	3119.439	1659.5
MEATHOUSE FORK	MEATHOUSE FORK	1335.848	3087

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
BIG ISAAC	LOWER	100 YR	Normal S = 0.007	
LAUREL RUN	UPPER	100 YR	Normal S = 0.016	
MEATHOUSE FORK	MEATHOUSE FORK	100 YR		Known WS = 942

GEOMETRY DATA

Geometry Title: Lake
Geometry File : x:\Navitus Jobfiles\Antero Resources\ANT019-Lake\Engineering\Drainage Comp\Floodplain\Entrance Study\Computations\HEC-RAS\EntranceStudy.g02

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
BIG ISAAC	LOWER		1

LAUREL RUN UPPER
MEATHOUSE FORK MEATHOUSE FORK 1

JUNCTION INFORMATION

Name: 1
Description:
Energy computation Method

Length across Junction		Tributary		Reach	Length	Angle
River	Reach	River				
BIG ISAAC	LOWER	to MEATHOUSE FORK	MEATHOUSE FORK		1	0
LAUREL RUN	UPPER	to MEATHOUSE FORK	MEATHOUSE FORK		1	0

CROSS SECTION

RIVER: BIG ISAAC
REACH: LOWER RS: 2531.399

INPUT
Description:

Station Elevation Data num= 108

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	958.51	.98	958	2.07	957.44	4.9	956	6.56	955.62
8.7	955.07	11.26	954.44	12.79	954	17.03	953.17	22.73	952
25.08	951.75	27.47	951.53	34.18	950.86	40.48	950.32	41.62	950.22
43.55	950	47.54	950	47.74	949.98	47.9	950	56.14	950
56.47	949.86	58.53	948.94	62.75	948	66.59	946.8	67.45	946.52
69.55	946	75.59	946	76.38	946.33	80.26	948	80.46	948.09
80.85	948.25	93.96	948.07	97.25	948.03	99.12	948.02	99.28	948.01
99.37	948	100.28	947.96	101.14	947.91	101.68	947.88	102.01	947.87
102.4	947.84	103.16	947.8	105.08	947.69	107.21	947.58	108.3	947.51
109.7	947.41	111.69	947.25	118.5	946.83	121.59	946.52	125.26	946
125.82	946	126.95	945.62	128.12	945.33	130.94	944.55	132.97	944
133.17	943.96	133.32	943.94	133.64	943.91	134.41	943.91	146.64	943.75
149.96	943.78	154.5	943.72	158.48	943.94	162.88	943.97	163.58	943.98
166.86	944	170.14	944.25	176.75	944.74	181.78	945.07	184.86	945.25
187.16	945.27	189.15	945.38	189.34	945.39	194.32	945.59	195.31	945.62
196.18	945.64	207.05	946	267.69	946	268.74	946.02	268.86	946.02
283.34	946.22	287.3	946.28	289.24	946.37	291.01	946.46	293.45	946.57
295.79	946.68	300.75	946.92	309.64	947.34	313.76	947.54	321.84	947.92
323.47	948	331.02	948.65	337.15	949.17	346.5	950	354.99	950.7
364.99	951.51	368.07	951.76	371.15	952	382.81	952.94	388.06	953.34
397.65	954	400.86	954.28	408.62	954.88	410.15	954.99	413.45	955.24
415.71	955.36	417.22	955.47	420.33	955.59				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	121.59	.035	207.05	.035

EntranceStudy.rep
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 121.59 207.05 423.58 165.83 116.04 .1 .3

CROSS SECTION

RIVER: BIG ISAAC
 REACH: LOWER

RS: 2364.929

INPUT
 Description:

Station Elevation Data		num= 132									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	971.57	.54	971.12	1.91	970	3.27	968.87	4.34	968		
6.15	966.49	6.75	966	7.81	965.13	9.13	964	10.18	963.02		
11.23	962	12.39	960.84	13.22	960	15.17	958.04	15.22	958		
15.32	957.9	17.12	956	18.12	954.9	18.96	954	21.14	954		
23.59	955.12	24.8	955.47	25.54	955.49	27.4	955.56	38.09	955.96		
39.65	955.97	42.42	954.89	45.04	954	47.86	952.51	48.8	952		
49.26	951.68	51.64	950	52.35	949.5	54.49	948	55.49	947.29		
57.33	946	58.69	945.04	60.17	944	75.31	943.63	79.3	943.54		
106.7	942.87	107.52	942.86	115.48	942.69	143.43	942.09	145.14	942.05		
147.82	942	148.57	941.86	148.97	941.8	149.34	941.75	153.9	941.81		
158.34	941.66	160.51	941.98	160.65	942	160.83	942	162.12	942.05		
162.51	942.06	170.72	942.33	175.37	942.49	182.62	942.74	186.31	942.86		
191.74	943.06	196.09	943.21	197.12	943.24	199.99	943.32	203.54	943.41		
206.69	943.52	211.96	943.65	213.86	943.72	223.39	943.93	223.73	943.94		
224.5	943.96	226.45	944	233.96	944.57	236.46	944.84	240.5	945.18		
246.75	945.81	247.48	945.88	248.76	946	255.62	946.24	255.88	946.25		
262.77	946.5	263.68	946.53	268.95	946.73	271.16	946.78	275.07	946.94		
280.37	947.11	284.77	947.19	287.22	947.25	292.17	947.34	294.6	947.4		
298.18	947.45	300.15	947.51	309.18	947.66	313.01	947.73	313.96	947.76		
318.16	947.83	318.75	947.84	324.03	947.92	324.34	947.92	329.33	948		
333.07	948.08	333.5	948.1	345.58	948.41	347.69	948.47	357.44	948.75		
360.75	948.81	366.57	948.99	370.29	949.04	374	949.1	380.19	949.24		
383.89	949.35	396.36	949.66	397.99	949.7	400	949.75	400.67	949.76		
409.92	950	412.31	950.12	413.47	950.21	414.57	950.31	421	950.75		
423.79	951.06	424.53	951.12	424.96	951.16	431.89	952	432.36	952.25		
435.73	954	438.9	955.66	439.56	956	440.28	956.34	443.75	958		
447.64	959.78	448.01	959.95								

Manning's n Values		num= 7									
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	24.8	.013	42.42	.05	75.31	.035	115.48	.035		
175.37	.035	431.89	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 115.48 175.37 251.58 300 228.64 .1 .3

CROSS SECTION

EntranceStudy.rep

RIVER: BIG ISAAC
REACH: LOWER

RS: 2037.082

INPUT
Description:

Station Elevation Data				num=	94					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	970.28	.52	970	3.08	968.4	3.71	968	4.3	967.64	
6.81	966	7.64	965.43	9.61	964	12.01	962.08	12.11	962	
12.18	961.94	14.41	960	16.15	958.43	16.61	958	16.75	957.87	
18.75	956	23.34	956	25.67	957.24	33.63	957.27	41.31	957.25	
43.39	956.28	43.97	956	46.18	954.86	47.8	954	49.63	952.66	
50.27	952.18	50.51	952	51.46	951.31	53.29	950	54.87	948.92	
56.18	948	57.85	946.87	59.19	946	59.87	945.56	62.27	944	
65.31	942.22	65.81	942	66.72	941.83	67.81	941.66	69.76	941.32	
71.06	941.07	77.93	940	78.66	939.75	79.37	939.49	79.52	939.42	
79.75	939.33	80.8	939.29	90.47	938.88	92	939.83	92.2	940	
92.77	940.04	95.45	940.25	96.4	940.25	101.87	940.54	104.23	940.66	
106.98	940.66	109.43	940.77	111.41	940.87	115.34	940.87	117.2	940.95	
120.52	941.37	125.54	942	211.51	942	238.94	941.83	240.21	941.83	
240.77	941.83	246.21	941.88	255.23	941.95	255.49	941.95	261.27	942	
265.03	942.09	267.48	942.16	268.23	942.18	277.65	942.74	286	943.12	
292.43	943.44	295.4	943.65	296.63	943.72	297.47	943.77	300.6	944	
314.77	945.33	321.3	945.89	322.42	946	333.82	947.82	334.33	947.92	
334.69	948	335.02	948.09	335.91	948.33	342.37	950	347.58	951.62	
348.85	952	349.23	952.14	353.87	954	354.47	954.27			

Manning's n Values				num=	7					
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	
0	.1	25.67	.013	41.31	.05	65.31	.035	95.45	.05	
117.2	.035	333.82	.1							

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	65.31	95.45		273.96	288.77		.1	.3

CROSS SECTION

RIVER: BIG ISAAC
REACH: LOWER

RS: 1730.807

INPUT
Description:

Station Elevation Data				num=	69					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	955.75	2.8	954.65	4.52	954	6.88	953.48	12.4	952	
14.92	950.31	15.41	950	17.66	948.47	18.36	948	18.54	947.88	
21.29	946	22.4	945.23	24.19	944	26.86	942.12	27.03	942	
30.44	942	31.61	942.57	34.53	944	35.15	944.31	35.88	944.66	
36.1	944.77	36.33	944.77	37.79	944.77	41.18	944.76	54.18	944.47	
54.38	944.47	55.79	944.45	56.8	944.4	58.32	944.24	60.83	944	
64.79	943.26	70.75	942	78.87	940.32	80.74	940	82.07	939.53	

EntranceStudy.rep

86.67	938.01	88.72	937.88	96.71	937.28	105.69	938.43	116.9	939.74
119.62	939.74	119.63	939.74	119.64	939.74	119.78	939.74	120.17	939.71
126.42	939.33	129.11	939.17	133.35	939.71	134.76	940	165.38	940
167.3	939.89	167.36	939.89	281.25	938	310.77	938	311.76	938.12
329.39	940	331.48	940.57	336.34	942	339.58	943.13	342.09	944
343.95	944.75	346.8	946	350.06	947.5	351.23	948	354.16	949.38
355.68	950	359.17	951.51	360.25	952	361.2	952.39		

Manning's n Values		num= 6							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	36.1	.013	56.8	.035	78.87	.035	116.9	.035
329.39	.1								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.	
	78.87	116.9		28.48 59.01	21.33		.1	.3	
Ineffective Flow	num= 1								
Sta L	Sta R	Elev	Permanent						
0	55.79		T						

CROSS SECTION

RIVER: BIG ISAAC
REACH: LOWER

RS: 1669.175

INPUT
Description:

Station Elevation Data		num= 99							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	957.8	1.44	957.13	3.82	956	6.34	954.85	8.13	954
11.67	952.4	12.52	952	16.65	950.19	17.08	950	17.29	949.9
21.33	948	23.37	947	25.5	946	28.67	944.42	29.56	944
33.2	942.18	33.56	942	37.68	942	39.01	942.77	40.88	943.81
47.15	943.73	59.1	943.37	65.17	943.22	70.15	943.11	74.85	942.27
75.66	942	77.86	940.74	79.66	940	83.72	940	84.01	940.06
84.03	940.06	85.17	940.28	85.31	940.24	85.82	940.19	87.42	940.37
88.61	940.43	90.37	940.62	91.72	940.78	94.88	940.67	96.89	940.53
100.36	940.31	102.32	940.23	102.94	940.2	103.68	940.17	104.44	940.15
105.03	940.16	109.16	940	112.51	940	113.89	939.64	116.01	939.38
119.46	938.79	121.29	938.54	127.02	938	128.69	937.59	128.78	937.57
128.84	937.56	131.49	937.48	134.76	937.47	147.01	937.2	150.64	937.2
152.26	937.54	153.93	938	162.11	938.3	162.47	938.31	166.11	938.43
169.87	938.54	170.74	938.52	172.98	938.56	175.32	938.59	179.2	938.62
180.7	938.64	182.01	938.59	190.57	938.57	191.77	938.56	193.12	938.51
194.56	938.52	196.58	938.55	197.88	938.48	200.9	938.53	202.01	938.46
202.73	938.49	238.35	938	330.04	938	334.9	938.68	345.07	940
349.81	941.53	351.51	942	352.32	942.31	356.13	944	359.68	945.54
360.73	946	361.23	946.21	365.21	948	366.91	948.73	369.58	950
373.12	951.52	374.24	952	376.52	952.95	381.27	955.08		

Manning's n Values		num= 6							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val

EntranceStudy.rep

0 .1 40.88 .013 70.15 .035 127.02 .035 153.93 .035
 334.9 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 127.02 153.93 25.17 121.96 42.25 .1 .3
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 70.15 T

CROSS SECTION

RIVER: BIG ISAAC
 REACH: LOWER

RS: 1539.840

INPUT

Description:

Station Elevation Data num= 106

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	951.23	3.36	950	5.91	949.08	8.98	948	9.72	947.78
12.37	946.95	14.77	946.21	15.35	946	19.28	944.55	20.62	944
22.39	943.26	25.48	942	28.41	942	29.27	942.71	29.79	943.25
30.46	943.81	32.17	943.77	32.89	943.76	70.37	942.55	70.78	942.68
74.97	942.45	79.9	942.27	87.33	942.03	88.08	942	88.54	941.98
89.21	942	90.9	941.91	94.82	941.79	98.27	941.65	113.23	941.32
113.65	941.3	116.47	941.3	126.39	941.04	129.06	940.93	136.51	940.72
139.55	940.53	145.17	940.24	150.61	940	156.71	939.65	159.07	939.63
168.39	939.27	174.18	939.25	178.69	939.1	180.45	939.08	184.7	939.02
188.82	938.87	192.09	938.83	201.45	938.49	204.13	938.4	204.78	938.37
205.06	938.36	214.9	938.05	216.32	938	219.03	936.81	222.75	935.99
228.2	936.05	230.38	936.01	235.89	937.07	237.75	937.01	244.8	936.04
248.83	936	251.58	936	254.22	935.94	261.11	935.99	261.77	936
261.86	936	262.51	936.27	263.67	936.55	266.43	937.45	270.9	938
296	938	314.42	938	317.7	937.71	318.43	937.73	324.76	938
344.87	938	350.33	938.74	360.54	940	362.75	941.42	363.84	942
366.47	943.75	366.9	944	369.58	945.83	369.84	946	369.89	946.03
370.24	946.27	372.95	948	373.53	948.36	376.16	950	377.85	951.05
379.37	952	382.62	953.74	383.06	954	384.38	954.73	388.32	956.76
392.99	959.09	394.81	960	397.6	961.96	397.67	962	399.96	963.65
400.16	963.75	400.66	964	403.78	965.33	404.81	966	405.23	966.23
405.48	966.39								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	30.46	.013	113.23	.035	214.9	.035	270.9	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 214.9 270.9 14.05 89.52 50.18 .1 .3
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 32.89 T

CROSS SECTION

RIVER: BIG ISAAC
 REACH: LOWER

RS: 1419.259

INPUT

Description:

Station Elevation Data		num= 108		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	951.28	4.04	950	5.83	949.41	10.07	948	11.14	947.67		
13.81	946.84	15.09	946.45	15.38	946.36	15.6	946.29	16.54	946		
19.67	945.04	23.04	944	29.73	944	31.06	943.74	31.56	943.97		
32.9	943.98	34.65	943.93	41.67	943.55	45.66	943.52	53.84	943.34		
63.89	943.1	74.07	942.78	74.16	942.81	83.69	942.29	84.17	942.27		
85.02	942.24	85.59	942.23	86.39	942.22	92.55	942.13	95.04	942.06		
95.58	942.04	96.28	942	96.57	942	105.7	941.55	107.67	941.5		
108.56	941.47	118.48	941.15	120.88	941.11	133.14	940.82	155.86	940.36		
156.13	940.35	157.15	940.35	175.3	940.36	178.88	940.36	180.23	940.34		
191.7	940.25	199.42	940.03	201.29	940.01	202.23	940	204.61	940		
206.58	939.96	209.3	939.92	227.52	939.69	231.71	939.64	238.26	939.65		
256.1	939.31	259.81	939.3	264.43	939.25	287.74	938.61	289.41	938.61		
290.76	938.61	300.29	938.48	305.2	938.41	315.13	938.46	327.13	938		
333.18	938	338.9	936.15	339.4	936	339.49	935.97	341.12	935.32		
346.39	935.32	350.03	935.32	350.21	935.37	353.14	936	355.64	936		
362.74	936.41	367.03	936.59	386.38	938	388.61	938.39	393.92	939.31		
398.61	940	400.22	941.13	401.54	942	403.14	943.11	404.5	944		
406.05	945.08	407.47	946	408.66	947.15	409.55	948	410.03	948.58		
411.4	950	411.54	950.15	413.42	952	414.13	952.76	415.39	954		
418.48	955.93	418.6	956	421.13	957.22	422.64	958	425.73	959.56		
427.14	960.28	430.55	962	432.64	963.11	434.26	964	437.15	965.64		
438.65	966.45	441.47	968	441.61	968.07						

Manning's n Values		num= 7		Sta n Val		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	31.56	.013	95.04	.035	155.86	.013	238.26	.035
333.18	.04	388.61	.1						

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	333.18	388.61		11.01	96.75		.1	.3

CROSS SECTION

RIVER: BIG ISAAC
 REACH: LOWER

RS: 1318.016

INPUT

Description:

Station Elevation Data		num= 103		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	952.48	1.39	952	4.34	950.97	7.21	950	11.36	948.64

EntranceStudy.rep

13.31	948	14.37	947.65	18.33	946.41	19.36	946.09	19.63	946
25.88	944.05	26.02	944	32.16	944	32.48	944.38	32.86	944.76
39.26	944.37	44.55	944	49.61	943.78	54.08	943.49	58.99	943.22
61.92	943.06	68.42	943	69.95	943.04	70.45	943.06	75.95	942.97
94.48	942.33	101.81	942	106.37	941.88	111.05	941.76	115.48	941.61
126.77	941.42	134.57	941.25	148.48	940.98	174.39	940.21	175.21	940.21
187.98	940.16	189.91	940.15	190.86	940.12	200.01	940	216.33	940
236.24	939.68	257.89	939.32	258.06	939.32	258.29	939.32	271.49	939.17
288.43	938.98	295.41	938.86	308.24	938.8	324.14	938.84	354.87	938.81
355.73	938.8	355.77	938.8	355.81	938.79	356.11	938.78	372.12	938.37
385.56	938.18	389.61	938.12	395.88	938.07	400.42	938.03	403.3	938
408.79	937.4	412.25	936.01	412.28	936	414.7	934.93	414.9	934.84
420.56	934.91	430.58	934.88	434.21	934.84	443.06	934.72	446.9	934.94
447.45	935.66	447.99	936	448.67	936.12	451.33	936.54	456.77	938
458.65	938.8	459.59	939.16	461.97	940	462.82	940.82	463.97	942
464.88	942.89	466.82	944.86	468.02	946	468.48	946.46	470.01	948
471.79	949.7	472.11	950	472.26	950.14	475.08	952	477.52	953.59
478.2	954	480.94	955.87	481.16	956	481.33	956.13	484.01	958
484.5	958.41	486.83	960	487.52	960.55	489.62	962	491.09	963.08
492.4	964	493.45	964.69	494.85	965.58				

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	32.86	.013	69.95	.035	271.49	.013	354.87	.035
403.3	.04	456.77	.1						

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 403.3 456.77 9.6 50.46 66.09 .1 .3

CULVERT

RIVER: BIG ISAAC
 REACH: LOWER RS: 1291.256

INPUT

Description:

Distance from Upstream XS = 20.52
 Deck/Roadway width = 14.6
 Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 10											
Sta	Hi Cord	Lo Cord		Sta	Hi Cord	Lo Cord		Sta	Hi Cord	Lo Cord	
44	944	944		61.92	943.8	943.06		115.48	942.2	941.61	
134.57		942	941.25	174.39	941.5	940.21		414.9	939.3	934.84	
430.58	939.3	934.88	448.67	939.3	936.12	456.77		940.4		938	
462.82	940.82	940.82									

Upstream Bridge Cross Section Data

Station Elevation Data num= 103					
Sta	Elev	Sta	Elev	Sta	Elev
0	952.48	1.39	952	4.34	950.97
				7.21	950
				11.36	948.64

EntranceStudy.rep

13.31	948	14.37	947.65	18.33	946.41	19.36	946.09	19.63	946
25.88	944.05	26.02	944	32.16	944	32.48	944.38	32.86	944.76
39.26	944.37	44.55	944	49.61	943.78	54.08	943.49	58.99	943.22
61.92	943.06	68.42	943	69.95	943.04	70.45	943.06	75.95	942.97
94.48	942.33	101.81	942	106.37	941.88	111.05	941.76	115.48	941.61
126.77	941.42	134.57	941.25	148.48	940.98	174.39	940.21	175.21	940.21
187.98	940.16	189.91	940.15	190.86	940.12	200.01	940	216.33	940
236.24	939.68	257.89	939.32	258.06	939.32	258.29	939.32	271.49	939.17
288.43	938.98	295.41	938.86	308.24	938.8	324.14	938.84	354.87	938.81
355.73	938.8	355.77	938.8	355.81	938.79	356.11	938.78	372.12	938.37
385.56	938.18	389.61	938.12	395.88	938.07	400.42	938.03	403.3	938
408.79	937.4	412.25	936.01	412.28	936	414.7	934.93	414.9	934.84
420.56	934.91	430.58	934.88	434.21	934.84	443.06	934.72	446.9	934.94
447.45	935.66	447.99	936	448.67	936.12	451.33	936.54	456.77	938
458.65	938.8	459.59	939.16	461.97	940	462.82	940.82	463.97	942
464.88	942.89	466.82	944.86	468.02	946	468.48	946.46	470.01	948
471.79	949.7	472.11	950	472.26	950.14	475.08	952	477.52	953.59
478.2	954	480.94	955.87	481.16	956	481.33	956.13	484.01	958
484.5	958.41	486.83	960	487.52	960.55	489.62	962	491.09	963.08
492.4	964	493.45	964.69	494.85	965.58				

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	32.86	.013	69.95	.035	271.49	.013	354.87	.035
403.3	.04	456.77	.1						

Bank Sta: Left Right Coeff Contr. Expan.

403.3	456.77	.1	.3
-------	--------	----	----

Downstream Deck/Roadway Coordinates

num= 14

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
50.26	944.21	944.21	65.7	944.15	943.4	92.88	944.1	942.44
115.34	944	942	217.99	943	939.3	289.13	942	938.41
311.26	941.7	938	393.68	941	938	454.92	939.3	938.26
462.61	939.3	934.65	476.93	939.3	935.3	479.64	939.3	935.31
482.6	939.3	937.56	492.41	940.85	940.85			

Downstream Bridge Cross Section Data

Station Elevation Data num= 105

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	953.28	3.6	952	6.68	950.84	8.98	950	11.69	948.89
14.16	948	15.45	947.49	19.59	946.04	19.67	946.01	19.7	946
23.97	944.48	25.49	944	29.07	944	29.23	944.14	29.83	944.72
30.51	945.56	38.86	944.98	50.26	944.21	52.37	944.12	53.84	944
54.82	944	56.04	943.93	56.35	943.91	56.89	943.89	57.27	943.86
65.7	943.4	70.83	943.2	71.74	943.23	72.35	943.22	76.07	943.1
92.88	942.44	101.38	942.28	109.88	942.11	115.34	942	121.6	942
131.3	941.85	133.24	941.81	136.47	941.76	193.66	940.14	198.15	940
202.64	940	217.99	939.3	239.38	939.15	265.36	938.68	267.5	938.66
270.44	938.65	289.13	938.41	293.26	938.4	300.68	938.38	311.26	938
393.68	938	403.2	938.61	405.17	938.62	417.58	938.72	425.37	938.78

EntranceStudy.rep

430.65	938.78	434.94	938.78	452.52	939.17	454.92	938.26	460.05	936.15
461.56	935.29	462.17	934.85	462.61	934.65	476.93	935.3	478.87	935.51
478.9	934.74	479.64	935.31	480.4	936	482.6	937.56	483.09	938
483.95	938.73	485.3	939.39	488.07	940	489.16	940.19	492.41	940.85
501.85	941.08	512.21	941.18	516.87	941.62	518.04	941.74	521.9	942
522.94	943	524.03	944	524.45	944.42	526.08	946	526.57	946.51
528.11	948	528.94	948.75	529.52	949.28	530.25	950	530.83	950.68
532.15	952	533.36	953.24	533.98	954	535.27	955.33	536.34	956
539.29	957.27	540.94	958	542.79	958.82	545.56	960	549.83	961.89
550.12	962	551	962.38	554.89	964	556.12	964.55	556.78	964.84

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	30.51	.013	56.04	.035	452.52	.04	492.41	.013
512.21	.1								

Bank Sta: Left Right Coeff Contr. Expan.
 452.52 492.41 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
116.29	168.42	955

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	5	16

FHWA Chart # 8 - flared wingwalls

FHWA Scale # 1 - Wingwall flared 30 to 75 deg.

Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
7.54	37.35	.012	.035	0	.2	1

Upstream Elevation = 933.95
 Centerline Station = 440

Downstream Elevation = 933.76
 Centerline Station = 471.72

CULVERT OUTPUT Profile #100 YR Culv Group: Culvert #1

Q Culv Group (cfs)	142.10	Culv Full Len (ft)	37.35
# Barrels	1	Culv Vel US (ft/s)	1.78
Q Barrel (cfs)	142.10	Culv Vel DS (ft/s)	1.78
E.G. US. (ft)	942.43	Culv Inv El Up (ft)	933.95
W.S. US. (ft)	942.41	Culv Inv El Dn (ft)	933.76
E.G. DS (ft)	942.38	Culv Frctn Ls (ft)	0.01

EntranceStudy.rep

W.S. DS (ft)	942.36	Culv Exit Loss (ft)	0.03
Delta EG (ft)	0.05	Culv Entr Loss (ft)	0.01
Delta WS (ft)	0.05	Q Weir (cfs)	1247.90
E.G. IC (ft)	942.38	Weir Sta Lft (ft)	108.56
E.G. OC (ft)	942.43	Weir Sta Rgt (ft)	464.39
Culvert Control	Outlet	Weir Submerg	0.98
Culv WS Inlet (ft)	938.95	Weir Max Depth (ft)	3.11
Culv WS Outlet (ft)	938.76	Weir Avg Depth (ft)	1.84
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	653.11
Culv Crt Depth (ft)	1.35	Min El Weir Flow (ft)	939.31

Warning: The weir over culvert is submerged.

Warning: During the culvert inlet control computations, the program could not balance the culvert/weir flow. The reported inlet energy grade answer may not be valid.

CROSS SECTION

RIVER: BIG ISAAC
REACH: LOWER

RS: 1266.884

INPUT

Description:

Station Elevation Data		num= 105									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	953.28	3.6	952	6.68	950.84	8.98	950	11.69	948.89		
14.16	948	15.45	947.49	19.59	946.04	19.67	946.01	19.7	946		
23.97	944.48	25.49	944	29.07	944	29.23	944.14	29.83	944.72		
30.51	945.56	38.86	944.98	50.26	944.21	52.37	944.12	53.84	944		
54.82	944	56.04	943.93	56.35	943.91	56.89	943.89	57.27	943.86		
65.7	943.4	70.83	943.2	71.74	943.23	72.35	943.22	76.07	943.1		
92.88	942.44	101.38	942.28	109.88	942.11	115.34	942	121.6	942		
131.3	941.85	133.24	941.81	136.47	941.76	193.66	940.14	198.15	940		
202.64	940	217.99	939.3	239.38	939.15	265.36	938.68	267.5	938.66		
270.44	938.65	289.13	938.41	293.26	938.4	300.68	938.38	311.26	938		
393.68	938	403.2	938.61	405.17	938.62	417.58	938.72	425.37	938.78		
430.65	938.78	434.94	938.78	452.52	939.17	454.92	938.26	460.05	936.15		
461.56	935.29	462.17	934.85	462.61	934.65	476.93	935.3	478.87	935.51		
478.9	934.74	479.64	935.31	480.4	936	482.6	937.56	483.09	938		
483.95	938.73	485.3	939.39	488.07	940	489.16	940.19	492.41	940.85		
501.85	941.08	512.21	941.18	516.87	941.62	518.04	941.74	521.9	942		
522.94	943	524.03	944	524.45	944.42	526.08	946	526.57	946.51		
528.11	948	528.94	948.75	529.52	949.28	530.25	950	530.83	950.68		
532.15	952	533.36	953.24	533.98	954	535.27	955.33	536.34	956		
539.29	957.27	540.94	958	542.79	958.82	545.56	960	549.83	961.89		
550.12	962	551	962.38	554.89	964	556.12	964.55	556.78	964.84		

Manning's n Values		num= 6									
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	30.51	.013	56.04	.035	452.52	.04	492.41	.013		

EntranceStudy.rep

512.21 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 452.52 492.41 11.19 93.06 33.76 .1 .3
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 116.29 168.42 955

CROSS SECTION

RIVER: BIG ISAAC
 REACH: LOWER RS: 1172.189

INPUT
 Description:

Station Elevation Data			num=	115					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	953.77	.96	953.42	4.74	952	7.59	950.6	9.04	950
12.44	948.38	13.28	948	16.99	946.24	17.56	946	21.64	944.11
21.9	944	22.72	944	23.77	944.77	26.64	946	27.86	946
29.67	945.98	36.05	945.68	47.44	944.92	50.81	944.44	51.67	944.28
53.01	944.18	54.25	944.11	55.57	944	55.97	944	59.83	943.82
74.68	943.17	81.67	942.87	85.53	942.81	101.61	942.46	102.92	942.44
108.63	942.29	110.78	942.29	129.29	942	134.59	942	162.96	940.97
169.17	940.79	197.33	940	201.84	939.71	202.33	939.67	206.13	939.41
208.81	939.2	209.58	939.18	213.19	938.87	215.46	938.68	216.99	938.72
223.93	938.39	265.32	938	366.3	938	375.69	937.64	375.87	937.64
382.75	937.63	405.66	937.57	415.5	937.58	423.44	937.43	426.82	937.43
451.27	937.58	452.03	937.56	453.88	937.57	465.09	937.71	473.52	937.76
476.9	937.79	479.14	937.79	479.57	937.8	482.43	937.79	484.39	937.82
484.53	937.82	487.76	937.8	490.58	937.76	491.09	937.77	524.55	936
538.91	936	540.03	934.95	540.77	934.44	547.66	934.32	550.68	934.32
556.3	934.19	557.08	934.93	558.22	936	576.64	936.72	589.94	937.25
606.18	938	607.87	939.27	608.81	940	610.75	941.66	611.24	942
611.85	942.43	613.6	944	614.33	944.13	615.3	944.37	618.84	945.25
619.14	945.3	619.32	945.28	620.08	945.28	632.93	945.05	633.65	945.04
633.99	945.03	634.09	945.03	634.14	945.02	638.06	946	638.78	946
639.11	946.35	640.59	948	641.39	949	642.26	950	643.28	950.94
644.04	952	644.45	952.4	645.96	954	647.13	955.34	647.8	956
649.88	957.55	650.47	958	652.65	959.72	653.02	960	654.58	961.22

Manning's n Values			num=	8					
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	26.64	.013	47.44	.035	223.93	.05	538.91	.035
558.22	.06	619.14	.013	634.09	.1				

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 538.91 558.22 6.65 73.2 10.56 .1 .3
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 120.69 164.9 955

CROSS SECTION

RIVER: BIG ISAAC
 REACH: LOWER

RS: 1096.461

INPUT

Description:

Station Elevation		Data		num= 115		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	952.07	.2	952	2.6	950.67	3.8	950	6.79	948.36		
7.48	948	10.51	946.35	11.2	946	16.86	946	17.05	946.15		
24.93	946.16	29.15	946	35.31	945.71	40.97	944.93	42.34	944.65		
44.4	944.5	50.49	944	63.43	943.46	85.2	942.87	89.31	942.8		
94.74	942.62	95.83	942.58	97.28	942.53	122.39	942.13	133.34	942		
165.4	940.81	174.24	940.48	178.24	940.33	181.45	940.23	181.89	940.22		
184.69	940.12	185.39	940.1	185.66	940.09	188.77	940	190.34	940		
195.25	939.68	203.71	939.28	205.42	939.19	216.56	938.68	221.48	938.47		
226.72	938.18	227.23	938.16	229.45	938	378.84	938	418.34	936.54		
419.13	936.53	421.55	936.52	429.25	936.48	432.4	936.48	455.91	936		
490.95	936	491.85	936.01	492.01	936	499.68	936	563.8	936		
563.94	935.93	567.55	934.07	571.27	933.97	576.8	933.82	580.15	933.79		
584.45	933.69	588.18	935.14	590.71	935.76	592.07	936	620.34	936		
627.83	936.19	636.33	936.29	641.46	936.35	645.57	936.46	647.6	936.51		
648.84	936.53	653.73	936.61	659.71	936.71	689.38	937.76	690.8	937.79		
691.61	937.82	696.2	938	696.63	938.33	698.71	940	701.32	941.95		
701.39	942	701.58	942.12	701.72	942.22	703.9	944	707.59	945.64		
708.08	946	709.45	946.26	710.08	946.36	710.27	946.39	710.37	946.38		
710.82	946.37	714.16	946.29	721.23	946.12	723.72	946	724	945.99		
725.4	946.03	726.05	945.82	726.75	946	729.46	946	730.68	947.32		
731.27	948	731.6	948.42	732.94	950	734.48	951.47	734.85	952		
736.49	953.66	736.8	954	737.05	954.29	738.71	956	739.57	956.67		
741.25	958	742.61	959.11	743.76	960	745.15	961.15	745.8	961.67		

Manning's n Values		num= 7		Sta n Val		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.05	17.05	.013	35.31	.035	563.8	.035	592.07	.1
710.82	.013	726.75	.1						

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	563.8	592.07		695.49	85.68		.1	.3

Blocked Obstructions			num= 1
Sta L	Sta R	Elev	
136.38	170.07	955	

CROSS SECTION

RIVER: BIG ISAAC
 REACH: LOWER

RS: 1000.000

EntranceStudy.rep

INPUT
Description:

Station Elevation Data		num= 76		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	956.44	.84	956	1.31	955.75	7.83	952.35	8.46	952
8.68	951.88	12.3	950	12.57	949.87	16.42	948	19	946.85
20.92	946	25.24	944	28.65	942.46	29.67	942	30.56	941.6
34.1	940	37.83	939.16	40.83	938.48	43.1	938	81.46	938
85.41	937.34	86.64	937.11	86.77	937.09	94.5	936	97.61	935.57
104.78	934.39	110.63	934.24	115.51	934.05	125.72	933.73	129.87	933.59
131.85	933.57	137.68	935.1	138.92	936	148.52	936	159.7	936
236.31	937.68	237.41	937.68	238.14	937.68	251.55	937.97	252.93	938
255.48	939.29	256.38	939.88	256.54	940	256.71	940.11	257.28	940.52
259.46	942	261.4	943.39	262.36	944	263.05	944.42	265.43	946
267.98	947.43	269.36	947.66	271.97	947.91	271.98	947.91	271.99	947.91
272.02	947.91	272.04	947.91	290.15	946.97	290.32	946.97	291.31	948
293.88	948	294.29	948.32	295.76	950	297.77	951.84	297.92	952
298.15	952.22	299.87	954	301.72	955.68	302.02	956	302.6	956.37
304.79	958	304.93	958.09	305.64	958.62	307.46	960	308.21	960.6
309.42	961.54								

Manning's n Values		num= 3		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	86.64	.04	138.92	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 86.64 138.92 1 1 1 .1 .3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 6314.305

INPUT
Description:

Station Elevation Data		num= 88		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1001.78	1.85	1000.54	2.61	1000	5.08	998.34	5.55	998
7.99	996.17	8.21	996	8.49	995.76	9.65	994.76	10.59	994
11.6	993.11	12.68	992.19	12.89	992	13.46	991.52	15.26	990
17.14	988.46	17.66	988	19.8	986.13	19.98	986	20.4	985.9
28.82	984	30.87	984	34.92	983.83	35.54	983.83	46.09	983.58
82.01	982.06	82.12	982.06	83.11	982.01	83.12	982.01	83.16	982.01
83.33	982	98.91	982	108.17	982	109.86	981.69	112.48	980.65
113.66	980.22	114.11	980	114.54	979.78	116.06	978.99	117.1	978.47
118.96	978.38	125.47	978.35	127.25	979.31	128.56	980	128.77	980.11
132.4	982	132.56	982.08	133.69	982.67	139.11	982.55	140.13	982.54
148.72	982.47	151.26	983.3	152.23	983.59	153.29	983.96	153.37	984
153.6	984.26	155.14	986	155.95	986.9	156.93	988	157.76	988.92
158.72	990	159.55	990.93	160.51	992	161.35	992.94	162.29	994
163.72	995.51	164.25	996	164.84	996.43	167.02	998	167.59	998.39

EntranceStudy.rep

170.31	1000	173.83	1001.83	174.2	1002	174.97	1002.32	178.96	1004
180.41	1004.65	183.31	1006	186.12	1007.73	186.57	1008	187.1	1008.33
189.48	1009.52	190.51	1010	193.82	1010.99	198.22	1011.97	198.28	1011.99
198.34	1012	205.88	1013.69	206.07	1013.74				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	20.4	.035	108.17	.035	133.69	.013	148.72	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

108.17	133.69	79.48	81.18	79.01		.1	.3
--------	--------	-------	-------	-------	--	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
57.73	86.65	995

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 6232.875

INPUT
 Description:

Station Elevation Data num= 74

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1003.36	.99	1002.71	1.96	1002	4.06	1000.62	4.91	1000
7.18	998.51	7.89	998	8.13	997.78	10.81	996	13.13	994.39
13.56	994	14.92	992.77	15.88	992	16.78	991.33	18.35	990
19.89	988.72	20.85	988	21.78	987.3	23.45	986	25.76	984.28
26.1	984	26.11	984	29.59	983.58	40.75	982	86.08	980.34
86.13	980.34	95.68	980	98.03	978.67	99.44	977.87	100.97	977.05
103.96	977.35	110.43	978.37	113.56	979.99	113.59	980	113.91	980.2
116.55	982	116.8	982.14	117.24	982.4	117.53	982.56	119.99	982.51
123.57	982.43	133.28	982.19	136.03	983.22	137.79	984	141.78	985.93
141.95	986	142.08	986.09	144.7	988	147.35	989.7	148.03	990
150.81	991.1	153.6	992	155.12	992.52	156.08	992.86	157.54	993.45
158.81	994	159.81	994.7	161.52	996	163.43	997.41	164.21	998
166.56	999.73	166.93	1000	167.03	1000.08	167.19	1000.18	168.97	1001.35
170.16	1002	172.66	1003.2	174.22	1004	175.87	1004.45	181.02	1006
181.71	1006.23	184.16	1007.02	186.68	1007.81	187.23	1007.98		

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	29.59	.035	95.68	.035	117.24	.013	133.28	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

95.68	117.53	155.12	142.34	81.44		.1	.3
-------	--------	--------	--------	-------	--	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
42.61	71.54	995

CROSS SECTION

EntranceStudy.rep

RIVER: LAUREL RUN
REACH: UPPER

RS: 6088.039

INPUT
Description:

Station Elevation Data		num= 98		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1025.12	2.43	1024	4.47	1023.09	6.78	1022	10.13	1020.09		
10.3	1020	10.36	1020	10.49	1019.93	10.72	1019.8	11.78	1019.19		
13.88	1018	16.57	1016.49	17.44	1016	18.26	1015.55	21.03	1014		
21.4	1013.79	24.51	1012	25.48	1011.44	27.91	1010	29.84	1008.6		
30.8	1008	31.81	1006.71	32.17	1006.25	32.37	1006	32.51	1005.82		
33.91	1004	34.57	1003.11	35.42	1002	36.55	1000.46	36.89	1000		
37.99	998.48	38.34	998	38.56	997.69	39.77	996	40.87	994.69		
41.46	994	42.98	992.32	43.28	992	44.25	990.92	44.96	990.13		
45.08	990	46.71	988.18	46.87	988	46.88	987.99	48.66	986		
48.74	985.9	50.44	984	50.59	983.83	52.22	982	52.42	981.77		
53.99	980	54.36	979.7	56.09	978	57.49	976.56	57.55	976.52		
57.59	976.48	57.81	976.49	76.55	977.72	77.29	977.91	78.4	978		
81.69	978.62	84.47	979.02	87.1	979.4	89.25	980	90.49	980.7		
92.66	982	98.71	982	104.29	981.73	116.9	981.12	119.84	980.98		
126.07	980.64	132.15	981.06	142.49	981.74	142.97	981.83	143.97	982		
156.83	984	162.48	985.17	167.08	986	169.55	987.68	170.05	988		
170.51	988.42	172.22	990	173.05	990.87	173.87	992	175.89	993.85		
176.01	994	176.17	994.15	176.94	994.53	179.83	996	182.5	997.25		
183.95	998	185.92	998.94	188.25	1000	191.65	1001.39	193.2	1002		
193.94	1002.3	198.37	1004	201.13	1005.09						

Manning's n Values		num= 5		Sta		n Val		Sta		n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	52.42	.04	92.66	.035	126.07	.013	142.97	.035		

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	52.42	92.66		273.66	295.06	267.03		.1	.3

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 5772.495

INPUT
Description:

Station Elevation Data		num= 113		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1018.21	.33	1018.03	.38	1018	.54	1017.91	4.08	1016		
5.23	1015.39	7.81	1014	10.28	1012.7	11.6	1012	13.33	1011.15		
15.64	1010	18.71	1008.48	19.69	1008	22.76	1006.48	23.74	1006		
27.05	1004.37	27.8	1004	30.74	1002.26	31.17	1002	32.1	1001.33		
33.95	1000	34.35	999.72	36.73	998	37.88	997.18	39.52	996		

EntranceStudy.rep

41.7	994.45	42.33	994	43.66	993.06	45.08	992	45.62	991.58
47.74	990	49.81	988.1	49.92	988	50.14	987.8	51.95	986
53.3	984.64	53.94	984	55.86	982.06	55.92	982	56.23	981.69
59.78	978	65.06	977.38	66.43	977.21	74.43	976.33	77.37	976
78.32	975.15	79.62	974	80.44	973.29	81.26	972.55	86.6	972.87
95.81	973.22	96.07	973.3	96.25	973.35	96.64	973.45	98.65	973.87
99.28	974	101.9	974.55	102.16	974.63	102.46	974.71	104.53	975.31
105.72	975.61	106.14	975.74	106.9	976	111.53	976.28	112.24	976.33
117.12	976.64	127.93	977.9	128.57	977.93	129.57	977.99	129.78	978
133.68	978.19	134.3	978.23	136.13	978.34	137.99	978.45	139.84	978.55
148.59	979.05	155.84	978.4	157.15	978.22	158.75	978	161.68	978
166.6	979.6	167.87	980	168.16	980.18	171.14	982	172.12	982.61
174.2	984	175.95	985.17	177.14	986	181.28	987.67	182.05	988
183.28	988.5	187.07	990	189.66	991.04	191.85	992	191.92	992.03
196.82	994	197.46	994.24	201.86	996	204.45	997.1	206.59	998
208.63	998.98	210.69	1000	214.06	1001.87	214.3	1002	214.75	1002.27
217.65	1004	218.24	1004.37	220.91	1006	221.62	1006.28	225.36	1008
226.74	1008.38	231.99	1009.75	232.35	1009.84				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	77.37	.04	106.14	.035	128.57	.013	148.59	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

77.37	106.14	243.75	275.76	373.61	.1	.3
-------	--------	--------	--------	--------	----	----

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 5494.591

INPUT

Description:

Station Elevation Data num= 73

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1007.28	2.31	1006	3.7	1005.23	5.91	1004	7.51	1003.11
9.51	1002	11.54	1000.87	13.11	1000	16.48	998.13	16.71	998
17.2	997.72	20.17	996	23.5	994.03	26.89	992	27.13	991.85
30.21	990	30.63	989.74	33.53	988	34.02	987.64	36.42	986
38.72	984.12	38.87	984	39.9	983.16	41.34	982	41.7	981.71
43.83	980	45.09	979.01	46.36	978	48.62	976.25	48.95	976
55.02	975.51	69.35	974.35	73.73	974	75.57	973.59	83.53	972
83.59	971.98	84.35	971.73	89.09	971.26	94.71	970.87	95.77	971.76
96.03	972	98.1	973.88	98.24	974	100.23	974.32	102.69	974.86
108.98	974.97	109.94	974.98	120.15	975.13	127.29	975.94	127.93	976
129.4	976.37	135.82	978	136.92	978.34	138.91	978.98	142.12	980
143.75	980.75	146.4	982	148.33	982.93	150.59	984	154.22	985.76
154.73	986	156.15	986	180.93	987.49	182.12	987.92	182.14	987.91
182.36	988	183.4	988.39	187.83	990	191.5	991.32	193.37	992
194.52	992.5	198.05	994	198.14	994.04				

EntranceStudy.rep

Manning's n Values		num= 6		Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.01	75.57	.04	98.1	.035	102.69	.013	120.15	.035		
136.92	.06										

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	75.57	98.1		276.1	288.53		.1	.3
					307.93			

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 5357.523

INPUT

Description:

Station Elevation Data		num= 73		Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1002	3.78	1000	5.93	998.85	7.57	998	11.13	996.19		
11.51	996	11.94	995.78	15.21	994	17.93	992.51	18.86	992		
22.18	990.17	22.44	990.03	22.48	990	25.61	988.26	26.06	988		
27.13	987.27	29.1	986	30.54	984.4	30.91	984	31.45	983.4		
32.68	982	33.19	981.41	34.42	980	35.75	978.45	36.14	978		
36.85	977.16	37.71	976	44.01	975.34	56.96	974	85.73	972.55		
89.87	972.34	96.68	972	104.08	971.03	107.88	970.59	111.84	970.35		
118.84	969.8	120.79	970.99	122.11	971.84	122.32	972	125.84	972.91		
130.33	973.45	131.53	973.67	134.02	974	134.81	974.01	136.57	974.03		
140.41	974.08	157.3	974.01	158.99	974	169.26	974	170.03	974.17		
170.31	974.24	172.52	974.8	177.26	976	179.96	977.39	181.22	978		
182.06	978.46	185	980	186.52	980.84	188.61	982	190.96	983.29		
193.64	984.79	194.38	985.18	195.95	986	198.77	987.34	200.12	988		
202.9	989.29	204.39	990	208.13	991.56	209.17	992	211.09	992.63		
215.08	994	221.29	996	224.69	996.97						

Manning's n Values		num= 5		Sta	n Val	Sta	n Val	Sta	n Val
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	96.68	.04	125.84	.035	140.41	.013	158.99	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	96.68	125.84		29.17	22.01		.1	.3
					16.43			

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 5335.512

INPUT

Description:

Station Elevation Data		num= 85		Sta	Elev	Sta	Elev	Sta	Elev
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1002	4.02	1000	5.86	999.03	5.88	999.02	7.87	998

EntranceStudy.rep

10.32	996.49	11.07	996	13.99	994.09	14.12	994	14.15	994
14.39	993.83	14.64	993.67	17.18	992	17.21	992	18.73	990.98
20.22	990	22.24	988.61	23.06	988	23.63	987.18	24.5	986
25.21	984.69	25.61	984	26.43	982.46	26.69	982	27.62	980.26
27.76	980	28.78	978.08	28.82	978	29.33	977.04	29.86	976.1
29.93	976	40.63	974.52	43.79	974	45.48	973.91	50.24	973.7
67.68	972.9	72.28	972.69	83.72	972.15	84.79	972.1	86.88	972
96.3	970.62	100.35	970.06	101.78	969.97	114.5	969.6	115.05	970.2
116.16	972	119.09	973.65	119.72	974	120.15	974	122.05	974.01
129.41	974.04	129.9	974.04	132.73	974.05	135.38	974.06	142.97	974.17
159.13	974.3	160.93	974.3	161.4	974.17	162.12	974	170.04	974
171.38	974.72	173.98	976	176.53	977.12	178.34	978	180.59	979.15
182.23	980	185.49	981.65	186.02	981.91	186.2	982	189.26	983.53
190.21	984	192.73	985.26	194.22	986	197.29	987.54	198.19	988
201.73	989.79	202.13	990	206.04	991.86	206.31	992	208.33	992.59
211.87	993.63	213.06	994	215.13	994.55	220.58	996	223.13	996.64

Manning's n Values

Sta	n Val	Sta	num=	5	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	86.88	.04	119.72	.035	142.97	.013	161.4	.06	

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	86.88	119.72		159.1	137.86	102.84		.1	.3

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 5187.560

INPUT

Description:

Station	Elevation	Data	num=	86	Sta	Elev	Sta	Elev	Sta	Elev
0	1004.45	1.16	1004	4.5	1002.6	6.12	1002	8.38	1001.17	
11.14	1000	15.44	998.33	16.34	998	19.32	996.42	20.23	996	
20.25	996	20.84	995.62	21.37	995.26	22.48	994.53	23.26	994	
23.96	993.56	26.35	992	28.93	990.33	29.43	990	30.49	989.32	
32.65	988	34.44	986.98	36.09	986	37.16	984.66	37.72	984	
38.04	983.59	39.28	982	39.64	981.54	40.84	980	41.23	979.49	
42.39	978	42.81	977.45	43.95	976	44.4	975.42	45.5	974	
46.69	973.29	46.94	973.15	48.93	972	54.56	970.88	58.9	970	
59.32	969.79	59.69	969.59	60.06	969.37	65.95	968.85	76.08	968.06	
80.14	969.88	80.4	970	81.07	970.29	85.1	972	89.61	973.12	
92.29	973.79	93.35	974	135.37	976	140.59	976.2	143.14	976.28	
144.07	976.3	144.54	976.31	147.24	976.08	147.7	976.06	148.13	976.04	
149.72	976.04	151.61	976.04	163.2	976.29	165.73	976.33	166.57	976.35	
166.84	976.36	167.68	976.34	168.26	976.33	174.59	976	177.59	975.85	
184.11	975.51	187.63	975.56	189.49	976	191.64	977.51	192.44	978	
193.26	978.64	195.07	980	197.37	981.41	198.22	982	201.97	984	
202.02	984.02	205.8	986	208.03	987.13	209.71	988	211.22	988.87	
213.36	990									

EntranceStudy.rep

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 48.93 .04 85.1 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 48.93 85.1 53.89 68.79 69.68 .1 .3
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 108.99 143.76 985

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 5118.449

INPUT
 Description:

Station Elevation Data num= 92

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1004.15	.34	1004	3.93	1002.52	5.13	1002	9.76	1000.11
10.02	1000	10.37	999.85	11.08	999.58	15.22	998	19.93	996.21
20.47	996	20.48	996	22.12	995.23	22.43	995.09	24.77	994
28.57	992.2	29	992	29.66	991.67	33.14	990	36.65	988.36
37.41	988	38.17	987.65	41.73	986	45	984.34	45.6	984
46.9	982.77	47.57	982.14	47.74	982	49.48	980.38	49.94	980
51.52	978.55	52.17	978	53.64	976.67	54.43	976	55.79	974.82
56.7	974	57.13	973.84	58.65	973.27	62.48	972	66.38	971.04
70.31	970	70.86	969.82	71.4	969.64	73.86	968.79	87.08	968.02
89.12	967.88	89.7	968.15	89.92	968.27	90.24	968.43	90.78	968.74
92.69	969.89	92.89	970	93	970.07	93.05	970.09	93.25	970.16
96.06	971.38	97.02	971.84	98.36	972	98.71	972.04	98.72	972.04
99.06	972.07	102.33	972.48	104.74	972.76	106.12	972.92	108.7	973.26
111.64	973.67	117.12	973.97	117.44	974	117.65	974	120.85	974.18
121.4	974.2	127.21	974.64	141.74	976	152.68	977.33	158.24	978
159.64	978	190.71	978.84	196.31	978.92	209.23	978.65	213.65	978.94
217.5	979.78	218.49	980	218.67	980.17	220.42	982	223.09	983.98
223.12	984	223.23	984.05	227.42	986	228.3	986.42	231.69	988
234.38	988.88	238.04	990						

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 62.48 .04 97.02 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 62.48 97.02 52.99 47.79 75.02 .1 .3
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 122.68 157.44 985

CROSS SECTION

EntranceStudy.rep

RIVER: LAUREL RUN
REACH: UPPER

RS: 5070.286

INPUT

Description:

Station Elevation Data		num= 97									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1002.56	1.22	1002.14	1.68	1002	3.28	1000.96	4.77	1000		
6.24	999.05	7.87	998	10.91	996.13	11.11	996	11.24	995.92		
14.86	994	15.97	993.41	18.77	992	22.1	990.11	22.3	990		
22.68	989.79	26.24	988	27.91	987.22	30.59	986	32.69	985.01		
35.04	984	37.37	982.71	38.74	982	41.17	980.73	42.57	980		
43.17	979.68	46.25	978	48.43	976.75	49.77	976	52.69	974.79		
54.53	974	55.83	973.49	56.44	973.28	60.08	972	61.88	971.47		
66.86	970	70.21	969.38	71.74	969.05	75.44	968	75.69	968.11		
75.78	968.14	77.9	968.01	87.52	967.29	87.76	967.53	88.15	967.95		
88.16	968	88.29	968.11	90.1	970	91.29	970.49	95.75	972		
98.92	972.45	104.41	973.22	105.52	973.38	107.72	973.7	108.01	973.74		
108.53	973.74	109.99	973.85	111.01	973.91	111.82	973.96	112.49	974		
124.09	975.05	126.08	975.23	127.25	975.33	127.42	975.34	130.5	975.63		
130.65	975.64	130.69	975.65	133.6	975.7	149.49	977.22	155.2	978.14		
155.57	978.17	169.58	979.21	170.19	979.25	172.95	979.42	180.97	979.89		
182.61	980	190.31	980	193.09	980.06	199.28	980.04	201.26	980.14		
203.09	980.05	203.28	980	204.65	980	204.84	980.02	205.3	980.06		
207.49	980.15	208.7	980.12	224.2	981.15	227.58	981.37	227.59	981.37		
227.62	981.37	231.99	981.66	232.53	981.69	234.02	981.81	236.01	982		
237.24	982.33	245.39	984								

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	61.88	.04	95.75	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	61.88	95.75		72.82	71.44	67.88	.1	.3

Blocked Obstructions			num= 1
Sta L	Sta R	Elev	
130.44	169.44	985	

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 4998.406

INPUT

Description:

Station Elevation Data		num= 77									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1003.16	.35	1003.02	2.91	1002	5.06	1001.16	12.43	998.16		
12.82	998	14.1	997.48	17.71	996	18.5	995.68	22.62	994		

EntranceStudy.rep

24.7	993.06	27.05	992	29.75	990.38	30.38	990	30.81	989.74
33.69	988	36.08	986.55	36.99	986	38.83	984.88	40.26	984
40.87	983.64	43.56	982	45.87	980.37	46.39	980	47.44	979.15
48.89	978	49.92	977.2	51.46	976	53.17	974.69	53.87	974.15
54.07	974	54.53	973.65	56.72	972	58.17	971.04	59.54	970
64.82	969.11	70.86	968	71.1	967.94	71.24	967.91	71.44	967.85
75.06	967.6	81.15	967.13	82.14	967.55	83.29	968	93.14	968
98.77	968.43	101.21	969.34	101.5	969.46	102.92	970	109.08	970.94
115.81	972	137.14	974	154.01	976.08	154.19	976.1	158.34	976
165.25	978	178.04	980	186.62	980.49	191.67	980.81	207.11	981.75
220.99	981.84	225.94	981.79	227.66	981.88	227.89	981.89	228.08	981.9
228.31	981.91	229.05	981.93	230.77	982	232.58	983.55	233.13	984
234.1	984.85	235.42	986	236.15	986.64	237.7	988	238.71	988.54
239.96	989.2	241.67	990						

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 64.82 .04 83.29 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 64.82 83.29 188.11 226.48 286.17 .1 .3

Blocked Obstructions num= 2
 Sta L Sta R Elev Sta L Sta R Elev
 107.17 116.31 980 136.51 176.93 985

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 4765.350

INPUT

Description:

Station Elevation Data num= 113

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1014.48	1.1	1014	3.26	1012.7	4.49	1012	5.78	1011.24
7.98	1010	9.71	1008.94	11.33	1008	13	1007.12	14.97	1006
17.66	1004.69	18.88	1004	22.6	1002.16	23.31	1001.81	24.1	1001.43
27.3	1000	30.09	998.91	32.23	998	36.13	996.48	37.55	996
37.56	996	43.06	994.19	43.63	994	46.4	993.1	49.75	992
50.48	991.76	51.85	991.26	54.95	990	55.35	989.7	57.65	988
60.67	986.05	60.75	986	63.94	984	66.62	982.48	67.42	982
69.69	980.63	70.72	980	71.06	979.73	73.22	978	75.24	976.33
75.63	976	76.03	975.67	78.01	974	79.69	972.54	80.3	972
80.69	971.64	82.5	970	84.08	968.55	84.68	968	88.92	967.6
89.03	967.59	104.72	966	105.75	965.29	105.86	965.22	105.94	965.19
107.88	965	121.45	963.67	122.67	964.73	123.36	965.33	124.22	966
130.9	967.57	132.07	967.84	132.98	968	139.91	968	141.9	968
142.45	968.07	142.54	968.08	142.67	968.09	143.36	968.21	143.67	968.23
145.53	968.54	146.22	968.59	149.64	969.1	150.89	969.14	152.43	969.18
155.4	969.53	157.2	969.54	158.58	969.53	160.07	969.67	165.65	970
192.71	970	194.85	971.54	195.49	972	197.35	973.33	198.31	974

EntranceStudy.rep

198.81	974.33	201.25	976	203.91	977.78	204.27	978	204.58	978.07
211.89	979.68	214.1	979.65	219.24	979.52	228.03	979.51	230.71	979.85
232.05	979.92	233.65	980	235.54	981.64	235.99	982	236.71	982.54
238.62	984	240.35	985.32	241.24	986	243.42	987.67	243.86	988
246.31	989.87	246.48	990	246.98	990.33	249.53	992	252.57	993.99
252.59	994	252.64	994.03	254.38	995.21				

Manning's n Values

num=	3				
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	104.72	.04	124.22	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

104.72	124.22	323.07	300	176.86	.1	.3
--------	--------	--------	-----	--------	----	----

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 4431.983

INPUT
Description:

Station Elevation Data

num=	99								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1002	4.03	1000.73	6.26	1000	9.64	998.9	12.5	998
18.64	996.05	18.81	996	18.98	995.95	19.49	995.78	24.23	994.21
24.83	994	25.66	993.69	30.18	992	34.53	990.39	35.56	990
36.71	989.57	40.77	988	45.21	986.36	46.1	986	47.95	985.3
49.48	984.71	50.96	984	55.13	982.03	55.18	982	58.9	980.16
59.21	980	60.16	979.46	62.94	978	64.31	976.85	65.29	976.03
65.33	976	66.68	974.84	67.67	974	69.71	972.24	70	972
71.04	971.1	72.3	970	72.88	969.49	74.59	968	77.2	966.89
79.62	966	81.99	964.24	82.26	964	82.37	963.85	83.17	962.86
83.97	962.03	104.42	961.61	106.9	961.56	107.19	962	107.86	962.82
108.8	964	111.98	964.55	119.44	966	127.47	966	152.08	966
154.66	966.05	154.81	966.05	185.06	966.02	185.09	966.02	185.63	966.04
186.25	966.09	187.81	966.16	202.42	966.79	212.03	967.68	213.86	967.81
215.62	968	233.43	969.27	243.82	970	244.75	970.64	246.77	972
249.42	973.85	249.62	974	250.09	974.33	252.55	976	254.49	977.31
255.5	978	267.47	978	274.75	977.54	275.42	977.49	277.43	977.35
277.98	977.31	281.17	977.03	282.72	977.31	286.58	978	288.52	979.73
288.83	980	291.5	982	294.17	983.73	294.58	984	295.3	984.47
297.66	986	299.13	986.93	300.83	988	302.91	989.17	304.38	990
306.98	991.46	307.95	992	308.36	992.22	310.91	993.65		

Manning's n Values

num=	3				
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	79.62	.04	108.8	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

79.62	108.8	228.19	154.06	150.95	.1	.3
-------	-------	--------	--------	--------	----	----

Blocked Obstructions num= 1

EntranceStudy.rep

Sta L Sta R Elev
131.43 209.66 980

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 4266.832

INPUT

Description:

Station Elevation Data		num= 105		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1005.94	3.39	1005.07	7.18	1004	11.84	1002.61	13.95	1002		
17.04	1000.61	19.97	999.12	21.97	998	24.06	997.23	27.11	996		
33.26	994.19	33.92	994	36.88	993.12	40.67	992	42.57	991.29		
46.13	990	49.98	988.54	51.35	988	56.3	986.13	56.64	986		
56.8	985.91	60.3	984	62.25	982.28	62.56	982	64.02	980.71		
64.41	980.36	64.81	980	64.92	979.91	67.06	978	68.05	977.15		
69.34	976	70.67	974.58	71.22	974	72.63	972.46	73.05	972		
73.17	971.86	74.86	970	75.68	969.08	76.66	968	78.19	966.26		
78.42	966	78.86	965.89	79.04	965.84	81.72	965.09	85.57	964		
85.96	963.63	87.53	962	87.67	961.85	87.84	961.65	96.68	961.6		
103.95	961.56	104.51	961.74	105.15	961.94	105.32	962	109.32	963.1		
112.58	964	127.38	965.48	128.03	965.54	133.51	966	134.24	966		
135.7	965.95	135.88	965.96	136.74	965.97	197.53	965.43	205.73	965.29		
206.23	965.18	212.01	965.1	214.85	965	219.03	965.24	222.51	965.48		
229.91	966	232.12	966.16	238.52	966.62	243.07	966.99	245.16	967.14		
249.81	967.41	259.3	968	261.6	968.57	265.03	970	268.07	971.66		
268.69	972	269.74	972.57	272.44	974	276.61	974.58	283.24	975.64		
287.16	975.72	289.35	975.76	291.75	975.8	293.45	975.83	302.52	974.51		
303.86	974	304.4	974	305.92	975.67	306.23	976	306.55	976.35		
307.9	978	309.55	980	309.81	980.23	311.81	982	314.24	983.83		
314.46	984	314.75	984.15	318.44	986	319.32	986.32	320.08	986.6		

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	85.57	.04	112.58	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
85.57 112.58 271.31 315.07 314.36 .1 .3

Blocked Obstructions

num= 1

Sta L	Sta R	Elev
136.06	226.13	980

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 3949.469

INPUT

EntranceStudy.rep

Description:

Station Elevation Data		num= 105		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	995.06	3.17	994.07	3.36	994	3.43	993.97	9.6	992
14.49	990.19	14.63	990.13	15	990	15.22	989.92	15.59	989.79
20.19	988	22.16	987.36	25.81	986	31.06	984.42	32.42	984
34.33	983.46	39.31	982	45.73	980.13	46.18	980	46.2	980
47.52	979.48	51.34	978	52.2	977.67	56.42	976	58.23	975.3
60.16	974.55	61.54	974	64.79	972.69	66.43	972	67.09	971.44
68.76	970	69.75	969.16	71.09	968	72.21	967.04	73.42	966
74.64	964.96	75.75	964	80	962	80.01	962	80.02	962
86.29	960	86.38	959.86	87.1	958.71	87.58	958	87.59	958
88.06	957.28	96.79	956.84	97.44	956.78	98.37	957.37	99.39	958
99.42	958	101	959.03	102.52	960	103.84	960.61	123.48	961.05
165.38	962	198.36	962	210.29	963.56	213.69	964	227.46	964
231.77	964.44	238.9	966	245.27	967.49	247.21	968	249.36	968.23
252.02	968.43	255.91	968.78	265.21	969.56	269.28	969.8	271.97	969.98
272.25	970	273.31	970.08	274.21	970.11	274.53	970.11	276.59	970.87
281.09	972	283.87	973.84	284.1	974	284.66	974.43	286.7	976
288.25	976.95	290.68	978	292.03	978.41	293.26	978.72	295.34	979.29
297.51	979.82	298.16	980	299.28	980.55	300.8	981.22	301.61	981.63
302.61	982	303.84	982.92	305.25	984	305.43	984.13	305.5	984.19
305.59	984.26	306.78	985.24	307.58	985.89	307.7	986	309.58	987.17
310.65	988	313.51	989.54	314.35	990	315.2	990.43	316.62	991.18

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	86.29	.04	103.84	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	86.29	103.84		56.48	48.84	50.59	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
177.22	208.08	975

CROSS SECTION

RIVER: LAUREL RUN

REACH: UPPER

RS: 3900.631

INPUT

Description:

Station Elevation Data		num= 115		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	990.88	4.05	990.14	4.18	990.11	4.47	990	4.94	989.83
11.24	988	16.1	986.61	18.3	986	20.09	985.51	25.15	984
28.74	982.94	32.02	982	37.25	980.52	39.05	980	40.22	979.64
45.93	978	50.56	976.22	51.06	976	55.99	974.13	56.32	974
57.33	973.62	59.47	972.84	60.84	972.35	61.84	972	63.01	971.34
65.7	970	67.62	968.16	67.79	968	68.4	967.42	69.89	966
70.89	964.99	71.91	964	72.88	962.99	73.76	962	76.23	961.36

EntranceStudy.rep

80.27	960.31	81.46	960	81.77	959.61	83.11	958	83.16	958
84.18	956.93	84.43	956.6	89.5	956.48	94.18	956.39	94.62	956.65
96.78	958	96.85	958	98.12	959.15	99.12	960	101.05	961.94
101.11	962	122.07	962	178.59	962	179.57	961.99	179.93	961.99
181.15	961.98	181.41	961.98	182.26	961.98	199.68	961.85	201.23	961.83
203.03	961.85	204.38	961.86	207.65	961.82	208.27	961.83	208.75	961.86
210.03	961.9	212.15	961.95	213.57	961.98	213.99	962	214.38	962.03
214.62	962.05	215.99	962.2	227.98	963.31	228.27	963.36	230.92	964
235.27	964.65	238.4	965.17	239.68	965.4	242.77	966	244.89	966.36
248.87	967.11	254.3	967.86	257.17	968	264.95	968.28	267.17	968.36
269.96	968.49	270.64	968.62	271.12	968.74	272.34	969.03	276.34	970
278.4	971.58	278.99	972	279.34	972.25	281.76	974	283.33	975.41
284	976	285.85	977.67	286.23	978	288.37	979.94	288.45	980
288.87	980.38	290.63	982	291.07	982.41	292.88	984	295.05	985.01
296.53	985.71	297.14	986	299.78	987.24	301.37	988	303.79	989.15
305.59	990	307.91	991.1	309.8	992	311.81	992.93	312.99	993.47

Manning's n Values num= 3
 Sta n Val Sta n Val
 0 .1 80.27 .04 101.05 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 80.27 101.05 41.49 46.21 40.51 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev
 176.43 201.59 975

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 3853.996

INPUT

Description:

Station Elevation Data		num= 96							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	991.99	6.85	990.82	10.41	990.1	10.83	990	11.44	989.84
18.62	988	21.77	987.17	26.01	986	33.83	984	34.79	983.75
41.14	982	44.94	980.96	48.12	980	53.27	978.47	55.08	978
58.94	976.79	61.47	976	63.28	975.4	65.67	974.64	67.7	974
72.35	972.38	73.39	972	74.32	971.66	78.36	970	78.42	969.96
80.49	968	81.8	966.6	82.34	966	82.98	965.33	84.36	964
85.71	962.78	86.54	962	87.42	961.49	90	960	93.07	958.89
95.26	958	95.3	958	96.26	956.97	97.2	956.21	99.53	956.32
103.71	956.39	106.17	957.36	108.12	958	109.23	958.67	111.37	960
112.11	961.08	112.8	962	131.34	962	152.36	962	173.99	961.69
175	961.7	175.95	961.71	176.98	961.71	184.97	961.72	186.27	961.74
197.98	961.95	214.81	961.95	219.76	961.97	224.64	962	243.05	963.73
244.16	963.83	245.15	964	246.28	964.27	253.71	966	256.51	966.47
265.88	967.72	270.53	967.96	276.13	968	288.24	968	289.98	969.87
290.1	970	290.21	970.1	292.13	972	293.61	973.35	294.46	974

EntranceStudy.rep

296.17	975.52	296.7	976	298.8	977.88	298.93	978	300.54	979.44
301.17	980	301.27	980.09	303.43	982	304.43	982.89	305.68	984
306.71	984.9	308	986	311.16	987.4	312.5	988	313.16	988.25
317.58	990	320.12	990.99	322.69	992	325.67	993.25	327.48	994
328.36	994.4								

Manning's n Values num= 3
 Sta n Val Sta n Val
 0 .1 87.42 .04 112.8 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 87.42 112.8 75.96 62.46 59.87 .1 .3
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 152.59 182.04 975

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 3791.489

INPUT

Description:

Station	Elevation	Data	num=	112							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	992.04	.11	992	4.96	990.15	5.35	990	5.68	989.87		
10.33	988	11.79	987.44	15.33	986	19.19	984.3	19.99	984		
21.08	983.35	23.53	982	26.07	980.48	28	979.41	30.37	978		
31.39	977.44	33.78	976	34.79	975.39	37.05	974	38.45	973.15		
39.79	972.36	40.34	972	40.86	971.68	41.66	971.38	45.52	970		
45.66	969.96	48.18	969.23	51.47	968.59	54.29	968	56.86	967.22		
59.05	966.47	60.05	966	60.73	965.63	61.84	965.07	63.94	964		
65.07	963.38	67.76	962	74.9	960.84	82.21	960	83.67	959.35		
86.63	958	86.69	958	86.78	957.94	87.9	957.24	89.69	955.91		
94.45	956.13	99	956.39	101.13	957.5	102.14	958	102.23	958		
103.63	958.82	104.36	959.31	105.31	960	106.28	960.83	107.62	962		
113.47	962	115.27	961.88	125.11	961.22	126.94	961.12	129.18	960.99		
136.17	960.55	141.37	960.34	143.53	960.21	148.34	960.1	148.85	960.07		
153.34	960.02	153.43	960.02	153.56	960.02	153.62	960.01	153.93	960.01		
160.35	960.04	160.55	960.04	161.8	960.05	166.32	960.14	182.28	960.45		
205.08	961.07	234.13	961.65	239.87	962	245.11	963.37	247.54	964		
250.74	964.8	255.18	966	257.07	966.17	265.26	966.83	278.38	966.3		
286.44	967.38	287.35	968	289.42	969.6	289.97	970	290.57	970.38		
292.92	972	294.71	973.66	295.07	974	297.1	975.77	297.36	976		
299.55	977.91	299.65	978	301.66	979.76	301.93	980	301.95	980.01		
304.22	982	304.34	982.11	306.5	984	309.57	985.83	309.87	986		
314.24	987.58	315.53	988	319.08	989.34	320.56	990	323.2	991.38		
324.46	992	325.48	992.47								

Manning's n Values num= 3
 Sta n Val Sta n Val
 0 .1 87.42 .04 112.8 .035

EntranceStudy.rep

0 .1 82.21 .04 107.62 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 82.21 107.62 108.21 99.65 103.15 .1 .3
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 153.84 183.33 975

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 3691.713

INPUT
 Description:

Station Elevation Data num= 123

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	992.57	.81	992.39	1.51	992.2	1.73	992.15	2.1	992
4.19	991.19	7.13	990	8.27	989.54	11.98	988	14.37	987.04
16.93	986	21.01	984.38	21.94	984	22.11	983.9	26.55	982
28.87	980.51	29.81	980	32.49	978.51	33.37	978	35.16	977.02
37.1	976	37.68	975.69	40.86	974	41.79	973.48	44.6	972
47.57	970.14	47.83	970	48.09	969.81	48.78	969.37	51.24	968
54.24	966.44	55.25	966	59.44	964.24	59.96	964	61.98	963.1
64.42	962	67.93	960.89	70.23	960	71.72	960	74.58	960
79.76	959.38	83.02	959.14	98.11	958	99.37	957.24	101.45	956
101.92	955.72	109.31	955.9	111.2	956.05	111.25	956	111.29	956.03
114.32	958	114.33	958	117.43	959.5	118.46	960	127.02	960
127.54	959.98	140.02	959.39	169.35	958	202.46	958	202.76	958.01
202.89	958.01	209.95	958.13	210.4	958.15	221.07	958.3	225.93	958.32
226.7	958.36	227.62	958.42	232.9	958.48	234.02	958.56	235.62	958.66
237.71	958.79	242.79	958.97	244.8	959.13	247.83	959.39	248.55	959.45
249.37	959.52	252.34	959.77	253.39	959.83	255.18	960	261.36	961.42
263.93	962	267.07	962.62	271.58	963.47	273.41	963.82	274.4	964
276.78	964.33	277.64	964.45	278	964.5	278.27	964.54	279.1	964.51
279.85	964.48	281.21	964.42	282.81	964.36	285.19	964.27	292.2	964
299.74	964	301.42	965.56	301.87	966	303.65	967.48	304.3	968
306.51	969.79	306.78	970	308.3	971.24	309.24	972	309.37	972.11
311.68	974	312.1	974.35	314.12	976	314.84	976.68	316.22	978
317.98	979.88	318.08	980	318.19	980.11	320.23	982	322.19	983.4
323.07	984	324.27	984.43	328.98	986	331.19	986.82	334.69	988
337.43	989.06	339.66	990	341.5	990.78				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	98.11	.04	114.32	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 98.11 114.32 18.17 15.92 16.89 .1 .3
 Blocked Obstructions num= 1
 Sta L Sta R Elev

130.29 154.49 970

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 3675.796

INPUT
Description:

Station Elevation Data		num= 112									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	991.29	4.86	990	7.77	989.04	10.52	988	16.12	986.03		
16.21	986	16.28	985.98	22.05	984	23.92	983.3	27.48	982		
30.92	980.57	32.36	980	35.96	978.47	36.91	978	39.28	976.78		
40.29	976.23	40.8	976	41.05	975.86	44.44	974	46.77	972.74		
48.11	972	50.77	970.59	51.87	970	52.29	969.78	55.66	968		
59.22	966	63.01	964	63.85	963.75	64.68	963.59	69.42	962.48		
69.69	962.45	70.44	962.38	73.13	962.05	73.56	962	77.18	961.44		
78.76	961.14	83.35	960	84.39	959.91	84.63	959.88	84.95	959.85		
88.6	959.47	101.19	958	101.42	958	102.13	957.32	103.43	956		
104.09	955.39	104.14	955.35	104.15	955.34	104.16	955.34	104.2	955.34		
114.55	956.12	114.68	956.01	114.78	956	115.35	956.33	117.24	957.51		
117.97	958	117.98	958	118.32	958.19	118.48	958.23	120.18	959.07		
122.43	960	127.89	960	132.91	959.63	142.77	959.24	165.52	958.35		
173.24	958	242.09	958	244.27	958.18	245.37	958.3	251.53	958.98		
257.57	959.62	260.67	960	266.8	961.31	269.97	962	271.95	962.36		
277.11	963.3	281.13	964	281.37	964.04	282.75	964.25	288.34	964.02		
288.72	964	289.59	963.96	299	963.53	303.87	963.93	304.31	964		
305	964.76	306.19	966	306.93	966.58	308.77	968	310.72	969.51		
311.37	970	313.79	971.87	313.96	972	314.67	972.54	318.84	975.8		
319.09	976	320.88	977.81	321.06	978	321.2	978.15	322.77	980		
323.55	980.93	324.43	982	324.94	982.46	326.89	984	330.59	985.45		
331.93	986	333.27	986.51	337.52	988	342.77	989.57	344.18	990		
345.07	990.34	348.21	991.3								

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	101.42	.04	122.43	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	101.42	122.43		23.79	17.98		.1	.3

Blocked Obstructions			num= 1
Sta L	Sta R	Elev	
132.92	157.12	970	

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 3657.812

EntranceStudy.rep

INPUT
Description:

Station Elevation Data		num= 131		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	989.74	4.78	988.26	8.32	986.94	8.51	986.83	10.33	986.27		
10.55	986.23	11.86	986	13.1	985.81	13.21	985.76	13.33	985.73		
17.03	985.18	23.76	984	24.57	983.9	24.65	983.84	24.93	983.78		
27.04	983.01	31.89	982.43	32.93	982.18	33.8	982	34.29	982		
35.11	981.74	36.81	980.88	38.53	980.52	40.19	980	42.25	979.21		
43.83	978.5	46.06	978	46.53	977.82	48.15	977.02	50.25	976.37		
51.19	976	52.19	975.39	54.3	974	55.95	973.27	56.99	972.76		
58.4	972	63.92	970.12	64.34	970	66.55	969.3	70.68	968		
70.9	967.9	71.29	967.83	73.98	967.11	78.48	966	86.29	964.33		
86.31	964.33	87.72	964	91.97	963.06	95.62	962.6	98.14	962.3		
98.85	962.18	100.36	962	100.81	962	101.13	961.95	101.17	961.94		
101.18	961.94	102.71	961.66	102.89	961.63	103.48	961.53	104.66	961.28		
106.2	960.98	108.56	960.48	110.61	960	111.04	959.78	113.83	958		
113.86	958	114.28	957.6	115.97	956	116.26	955.7	116.7	955.24		
120.77	955.36	126.91	955.71	127.17	955.97	127.19	956	127.51	956.43		
128.6	958	128.62	958	129.52	959.16	130.07	960	138	960		
138.54	959.92	142.33	959.51	143.62	959.47	146.65	959.17	151.18	959.05		
153.37	958.85	158.14	958.51	158.19	958.5	171.15	958	256.21	958		
256.27	958.01	272.8	960	283.28	961.89	284.01	962	284.38	962.05		
296.86	963.76	297.35	963.76	311.46	963.22	312.81	963.17	312.93	963.13		
313.15	963.06	313.63	962.93	317.48	962.93	318.52	964	319.77	965.6		
320.08	966	320.37	966.38	321.74	968	321.94	968.26	323.05	969.54		
323.47	970	323.67	970.17	325.63	972	327.26	972.97	329.36	974		
330.24	974.66	332.17	976	332.91	976.77	334.06	978	335.19	979.27		
336.93	981.24	337.61	982	339.6	983.33	340.61	984	341.39	984.34		
345.02	986	348.71	987.57	349.75	988	351.27	988.49	356.14	990		
359.53	990.88										

Manning's n Values		num= 3		Sta		n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	110.61	.04	130.07	.035		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	110.61	130.07		31.6	25.08	28.39	.1	.3

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER
RS: 3632.733

INPUT
Description:

Station Elevation Data		num= 110		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	984.92	4.46	983.59	8.21	983.17	9.46	983.01	10.8	982.69		
13.09	982.56	13.73	982.42	16.85	982	18.38	981.77	18.79	981.82		
18.99	981.83	19.34	981.82	19.63	981.79	20	981.74	24.33	981.25		

EntranceStudy.rep

25.75	981.02	30.21	980.32	32.03	980	32.14	980	36.37	979.12
38.97	978.55	41.5	978	47.5	976.75	50.72	976	52.35	975.52
57.61	974	64.25	972.1	64.57	972	69.62	970.28	70.42	970
70.81	969.82	71	969.74	75.36	968	77.04	967.54	79.48	966.92
80.15	966.72	81.69	966	83	965.49	83.46	965.2	84.54	964.75
86.34	964	92.99	964	98.99	961.42	100.63	960	102.24	960
104.49	958.79	105.98	958	107.48	958	111.94	956.5	113.12	956
115.07	955.69	117.34	955.38	117.82	955.3	118.48	955.14	120.07	955.16
128.6	955.15	128.93	955.45	129.53	956	129.55	956	130.23	956.59
131.81	958	131.83	958	132.44	958.18	146.77	958.94	151.03	958.59
156.8	958	158.05	958	263.96	958	264.98	958.14	270.45	958.84
277.63	959.77	279.6	960	291.32	961.32	297.24	962	297.41	962.02
302.43	962.73	313.56	962.49	319.01	962.26	319.78	962	323.12	962
324.38	963.68	324.62	964	326.23	965.89	326.32	966	326.93	966.49
328.78	968	329.32	968.45	331.21	970	332.3	970.92	333.61	972
334.67	973.03	335.72	974	337.15	975.49	337.65	976	339.27	977.71
339.54	978	339.62	978.09	341.35	980	341.87	980.6	343.12	982
345.97	983.71	346.46	984	347.68	984.63	350.33	986	351.13	986.4
354.23	988	359.49	989.27	362.96	990	367.4	991.26	367.57	991.31

Manning's n Values num= 3
 Sta n Val Sta n Val
 0 .035 104.49 .04 132.44 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 104.49 132.44 136.38 147.69 46.47 .1 .3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 3465.882

INPUT
 Description:

Station	Elevation	Data	num=	147	Sta	Elev	Sta	Elev	Sta	Elev
0	984.74	19.47	978.76	21.17	978	24.53	976.97	26.2	976.44	
27.4	976	30.06	975.07	33.2	974	36.53	972.98	38.5	972.35	
39.54	972	41.41	971.56	43.82	971.05	49.29	970	58.96	968.56	
61.19	968.24	62.97	968	71.93	966.27	73.99	966	77.94	965.57	
80.66	965.31	86.03	964.77	91.38	964.32	92.79	964.2	95.59	964	
96.9	963.94	97.16	963.93	108.07	963.51	109.82	963.47	114.36	963.32	
116.38	963.29	118.56	963.24	122.51	963.2	124.26	963.18	128.34	963.02	
131.76	962.79	132.59	962.77	139.59	962.24	142.59	962	150.51	960.8	
154.92	960	156.62	959.71	157.69	959.64	161.23	959.22	162.46	959.16	
166.36	958.79	166.72	958.78	167.01	958.77	168.3	958.72	171.76	958.6	
172.72	958.51	173.28	958.46	179.82	958.24	186.09	958	188.29	957.39	
193.09	956.56	194.79	956.15	196.1	956	196.17	956	198.44	954.97	
200.09	954	200.37	954	200.73	953.85	201.53	953.13	202.61	953.15	
203.11	953.15	204.17	953.15	209.78	953.17	210.33	953.18	213.08	953.09	
216.06	953.04	217.63	953	219.49	952.88	221.36	952.8	223.68	952.75	

EntranceStudy.rep

225.68	952.7	227.23	952.69	228.24	952.65	230.78	952.55	238.84	953.35
243.16	953.69	246.52	954	246.55	954	249.3	954.25	249.65	954.32
251.02	954.46	251.23	954.49	251.79	954.55	252.66	954.72	253.7	954.86
253.93	954.89	256.71	955.46	258.2	955.68	259.51	956	259.59	956
263.21	956.09	266.69	956.17	268.74	956.22	275.86	956.7	289.12	957.62
290.89	957.73	291.7	957.78	293.02	957.86	293.77	957.9	294.89	958
298.96	958	317.54	959.81	318.14	959.86	319.33	960	324.52	960.03
334.75	960.6	342.13	960.49	345.49	961.29	345.98	961.03	346.34	960.91
347.59	961.78	347.92	962	348.13	962.18	350.38	964	350.88	964.41
352.78	966	353.84	966.91	355.03	968	356.57	969.57	357	970
357.63	970.73	358.76	972	360.09	973.61	360.42	974	361.83	975.77
362.01	976	363.28	977.32	363.75	977.8	363.97	978	364.6	978.55
366.26	980	367.06	980.54	369.04	982	370.91	983.2	372.22	984
374.01	985.38	374.91	986	379.54	987.48	381.18	988	381.91	988.21
388.05	990	392.54	990.77						

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .035 186.09	.04 259.51	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
186.09	259.51	17.32	127.69	123.64	.1	.3	

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 3309.640

INPUT
Description:

Station Elevation Data	num=	128		
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
0 982.22	1.02 981.95	2.11 981.65	7.66 980	9.84 979.61
11.51 978.98	13.87 978	13.91 977.98	19.09 976	21.71 975.03
24.41 974	26.35 973.25	30.09 972	33.55 971.2	35.56 970.72
38.1 970.05	38.25 970	38.51 969.94	46.66 968	54.14 966.06
54.38 966	60.27 964.51	62.65 964	64.19 963.77	72.33 962.92
79.43 962.15	81.1 962	81.18 962	86.38 961.73	87.77 961.66
100.71 961.18	104.74 960.99	108.6 960.83	121.18 960.27	122.33 960.22
123.03 960.2	123.48 960.19	128.12 960.02	131.2 960	131.77 960
132.01 960	136.09 960	140.74 959.96	144.54 959.9	144.66 959.9
146.67 959.85	147.02 959.86	158.4 959.45	161.67 959.33	164.95 959.2
186.24 958.12	186.76 958.1	188.72 958	195.74 957.68	234.89 956.71
244.65 956.45	257.29 956	268.64 956	296.92 956	304.37 954.53
306.82 954	306.84 954	308.37 952.59	309.18 951.98	310.79 952.01
315.99 952.08	317.41 952.72	318.98 953.71	319.44 954	321.66 955.54
322.54 956.14	325.26 958	327.59 958.91	328.25 959.18	328.48 959.27
328.72 959.34	330.46 959.36	333.18 959.5	348.76 960	350.18 961.41
350.75 962	351.74 962.96	352.85 964	353.37 964.47	355.03 966
356.31 967.08	357.39 968	359.09 969.42	359.7 969.94	359.77 970
362.01 971.88	362.16 972	362.69 972.45	364.56 974	365.75 974.96

EntranceStudy.rep

367.01	976	367.88	976.68	369.58	978	370.66	978.48	373.91	980
377.29	981.46	379.07	982	385.14	982.92	390.54	983.7	391.44	983.83
392.6	984	396.07	985.16	397.76	986	399.69	987.24	401.12	988
403.41	989.36	404.52	990	405.24	990.45	407.79	992	410.3	993.47
411.35	994	413.34	994.58	418.16	996	423.92	997.71	424.93	998
426.93	998.61	431.53	1000	436.98	1001.41	439.46	1002	446.91	1003.36
450.19	1004	455.04	1005.05	455.32	1005.11				

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	296.92	.04	328.25	.013	348.76	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

296.92	327.59	39.21	40.11	39.84	.1	.3
--------	--------	-------	-------	-------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
164.35	187.25	970

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 3269.177

INPUT

Description:

Station Elevation Data num= 189

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	978.86	3.53	978.23	9.74	976.55	11.31	976	14.97	974.6
16.57	974	20.75	972.4	21.83	972	24.11	971.23	27.88	970
32.9	968.36	33.95	968	34.41	967.83	35.7	967.35	38.78	966.24
39.49	966	41.22	965.4	45.17	964	50.35	963.32	54	962.83
60.02	962	62.03	961.28	63.3	960.79	65.36	960	68.12	959.82
69.16	959.77	70.56	959.7	82.69	959.38	85.96	959.33	89.35	959.13
92.52	959	97.65	958.72	103.14	958.43	105.91	958.29	109.67	958.17
110.26	958.14	110.76	958.12	114.51	958.11	115.15	958.09	120.04	958.11
120.49	958.11	120.71	958.11	135.37	958.15	135.71	958.14	135.98	958.14
138.28	958.16	138.45	958.16	143.03	958.25	149.87	958	175.46	958
175.91	957.99	178.92	957.78	180.58	957.72	180.94	957.69	186.7	957.43
188.57	957.39	190.03	957.33	192.03	957.3	193.66	957.28	194.86	957.27
198.94	957.32	204.5	956.98	211.37	956.88	226.1	956.37	233.19	956.22
247.54	956.18	261.66	956.28	261.7	956.28	262.11	956.27	262.54	956.26
262.94	956.25	263.32	956.25	263.73	956.24	268.76	956.17	277.32	956.08
281.08	956	282.76	955.93	283.08	955.9	289.96	955.66	291.1	955.5
295.09	955.38	296.27	955.15	298.16	955.02	299.48	954.72	301.07	954.39
301.57	954.33	301.97	954.31	302.73	954	302.77	954	305.12	952.48
305.89	952	305.95	951.98	305.98	951.98	306.31	951.98	311.69	952.05
314.43	952.08	314.48	952.07	315.22	952	317.29	953.1	318.63	954
319.62	954.9	320.75	956	321.97	957.11	323.03	958	324.92	958.23
326.1	958.37	326.54	958.43	326.99	958.49	327.5	958.55	328.43	958.82
331.74	958.85	345.82	958.84	346.13	958.92	346.62	959.11	349	960
349.75	961.01	350.5	962	351.36	963.16	352	964	353.05	965.42

EntranceStudy.rep

353.49	966	354.91	967.96	354.94	968	355.01	968.05	355.16	968.17
357.51	970	358.6	970.73	360.52	972	361.83	972.87	363.51	974
365.73	975.1	367.35	976	369.6	977.18	371.34	978	371.87	978.09
376.36	978.77	379.18	979.15	381.58	979.41	382.9	979.57	387.21	979.99
387.28	980	391.04	980.87	393.06	982	394.27	982.98	395.51	984
396.78	985.03	397.95	986	399.36	987.14	400.39	988	402.28	989.59
402.88	990	402.89	990	403.12	990	405.2	990.61	410.21	992
411.36	992.27	414.24	992.92	417.32	993.61	417.81	993.72	419.13	994
423.01	994.8	424.69	995.07	425.62	995.21	428.15	995.59	428.64	995.69
430.79	996	432.5	996	432.93	996.28	435.47	998	435.87	998.08
436.01	998.1	438.6	998.58	439.53	998.68	441.28	998.98	442.72	999.2
444.41	999.33	445.36	999.46	447.65	999.65	448.05	999.7	451.05	999.95
451.1	999.96	451.59	1000	454.35	1000.39	456.09	1000.71	457.89	1001.11
459.89	1001.48	461.91	1002	464.93	1002.81	467.32	1003.45		

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	289.96	.04	323.03	.035	328.43	.013	345.82	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 289.96 323.03 34.53 26.06 33.76 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
142	163.45	970

BRIDGE

RIVER: LAUREL RUN
 REACH: UPPER RS: 3257.286

INPUT
 Description:
 Distance from Upstream XS = 3.59
 Deck/Roadway Width = 15.8
 Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
277.32	956.08	956.08	295.09	956.5	956	323.03	958	957.5

Upstream Bridge Cross Section Data

Station Elevation Data num= 189

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	978.86	3.53	978.23	9.74	976.55	11.31	976	14.97	974.6
16.57	974	20.75	972.4	21.83	972	24.11	971.23	27.88	970
32.9	968.36	33.95	968	34.41	967.83	35.7	967.35	38.78	966.24
39.49	966	41.22	965.4	45.17	964	50.35	963.32	54	962.83
60.02	962	62.03	961.28	63.3	960.79	65.36	960	68.12	959.82
69.16	959.77	70.56	959.7	82.69	959.38	85.96	959.33	89.35	959.13
92.52	959	97.65	958.72	103.14	958.43	105.91	958.29	109.67	958.17
110.26	958.14	110.76	958.12	114.51	958.11	115.15	958.09	120.04	958.11

EntranceStudy.rep

120.49	958.11	120.71	958.11	135.37	958.15	135.71	958.14	135.98	958.14
138.28	958.16	138.45	958.16	143.03	958.25	149.87	958	175.46	958
175.91	957.99	178.92	957.78	180.58	957.72	180.94	957.69	186.7	957.43
188.57	957.39	190.03	957.33	192.03	957.3	193.66	957.28	194.86	957.27
198.94	957.32	204.5	956.98	211.37	956.88	226.1	956.37	233.19	956.22
247.54	956.18	261.66	956.28	261.7	956.28	262.11	956.27	262.54	956.26
262.94	956.25	263.32	956.25	263.73	956.24	268.76	956.17	277.32	956.08
281.08	956	282.76	955.93	283.08	955.9	289.96	955.66	291.1	955.5
295.09	955.38	296.27	955.15	298.16	955.02	299.48	954.72	301.07	954.39
301.57	954.33	301.97	954.31	302.73	954	302.77	954	305.12	952.48
305.89	952	305.95	951.98	305.98	951.98	306.31	951.98	311.69	952.05
314.43	952.08	314.48	952.07	315.22	952	317.29	953.1	318.63	954
319.62	954.9	320.75	956	321.97	957.11	323.03	958	324.92	958.23
326.1	958.37	326.54	958.43	326.99	958.49	327.5	958.55	328.43	958.82
331.74	958.85	345.82	958.84	346.13	958.92	346.62	959.11	349	960
349.75	961.01	350.5	962	351.36	963.16	352	964	353.05	965.42
353.49	966	354.91	967.96	354.94	968	355.01	968.05	355.16	968.17
357.51	970	358.6	970.73	360.52	972	361.83	972.87	363.51	974
365.73	975.1	367.35	976	369.6	977.18	371.34	978	371.87	978.09
376.36	978.77	379.18	979.15	381.58	979.41	382.9	979.57	387.21	979.99
387.28	980	391.04	980.87	393.06	982	394.27	982.98	395.51	984
396.78	985.03	397.95	986	399.36	987.14	400.39	988	402.28	989.59
402.88	990	402.89	990	403.12	990	405.2	990.61	410.21	992
411.36	992.27	414.24	992.92	417.32	993.61	417.81	993.72	419.13	994
423.01	994.8	424.69	995.07	425.62	995.21	428.15	995.59	428.64	995.69
430.79	996	432.5	996	432.93	996.28	435.47	998	435.87	998.08
436.01	998.1	438.6	998.58	439.53	998.68	441.28	998.98	442.72	999.2
444.41	999.33	445.36	999.46	447.65	999.65	448.05	999.7	451.05	999.95
451.1	999.96	451.59	1000	454.35	1000.39	456.09	1000.71	457.89	1001.11
459.89	1001.48	461.91	1002	464.93	1002.81	467.32	1003.45		

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	289.96	.04	323.03	.035	328.43	.013	345.82	.06

Bank Sta: Left Right Coeff Contr. Expan.

289.96	323.03	.1	.3
--------	--------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
142	163.45	970

Downstream Deck/Roadway Coordinates num= 6

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
264.07	955.4	955.4	280.78	955.6	954	302.24	955.8	954
309.78	956	955	316.84	956.5	956	324.51	958	958

Downstream Bridge Cross Section Data num= 135

Station	Elevation	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	976.99	6.52	974.99	15.39	972.06	15.55	972	15.62	971.97
20.81	970	22.46	969.41	26.28	968	30.73	966.43	31.9	966

EntranceStudy.rep

37.21	964.14	37.6	964	39.12	963.56	43.87	962	49.65	960.88
51.61	960.55	52.65	960.43	53.28	960.38	53.54	960.35	54.47	960
84.83	958	84.84	958	93.16	957.77	133.3	957.86	160.38	957.8
161.37	957.81	163.74	957.83	164.69	957.88	166.01	957.91	168.01	957.89
175.17	957.86	178.11	957.84	182.46	957.73	188.33	957.54	227.02	956.62
239.68	956.48	241.07	956.46	248.59	956.22	249.97	956.15	252.75	956.05
254.14	956	255.28	956	264.07	955.4	277.47	954.49	280.78	954
302.24	954	305.62	952.78	307.73	952	309.09	951.71	309.14	951.7
309.2	951.68	309.56	951.71	309.78	951.72	316.84	952.08	317.18	952.05
317.46	952	319.53	953.55	320.05	954	321.22	955.18	321.91	956
322.69	956.89	324.51	958	325.08	958	325.96	958.13	330.41	958.53
331	958.53	342.78	958.43	347.81	958.41	348.85	958.87	349.24	959.08
350.98	960	351.28	960.46	352.26	962	353.42	963.78	353.56	964
353.71	964.23	354.87	966	356.57	967.65	357	968	358.38	968.71
358.41	968.72	360.9	970	361.98	970.59	364.68	972	368.86	973.94
369.01	974	375.73	975.19	380.83	975.86	381.31	975.93	381.98	976
385.31	976.37	387.63	976.85	390.6	977.28	393.01	978	394.74	979.33
395.63	980	396.16	980.41	398.22	982	398.99	982.6	400.8	984
402.9	985.03	404.95	986	408.82	987.44	410.35	988	411.61	988.41
414.32	989.25	417.53	990	418.54	990.14	422.39	990.59	423.67	990.75
426.13	991.03	429.09	991.4	429.99	991.5	430.44	991.55	430.79	991.59
434	992	435.93	992.26	436.75	992.39	440.46	992.89	443.71	993.46
444.58	993.57	446.44	994	448.93	994.61	453.69	996	455.47	996.59
456.27	996.84	459.21	997.72	459.85	997.91	460.21	998	462.12	998.44
463.7	998.8	469.08	1000	469.75	1000.16	470.9	1000.38	471.55	1000.52

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	302.24	.04	324.51	.035	331	.013	347.81	.06

Bank Sta: Left Right Coeff Contr. Expan.

302.24	324.51	.1	.3
--------	--------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
198.18	247.93	975

- Upstream Embankment side slope = 1.5 horiz. to 1.0 vertical
- Downstream Embankment side slope = 1.5 horiz. to 1.0 vertical
- Maximum allowable submergence for weir flow = .98
- Elevation at which weir flow begins =
- Energy head used in spillway design =
- Spillway height used in design =
- Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
 Energy
 Selected Low Flow Methods = Energy

High Flow Method
 Energy Only

Additional Bridge Parameters

Add Friction component to Momentum
 Do not add Weight component to Momentum
 Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end
 Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #100 YR

		Element	Inside BR US	Inside BR DS
E.G. US. (ft)	958.93	E.G. Elev (ft)	958.92	958.69
W.S. US. (ft)	958.72	W.S. Elev (ft)	958.71	957.50
Q Total (cfs)	1489.60	Crit W.S. (ft)	957.51	957.50
Q Bridge (cfs)	253.64	Max Chl Dpth (ft)	6.73	5.82
Q Weir (cfs)		Vel Total (ft/s)	3.57	8.35
Weir Sta Lft (ft)		Flow Area (sq ft)	417.43	178.43
Weir Sta Rgt (ft)		Froude # Chl	0.25	0.64
Weir Submerg		Specif Force (cu ft)	844.06	697.46
Weir Max Depth (ft)		Hydr Depth (ft)	2.00	2.14
Min El Weir Flow (ft)	956.09	W.P. Total (ft)	303.08	128.61
Min El Prs (ft)	957.47	Conv. Total (cfs)	22726.6	9490.5
Delta EG (ft)	1.14	Top Width (ft)	208.86	83.41
Delta WS (ft)	2.02	Frctn Loss (ft)	0.14	0.11
BR Open Area (sq ft)	56.06	C & E Loss (ft)	0.10	0.03
BR Open Vel (ft/s)	4.55	Shear Total (lb/sq ft)	0.37	2.13
Coef of Q		Power Total (lb/ft s)	0.00	0.00
Br Sel Method	Energy only			

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water

surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: LAUREL RUN

REACH: UPPER

RS: 3243.083

INPUT

Description:

Station Elevation Data		num= 135									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	976.99	6.52	974.99	15.39	972.06	15.55	972	15.62	971.97		
20.81	970	22.46	969.41	26.28	968	30.73	966.43	31.9	966		
37.21	964.14	37.6	964	39.12	963.56	43.87	962	49.65	960.88		
51.61	960.55	52.65	960.43	53.28	960.38	53.54	960.35	54.47	960		
84.83	958	84.84	958	93.16	957.77	133.3	957.86	160.38	957.8		
161.37	957.81	163.74	957.83	164.69	957.88	166.01	957.91	168.01	957.89		
175.17	957.86	178.11	957.84	182.46	957.73	188.33	957.54	227.02	956.62		
239.68	956.48	241.07	956.46	248.59	956.22	249.97	956.15	252.75	956.05		
254.14	956	255.28	956	264.07	955.4	277.47	954.49	280.78	954		
302.24	954	305.62	952.78	307.73	952	309.09	951.71	309.14	951.7		
309.2	951.68	309.56	951.71	309.78	951.72	316.84	952.08	317.18	952.05		
317.46	952	319.53	953.55	320.05	954	321.22	955.18	321.91	956		
322.69	956.89	324.51	958	325.08	958	325.96	958.13	330.41	958.53		
331	958.53	342.78	958.43	347.81	958.41	348.85	958.87	349.24	959.08		
350.98	960	351.28	960.46	352.26	962	353.42	963.78	353.56	964		
353.71	964.23	354.87	966	356.57	967.65	357	968	358.38	968.71		
358.41	968.72	360.9	970	361.98	970.59	364.68	972	368.86	973.94		
369.01	974	375.73	975.19	380.83	975.86	381.31	975.93	381.98	976		
385.31	976.37	387.63	976.85	390.6	977.28	393.01	978	394.74	979.33		
395.63	980	396.16	980.41	398.22	982	398.99	982.6	400.8	984		
402.9	985.03	404.95	986	408.82	987.44	410.35	988	411.61	988.41		
414.32	989.25	417.53	990	418.54	990.14	422.39	990.59	423.67	990.75		
426.13	991.03	429.09	991.4	429.99	991.5	430.44	991.55	430.79	991.59		
434	992	435.93	992.26	436.75	992.39	440.46	992.89	443.71	993.46		
444.58	993.57	446.44	994	448.93	994.61	453.69	996	455.47	996.59		
456.27	996.84	459.21	997.72	459.85	997.91	460.21	998	462.12	998.44		
463.7	998.8	469.08	1000	469.75	1000.16	470.9	1000.38	471.55	1000.52		

Manning's n Values

num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	302.24	.04	324.51	.035	331	.013	347.81	.06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	302.24	324.51		31.99	36.23	30.39		.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
198.18	247.93	975

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 3206.856

INPUT

Description:

EntranceStudy.rep

Station Elevation Data									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	973.69	1.24	973.27	11.76	969.59	15.53	970.63	18.01	970
18.91	968.91	21.79	966	22.99	965.57	27.16	964	30.77	962.62
32.37	962	38.12	960.6	41.07	960	44.58	959.35	50.48	958
55.91	958	71.19	957.41	72.66	957.4	74.23	957.37	76.25	957.33
78.41	957.3	85.45	957.1	88.41	957.07	92.17	957.04	98.37	956.85
103.57	956.84	107.09	956.74	138.4	956.79	143.67	956.79	158.59	956.81
163.91	956.8	171.87	956.77	177.29	956.78	179.93	956.78	185.27	956.77
187.52	956.78	240.44	956	250.21	956	262.48	954.91	268.05	954.41
271.2	954	299.68	954	300.21	953.72	303.4	952	303.66	951.82
305.35	950.61	310.41	950.9	311.92	951.06	312.66	951.52	313.47	952
316.22	952.75	320.92	954	321.41	954.28	324.09	956	327.24	956.4
330.03	956.75	331.41	956.94	334.6	957.23	338.26	957.47	344.43	957.66
351.64	958	353.96	958	355.96	960	357.82	962	357.93	962.11
358.04	962.24	359.82	964	361.81	965.97	361.85	966	361.93	966.03
366.24	968	369.56	969.15	370.86	969.61	372.37	970	374.64	970.43
375.4	970.44	377.91	970.67	379.74	970.75	381.31	970.8	383.08	970.89
385.05	971.06	388.26	971.44	389.53	971.54	393.14	972	394.11	972.19
394.62	972.37	397.82	973.23	399.36	974	400.68	974.83	402.53	976
403.06	976.34	404.47	977.23	405.71	978	406.37	978.4	408.96	980
410.8	981.07	413.67	982	414.42	982.13	418.97	982.77	421.82	983.02
424.52	983.3	428.75	983.57	429.64	983.63	432.33	984	433.82	984
435.44	984.76	438.14	986	438.78	986.27	443.2	988	443.43	988.07
445.18	988.45	446.65	988.66	448.11	988.9	448.95	989.03	449.48	989.09
450.23	989.17	453.86	989.63	454.5	989.7	456.95	990	457.86	990.11
458.02	990.14	458.12	990.15	460.48	990.47	460.83	990.53	461.37	990.63
463.28	990.94	464.25	991.14	467.49	991.82	467.83	991.89	468.31	992
474.16	993.35	477.01	994	477.23	994.05				

Manning's n Values									
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	299.68	.04	324.09	.035	334.6	.013	351.64	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	299.68	324.09		103.5	84.47	280.23	.1	.3

Blocked Obstructions		
Sta L	Sta R	Elev
192.46	241.63	970

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 3119.439

INPUT

Description:

Station Elevation Data									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	966.48	4.81	965.59	18.2	962.36	45.3	956	51.58	956
96.77	954.47	109.27	954.12	113.12	954.04	113.46	954.04	113.67	954.03

EntranceStudy.rep

113.77	954.03	116.48	954.01	116.56	954.01	116.77	954.01	119.75	954.04
119.95	954.04	185.35	954.15	186.09	954.16	186.47	954.16	188.36	954.18
195.87	954.05	195.94	954.05	201.67	954.06	201.78	954.05	204.78	954
244.05	954	244.15	954	252.63	953.58	259.15	953.26	284.3	952
284.31	952	284.72	951.51	286	950	286.1	949.82	286.9	948.78
290.28	948.9	291.53	948.89	297.93	949.01	298.46	949.11	298.63	949.14
298.88	949.2	299.64	949.45	301.26	950	303.26	950.44	305.09	950.82
307.55	951.35	308.66	951.58	310.61	952	313.37	952.44	313.99	952.34
317.88	952.72	321.91	952.58	324.7	952.71	328.65	952.9	332.34	953.08
334.98	953.21	338.05	953.37	340.18	953.47	341.94	953.56	350.88	954
350.92	954.01	350.99	954.03	355.99	955.48	357.74	956	361.59	956.24
363.28	956.35	363.73	956.37	363.93	956.38	364.86	956.43	382.82	957.12
387.98	957.38	390.9	957.5	399.57	957.69	400.61	957.73	401.67	957.76
402.99	957.81	405.25	957.88	408.85	958	409.42	958.05	409.53	958.05
412.59	958.27	421.95	960	428.82	960	428.98	960.04	429.77	960.45
432.06	961.61	432.43	961.82	432.75	962	435.83	963.82	436.13	964
436.17	964.02	439.26	966	439.72	966.11	439.97	966.14	444.44	967.06
450.04	968	453.68	968	453.82	968.09	457.23	970	458.6	971.38
459.29	972	459.5	972.18	460.95	973.5	461.5	974	461.62	974.07
464.99	976	467.72	977.55	468.63	978	469.51	978.42		

Manning's n	Values	num=	5						
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	284.3	.04	310.61	.035	364.86	.013	390.9	.035

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	284.3	310.61		148.04	169.96	53.13		.1	.3

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 2947.900

INPUT
Description:

Station Elevation Data	num=	80							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	961.29	8.9	960.49	32.15	958	33.5	958	40.29	957.31
53.94	956	59.32	954.94	64.1	954	64.64	954	78.94	953.65
98.26	953.18	117.65	952.71	124.66	952.54	150.34	952	240.68	952
242.74	951.88	249.07	951.49	249.99	951.44	253.05	951.24	256.66	951
264.24	950.5	271.98	950	275.22	948.47	276.21	948	276.44	947.85
279.01	946.15	283.37	946.51	286.45	946.79	287.43	947.46	288.25	948
288.52	948.18	291.35	950	292.89	950.87	294.9	952	297.49	953.35
298.76	954	300.14	954.72	301.8	955.58	302.63	956	315.09	957.22
321.46	957.57	322.33	957.64	325.86	957.9	329.67	958	331.31	958.04
331.83	958	335.95	958	343.54	958	347.92	959.88	348.19	960
348.35	960.07	352.66	962	354.15	962.77	356.33	964	357.52	965.22
358.27	966	359.8	967.55	360.23	968	362.11	969.91	362.2	970
362.42	970.22	364.21	972	365.19	972.87	366.32	974	368.34	975.3
369.64	976	372.96	977.7	373.54	978	374.65	978.57	377.51	980

EntranceStudy.rep

378.96	980.72	381.73	982	384.76	983.58	385.17	983.79	385.6	984
386.31	984.27	391.04	986	393.68	987	396.38	988	397.93	988.51

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	271.98	.04	302.63	.035	321.46	.013	335.95	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	271.98	302.63		148.98	300.31		.1	.3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 2616.159

INPUT
 Description:

Station Elevation Data num= 75

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	956.56	9.39	956	10.96	955.9	28.46	954.77	39.31	954.07
40.36	954	67.42	952.43	69.56	952.31	75.28	952	94.52	950.89
109.48	950	131.92	949.29	150.24	948.58	165.25	948	174.28	948
175.54	947.61	180.68	946	181.37	945.65	183.84	944.39	188.3	944.38
198.16	944.25	199.69	944.78	202.95	946	206.11	947.14	208.56	948
231.44	948	276.95	948	280.92	948.08	288.38	948.27	289.93	948.32
296.73	948.51	299.65	948.59	304.81	948.73	311.99	948.87	315.55	948.97
317.63	949.02	320.89	949.1	323.09	949.16	329.93	949.22	333.06	949.33
335.11	949.3	339.26	949.52	344.42	949.81	344.93	949.81	347.82	950
348.35	950.23	352.39	952	353.13	952.33	356.95	954	359.35	955.05
361.57	956	364.56	956.45	365.84	956.63	366.47	956.73	366.95	956.84
367.87	957.1	379.85	957.92	381.01	958	384.63	958.24	387.41	958.44
387.72	958.24	388.11	958	390.71	956.46	392.93	957.04	393.79	957.63
394.29	958	394.78	958.37	396.99	960	398.52	961.15	399.66	962
401.88	963.69	402.27	964	402.42	964.11	404.87	966	406.04	966.64

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	174.28	.04	208.56	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	174.28	208.56		249.11	158.86		.1	.3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 2447.349

INPUT
 Description:

Station Elevation Data num= 76

EntranceStudy.rep

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	977.55	2.91	976.1	16.13	970	23.79	968.85	25.86	968.53
29.13	968	33.44	966.61	35.19	966	37.87	964.16	38.23	964
38.91	963.53	40.89	962	40.95	961.96	43.32	960	45.27	958.47
45.86	958	46.23	957.72	47.85	956	48.7	955.04	50.34	953.09
51.34	952	52.8	950.29	53.06	950	53.15	949.88	54.83	948
55.52	947.42	57.31	946	58.78	944.72	59.69	944.09	70.23	944.09
73.63	944.88	78.34	946	103.09	946	145.49	946	158.04	946.59
159.21	946.61	164.59	946.66	165.31	946.67	169.89	946.76	173.6	946.86
181.35	947.08	182.09	947.07	204.83	947.25	271.22	947.33	278.06	947.41
280.46	947.42	290.36	947.49	327.5	948	340.75	948	341.35	948.29
345.81	950	349.63	951.98	349.67	952	349.7	952.02	353.14	954
356.82	955.59	357.74	956	358.11	956.12	361.91	956	379.22	956
380.3	956.97	381.45	958	382.54	958.97	383.69	960	384.77	960.97
385.92	962	387.01	962.97	388.16	964	390.06	965.69	390.41	966
391.95	967.01	392.41	967.31	393.41	968	394.08	968.43	396.44	970
396.48	970.03								

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.1	57.31	.04
		78.34	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	57.31	78.34		177.57	199.84		.1	.3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 2242.734

INPUT
 Description:

Station	Elevation	Data	num=	96					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	981.02	2.91	980	4.52	979.41	8.57	978	11.94	976.54
13.31	976	14.91	975.12	16.92	974	19.69	972.53	20.61	972
21.45	971.55	24.42	970	26.67	968.82	28.15	968	29.67	966.83
29.83	966.66	30.47	966	30.91	965.54	32.2	964	33.8	962.27
34.06	962	35.58	960.26	35.83	960	37.39	958.22	37.6	958
37.9	957.66	39.28	956.2	39.45	956	41.13	954.14	41.27	953.97
43.06	952	43.12	951.94	44.95	950	46.22	948.73	47.03	948
48.16	947.49	49.94	946.64	51.17	946	52.23	945.74	57.89	944
58.6	943.01	59.52	942	59.8	942.42	60.14	942.84	67.44	941.8
71.94	941.45	72.92	942	75.59	943.72	76.08	944	103.6	944
104.41	944.01	162.6	944.51	174.17	944.44	175.26	944.44	183.48	944.41
196.41	944.39	216.28	944.67	220.91	944.69	224.33	944.74	248.89	945.25
269.38	945.76	270.42	945.77	278.85	946	284.61	946.53	291.71	947.36
295.98	947.22	299.78	947.17	306.05	947.79	309.19	948	313.91	949.64
315.03	950	319.09	951.84	319.45	952	324.96	952.74	326.6	953
328.3	953.09	328.99	953.12	329.94	953.17	330.62	953.21	333.87	952.57
345.28	952	346.27	952	351.64	956	352.14	956.37	354.33	958

EntranceStudy.rep

355.05	958.54	357.01	960	358.11	960.82	359.7	962	361.56	963.38
362.39	964	363.4	964.57	366.05	966	366.35	966.11	371.59	968
372.89	968.48								

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .1 57.89	.04	76.08 .035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff	Contr.	Expan.
57.89	76.08	290.24	300	301.49	.1	.3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 1937.711

INPUT
 Description:

Station Elevation Data	num=	77
Sta Elev	Sta Elev	Sta Elev
0 973.8	2.76 972.4	4.34 971.56
11.23 968	12.14 967.51	15.08 966
21.45 962.52	22.3 962	24.3 960.53
28.44 957.37	30.17 956	30.6 955.69
33.68 953.36	35.45 952	36.34 951.34
40.66 948	46.36 946.28	47.32 946
56.78 943	59.38 942	60.5 941.4
70.97 939.81	74.06 941.2	75.82 942
254.83 942.34	258.85 942.87	264.86 943.49
277.24 946	278.78 946.2	292.46 948
300.66 948.68	313.94 949.09	316.48 949.18
318.44 948.32	319.19 948	321.54 948
324.95 951.02	326.06 952	327.56 953.28
330.86 956	332.8 957.52	333.39 958
337.9 960.79	339.85 962	341.97 963.15
348.25 966	349.31 966.45	

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .1 59.38	.04	75.82 .035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff	Contr.	Expan.
59.38	75.82	284.2	300	268.28	.1	.3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 1633.916

INPUT

EntranceStudy.rep

Description:

Station Elevation Data		num= 85		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	971.83	1.13	971.36	4.84	970	9.36	968.31	10.17	968
10.71	967.79	12.01	967.32	15.66	966	16.27	965.53	19.54	964
21.09	962.32	21.32	962	22.49	960.66	23.06	960	23.52	959.61
25.49	958	26.19	957.4	27.88	956	28.78	955.21	30.24	954
31.32	953.05	33.62	951.14	34.87	950	35.35	949.55	37.2	948
37.73	947.51	39.52	946	40.1	945.45	41.78	944	42.84	942.91
43.69	942	44.72	940.85	45.56	940	45.97	939.57	46.6	938.93
50.03	938.67	57.38	938.24	58.96	939.29	60.24	940	92.04	940
129.6	940	129.99	940.02	156.77	940.8	157.47	940.88	159.4	941.04
162.6	941.27	165.46	941.38	168.1	941.54	170.22	941.63	172.79	941.71
184.64	942	230.62	942	295.77	943.61	299.82	943.68	301.64	943.71
305.08	943.77	310.66	944	314.7	944.4	316.24	944.52	320.17	944.82
321.05	944.85	324.66	944.99	334.79	946	336.41	946.27	346.19	948
349.43	949.16	351.81	950	356.16	950.84	357.03	951.01	357.22	951.04
357.55	951.11	358.04	951.14	358.23	951.15	358.6	951.17	358.89	951.18
375.08	951.87	382.57	951.95	383.73	952	387.69	953.69	388.38	954
390.49	954.92	393.07	956	395.93	956.87	399.46	958	400.18	958.22

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	45.56	.04	60.24	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	45.56	60.24		76.45	74.44	89.65	.1	.3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 1559.375

INPUT

Description:

Station Elevation Data		num= 85		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	974.95	2.53	974	5.55	972.97	8.74	972	13.16	970.74
15.46	970.26	16.43	970	17.78	969.35	19.63	969.12	20.78	968.91
24.3	968	24.62	967.93	25	967.84	30.95	966.45	31.04	966.43
32.62	966	35.48	964.79	37.34	964	38.37	963.56	41.56	962
43.48	961.04	45.54	960	46.27	959.59	49.51	958	52.25	956.2
52.56	956	54.22	954.02	54.25	953.98	54.74	953.39	55.94	952
56.09	951.84	57.69	950	58.03	949.65	59.48	948	60.42	946.89
61.21	946	61.69	945.53	63	944	63.73	943.26	65.08	942
66.7	940.42	67.1	940	68.15	938.98	69	938.12	76.79	938.05
81.59	937.98	82.47	938.4	85.43	940	102.34	940	119.38	939.67
140.43	939.27	141.7	939.25	183.16	939.59	188.05	939.75	194.61	940
217.92	940.94	221.79	941	227.38	941.2	234.46	941.39	256.57	942
275.16	942	374.7	943.88	381.14	944	382.09	944.13	396.14	946
397.81	946.76	400.64	948	403.29	948.3	404.36	948.41	404.78	948.45

EntranceStudy.rep

405.16	948.48	405.44	948.51	405.84	948.55	411.67	949.05	423.56	949.98
427.11	949.99	428.15	950	431.58	951.78	431.99	952	432.3	952.16
435.74	954	439.27	955.93	439.4	956	439.6	956.09	442.16	957.34

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 66.7 .04 85.43 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 66.7 85.43 42.97 41.79 35.71 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev
 200.22 241.03 950

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 1517.572

INPUT

Description:

Station Elevation Data num= 86

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	970.88	2.45	970	6.59	968.61	8.19	968	11.39	967
14.47	966	17.87	964.92	21.29	964	23.35	963.33	26.99	962.28
27.98	962	32.93	960.5	34.58	960	37.36	959.15	41.23	958
45.1	956.63	46.56	956	49.71	954.57	51.04	954	51.38	953.82
53.24	952	54.48	950.61	55.05	950	56.43	948.45	56.85	948
57.59	947.22	58.54	946	60.02	944.35	60.3	944	60.61	943.55
61.98	942	62.44	941.47	64.27	940	65.9	938.32	66.19	937.98
66.21	938	68.66	937.94	79.42	937.65	79.73	937.82	80.15	938
82.63	939.22	83.93	940	92.79	940	112.55	939.34	116.97	939.18
145.47	938.2	147.62	938.13	151.44	938	153.94	938	173.86	938.76
178.86	938.95	212.97	940	255.55	941.18	270.08	941.6	283.84	942
286.91	942	350.84	942.88	357.18	943.05	367.06	943.31	381.07	943.65
395.22	944	400.7	945.05	404.49	945.77	405.5	946	408.12	946.64
413.2	948	413.98	948.08	414.36	948.09	415.69	948.06	418.88	948
420.38	947.98	421	947.99	430.83	947.74	431.27	947.77	433.9	948
436.81	949.85	437.02	950	438.49	951.05	439.85	952	440.06	952.14
442.72	954	443.6	954.56	445.69	956	448.25	957.66	448.73	958
449.89	958.52								

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 64.27 .04 83.93 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 64.27 83.93 126.34 122.91 10.28 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev
 204.37 245.18 950

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 1393.455

INPUT

Description:

Station Elevation Data		num= 83		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	970.98	1.81	970	4.47	968.5	5.37	968	6.5	967.36		
8.97	966	10.59	965.06	11.61	964.5	12.45	964	13.8	963.06		
15.35	962	16.16	961.36	18.03	960	19.79	958.8	21.94	957.11		
23.49	956	24.77	954.98	26.14	954	27.92	952.57	28.73	952		
30.31	950.77	31.35	950	33.69	948.62	34.77	948	37.55	946.39		
38.24	946	39.32	945.38	39.52	945.26	41.76	944	44.5	942.39		
45	942.11	45.19	942	47.22	941.67	56.82	940	71.69	938.32		
73.99	938	74.7	937.58	74.91	937.47	75.11	937.4	76.46	937.36		
84.12	937.22	94.66	936.9	95.01	937.08	97.16	938	137.61	938		
195.1	938	215.64	938.82	235.69	939.57	237.02	939.61	242.32	939.88		
244.99	940	248.45	940	270.14	940.47	273.18	940.53	277.25	940.61		
338.17	942	365.18	942	373.8	942.22	376.93	942.3	381.87	942.43		
405.42	943.03	430.83	943.68	443.41	944	447.06	945.51	448.4	946		
454.66	947.03	456.77	947.43	457.02	947.43	457.4	947.43	470.94	947.75		
473.86	947.68	475.99	947.84	478.07	948	480.45	949.72	480.84	950		
481.05	950.15	483.59	952	483.79	952.14	486.35	954	486.53	954.13		
489.1	956	489.36	956.18	491.48	957.72						

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	71.69	.04	97.16	.06		

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	71.69	97.16		52.96	64.88	11.76		.1	.3

Blocked Obstructions			num= 1
Sta L	Sta R	Elev	
269.32	293.88	950	

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 1327.528

INPUT

Description:

Station Elevation Data		num= 84		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	966.05	.09	966	2.28	964.39	2.92	964	3.3	963.73		
8.09	960.28	8.47	960	8.89	959.7	11.25	958	11.68	957.69		
14.03	956	15.4	955.05	16.87	954	17.88	953.26	19.6	952		

EntranceStudy.rep

20.76	951.26	21.4	950.85	22.77	950	24.44	949.02	26.25	948
27.1	947.51	29.74	946	32.38	944.43	33.14	944	35.25	942.76
36.58	942	41.62	940.11	42.01	940	42.6	939.92	60.41	938
62.54	937.52	63.57	937.34	65.75	936.63	77.45	936.34	83.33	936.35
86.4	937.28	88.72	938	124.54	938	207.1	938	209.86	938.07
211.14	938.11	219.44	938.37	226.21	938.58	230.74	938.74	242.86	939.09
248.91	939.31	250.94	939.38	253.4	939.47	260.12	939.66	262.21	939.73
271.44	940	271.84	940	276.38	940.08	279.94	940.16	293.15	940.44
304.9	940.69	308.68	940.77	319.73	940.99	327.71	941.17	343.34	941.5
344.23	941.51	345.43	941.54	366.23	942	396.78	942	402.39	942.15
408.63	942.31	454.42	943.47	469.86	943.86	475.49	944	479.69	945.74
480.32	946	487.07	946.65	488.72	946.92	496.64	947.19	506.23	947.61
506.66	947.4	507.88	947.76	510.25	947.94	511.08	948	513.62	949.85
513.83	950	516.39	951.86	516.58	952	518.92	953.7		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	60.41	.04	88.72	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

60.41	88.72	72.26	78.97	14.21	.1	.3
-------	-------	-------	-------	-------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
304.42	329.31	950

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 1246.668

INPUT
 Description:

Station Elevation Data num= 92

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	969.45	1.28	968	2.62	966.82	3.37	966	5.78	965.5
5.97	965.46	10.92	964.78	11.9	964.6	12.38	964.39	12.86	964
13.3	963.68	15.07	962.45	15.74	962	15.94	961.87	18.64	960
20.94	958.28	21.82	957.7	24.22	956	24.78	955.63	27.08	954
28.16	953.27	29.95	952	31.44	951.17	33.2	950	35.23	948.97
37.01	948	39.66	946.63	40.86	946	44.09	944.37	44.52	944.12
44.74	944	44.92	943.9	45.02	943.84	45.7	943.54	49.34	942
50.83	941.25	53.07	940	54.21	938.32	54.49	938	54.77	937.58
55.39	936.34	63.89	936.07	67.12	936.03	72.83	935.97	82.49	936.11
82.59	936.11	92.53	936.14	93.08	936.15	107.21	936.35	108.51	936.39
109.12	936.4	117.57	936.73	119.5	936.75	121.2	936.77	121.47	936.81
129.81	938	268.16	938	300.61	939.41	303.37	939.47	318.04	940
330.89	940.27	364.28	940.87	368.47	940.94	404.68	941.71	406.56	941.75
408.3	941.79	417.37	941.98	418.45	942	462.49	942	523.71	943.8
526.53	943.87	531.72	944	532.82	944.43	536.92	946	540.78	946.66
541.75	946.79	544.3	946.92	545.26	946.96	545.5	946.97	546.08	946.99
554.52	947.04	563.27	947.42	565.71	946.25	566.84	946.58	569.06	948

EntranceStudy.rep

571.11 949.52 571.75 950 573.81 951.53 574.45 952 576.54 953.57
 577.13 954 578.41 954.97

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 54.21 .04 129.81 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 54.21 129.81 77.35 87.84 15.82 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev
 397.79 427.13 950

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 1158.443

INPUT

Description:

Station	Elevation	Data	num=	93	Sta	Elev	Sta	Elev	Sta	Elev
0	968.01	.03	968	.28	967.79	2.24	966	8.06	964.65	
10.42	964	13.07	963.13	15.7	962	19.2	960.39	20.02	960	
24.23	958.08	24.41	958	24.44	957.98	27.46	956	29.43	954.01	
29.44	954	29.56	953.88	31.41	952	31.54	951.87	33.35	950	
34.6	948.84	35.44	948	35.92	947.48	36.85	946.55	37.49	946	
37.88	945.72	39.93	944	42.37	942.18	42.56	942	44.03	940.71	
44.74	940	46.42	938.35	46.73	938	51.57	937.28	60.26	936	
60.41	935.98	60.58	936.09	66.76	936.06	71.79	935.97	71.85	935.99	
71.86	936	80.2	936	95.97	936.37	114.79	936.69	127.46	936.88	
128.08	936.89	128.36	936.9	170.26	938	358.38	938	375.32	939.99	
375.42	940	402.08	940	464.8	941.8	473.19	941.97	473.74	941.98	
474.16	941.99	474.87	942	478.94	942.28	479.74	942.29	486.5	942.28	
488.53	942.28	490.34	942.28	494.86	942.28	499.35	942.25	501.53	942.25	
503.8	942.24	504.69	942.24	516.79	942.2	518.41	942.17	518.85	942.16	
519.5	942.14	523.15	942	542.6	942	542.97	942.01	595.08	944	
596.06	944.32	601.2	946	602.11	946	602.81	946.09	607.49	946.61	
610.08	946.67	624.16	947.1	628.1	947.18	628.42	946.95	629.43	946.32	
629.95	946	632.22	946	634.14	947.31	635.19	948	635.61	948.26	
638.21	950	639.03	950.51	640.42	951.44					

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 46.73 .04 170.26 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 46.73 170.26 78.36 95.44 10.64 .1 .3

Blocked Obstructions num= 2
 Sta L Sta R Elev Sta L Sta R Elev
 464.19 466.71 950 474.56 486.67 950

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 1055.088

INPUT

Description:

Station Elevation Data		num= 110		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	958.86	1.92	958	3.9	957	5.84	956	7.21	955.3		
9.43	954.16	9.74	954	10.47	953.63	13.65	952	16.12	950.77		
17.6	950	18.3	949.71	19.67	949.1	21.95	948	27.04	946.01		
27.05	946	27.09	945.98	32.23	944	36.84	942.34	37.74	942		
38.15	941.82	39.73	941.07	41.88	940	44.77	939.47	49.04	939.25		
59.44	938	68.09	938	69.46	936.16	69.57	936	70.23	935.07		
70.46	934.8	71.26	934.84	84.33	935.19	85.55	935.82	85.84	936		
151.32	936	153.74	936	192.57	936.91	235.9	936.92	238.12	936.74		
241.13	936.69	241.22	936.69	241.56	936.69	248.47	936.63	253.38	936.59		
257.33	936.57	265.9	936.49	268.39	936.47	270.75	936.43	272.14	936.41		
272.99	936.43	273.82	936.41	274.56	936.39	275.56	936.45	276.55	936.42		
278.74	936.57	280.32	936.52	281.57	936.48	282.21	936.45	325.16	938		
470.7	938	471.98	938.18	476.04	938.61	478.02	938.89	497.75	940		
500.64	940	505.82	940.16	514	940.33	535.28	940.79	536.22	940.83		
540.89	940.94	542.4	940.99	545.15	941.07	548.33	941.15	551.54	941.23		
559.73	941.48	560.45	941.51	563.26	941.58	576.73	942	577.31	942		
579.31	942.04	581.45	942.06	588.44	942.17	602.67	942.34	615.46	942.47		
618.66	942.57	624.34	942.52	625.65	942.56	627.67	942.56	661.93	943.73		
670.81	944	673.02	944.17	680.16	945.37	683.4	945.91	683.99	946		
684.52	946.08	686.18	946.27	687.27	946.34	692.72	946.53	704.75	946.8		
705.6	946.21	705.88	946	709.89	946	712.65	947.59	713.32	948		
715.66	949.36	716.69	950	718.7	951.18	720.04	952	720.59	952.32		

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	68.09	.04	85.84	.06

Bank Sta: Left 68.09 Right 85.84 Lengths: Left 33.6 Channel 54.67 Right 605.44 Coeff Contr. .1 Expan. .3

Blocked Obstructions			num= 1		
Sta L	Sta R	Elev	Sta L	Sta R	Elev
542.9	606.41	950			

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 1000.000

INPUT

Description:

EntranceStudy.rep

Station Elevation Data			num= 76								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	956.44	.84	956	1.31	955.75	7.83	952.35	8.46	952		
8.68	951.88	12.3	950	12.57	949.87	16.42	948	19	946.85		
20.92	946	25.24	944	28.65	942.46	29.67	942	30.56	941.6		
34.1	940	37.83	939.16	40.83	938.48	43.1	938	81.46	938		
85.41	937.34	86.64	937.11	86.77	937.09	94.5	936	97.61	935.57		
104.78	934.39	110.63	934.24	115.51	934.05	125.72	933.73	129.87	933.59		
131.85	933.57	137.68	935.1	138.92	936	148.52	936	159.7	936		
236.31	937.68	237.41	937.68	238.14	937.68	251.55	937.97	252.93	938		
255.48	939.29	256.38	939.88	256.54	940	256.71	940.11	257.28	940.52		
259.46	942	261.4	943.39	262.36	944	263.05	944.42	265.43	946		
267.98	947.43	269.36	947.66	271.97	947.91	271.98	947.91	271.99	947.91		
272.02	947.91	272.04	947.91	290.15	946.97	290.32	946.97	291.31	948		
293.88	948	294.29	948.32	295.76	950	297.77	951.84	297.92	952		
298.15	952.22	299.87	954	301.72	955.68	302.02	956	302.6	956.37		
304.79	958	304.93	958.09	305.64	958.62	307.46	960	308.21	960.6		
309.42	961.54										

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	81.46	.04	138.92	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	81.46	138.92		1	1		.1	.3

CROSS SECTION

RIVER: MEATHOUSE FORK
 REACH: MEATHOUSE FORK RS: 1335.848

INPUT
 Description:

Station Elevation Data			num= 76								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	956.44	.84	956	1.31	955.75	7.83	952.35	8.46	952		
8.68	951.88	12.3	950	12.57	949.87	16.42	948	19	946.85		
20.92	946	25.24	944	28.65	942.46	29.67	942	30.56	941.6		
34.1	940	37.83	939.16	40.83	938.48	43.1	938	81.46	938		
85.41	937.34	86.44	937.15	86.77	937.09	94.5	936	97.61	935.57		
104.78	934.39	110.63	934.24	115.51	934.05	125.75	933.73	129.87	933.59		
131.82	933.57	137.65	935.11	138.88	936	148.18	936	159.74	936		
236.22	937.67	237.34	937.68	238.07	937.68	251.44	937.96	253.03	938		
255.45	939.22	256.44	939.87	256.62	940	256.8	940.12	257.43	940.57		
259.53	942	261.41	943.34	262.44	944	263.19	944.45	265.52	946		
268.01	947.39	269.37	947.62	271.91	947.86	271.97	947.88	272.05	947.9		
272.35	947.89	272.62	947.86	290.26	946.95	290.44	946.95	291.46	948		
293.95	948	294.35	948.31	295.83	950	297.85	951.86	297.99	952		
298.21	952.2	299.94	954	301.8	955.7	302.1	956	302.65	956.35		
304.86	958	304.95	958.06	305.43	958.42	307.53	960	308.38	960.69		
308.72	960.95										

EntranceStudy.rep

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 94.5 .04 138.88 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 94.5 138.88 96.18 135.67 152.34 .1 .3

CROSS SECTION

RIVER: MEATHOUSE FORK
 REACH: MEATHOUSE FORK RS: 1191.458

INPUT
 Description:

Station Elevation Data num= 62
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 0 944.97 2.1 944.09 2.34 944 2.42 943.96 7.27 942
 10.72 940.57 12.12 940 18.54 939.18 26.34 938 52.22 936.96
 54.37 936.91 59.92 936.8 74.44 936.48 78.46 936.36 80.49 936.3
 96.95 936.03 98.03 936 143.34 936 158.22 936 160.96 934.13
 161.59 933.67 161.78 933.56 163.85 933.55 177.64 933.53 179.13 934.9
 182.43 935.47 186.38 936 189.18 936.14 190.27 936.24 197.65 936.75
 199.55 936.94 210.08 938 216.09 939.73 217.06 940 220.88 941.04
 224.71 942 229.82 943.75 230.6 944 230.73 944.09 233.48 946
 234.88 946.94 236.38 948 238.76 949.58 239.38 950 241.5 951.45
 242.36 952 243.43 952.7 245.98 954 248.57 954.57 249.49 954.74
 250.87 954.88 252.06 954.95 264.88 955.68 266.64 955.69 271.14 956
 273.47 956 274 956.46 277.89 959.86 278.06 960 278.36 960.25
 280.27 962 281.05 962.67

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .06 158.22 .04 186.38 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 158.22 186.38 1 1 1 .1 .3

SUMMARY OF MANNING'S N VALUES

River:BIG ISAAC

Reach	River Sta.	n1	n2	n3	n4	n5	n6	n7	n8
LOWER	2531.399	.035	.035	.035					
LOWER	2364.929	.1	.013	.05	.035	.035	.035	.1	
LOWER	2037.082	.1	.013	.05	.035	.05	.035	.1	
LOWER	1730.807	.1	.013	.035	.035	.035	.1		
LOWER	1669.175	.1	.013	.035	.035	.035	.1		

EntranceStudy.rep										
LOWER	1539.840	.1	.013	.035	.035	.1				
LOWER	1419.259	.1	.013	.035	.013	.035	.04	.1		
LOWER	1318.016	.1	.013	.035	.013	.035	.04	.1		
LOWER	1291.256									
LOWER	1266.884	Culvert	.1	.013	.035	.04	.013	.1		
LOWER	1172.189		.1	.013	.035	.05	.035	.06	.013	.1
LOWER	1096.461		.05	.013	.035	.035	.1	.013	.1	
LOWER	1000.000		.1	.04	.1					

River:LAUREL RUN

Reach	River Sta.	n1	n2	n3	n4	n5	n6
UPPER	6314.305	.1	.035	.035	.013	.05	
UPPER	6232.875	.1	.035	.035	.013	.05	
UPPER	6088.039	.1	.04	.035	.013	.035	
UPPER	5772.495	.1	.04	.035	.013	.06	
UPPER	5494.591	.01	.04	.035	.013	.035	.06
UPPER	5357.523	.1	.04	.035	.013	.06	
UPPER	5335.512	.1	.04	.035	.013	.06	
UPPER	5187.560	.1	.04	.035			
UPPER	5118.449	.1	.04	.035			
UPPER	5070.286	.1	.04	.035			
UPPER	4998.406	.1	.04	.035			
UPPER	4765.350	.1	.04	.06			
UPPER	4431.983	.1	.04	.035			
UPPER	4266.832	.1	.04	.035			
UPPER	3949.469	.1	.04	.035			
UPPER	3900.631	.1	.04	.035			
UPPER	3853.996	.1	.04	.035			
UPPER	3791.489	.1	.04	.035			
UPPER	3691.713	.1	.04	.035			
UPPER	3675.796	.1	.04	.035			
UPPER	3657.812	.1	.04	.035			
UPPER	3632.733	.035	.04	.035			
UPPER	3465.882	.035	.04	.035			
UPPER	3309.640	.035	.04	.013	.06		
UPPER	3269.177	.035	.04	.035	.013	.06	
UPPER	3257.286	Bridge					
UPPER	3243.083	.035	.04	.035	.013	.06	
UPPER	3206.856	.035	.04	.035	.013	.06	
UPPER	3119.439	.035	.04	.035	.013	.035	
UPPER	2947.900	.035	.04	.035	.013	.035	
UPPER	2616.159	.035	.04	.035			
UPPER	2447.349	.1	.04	.035			
UPPER	2242.734	.1	.04	.035			
UPPER	1937.711	.1	.04	.035			
UPPER	1633.916	.1	.04	.035			
UPPER	1559.375	.1	.04	.035			
UPPER	1517.572	.1	.04	.035			
UPPER	1393.455	.1	.04	.06			

EntranceStudy.rep

UPPER	1327.528	.1	.04	.06
UPPER	1246.668	.1	.04	.06
UPPER	1158.443	.1	.04	.06
UPPER	1055.088	.1	.04	.06
UPPER	1000.000	.1	.04	.1

River: MEATHOUSE FORK

Reach	River Sta.	n1	n2	n3
MEATHOUSE FORK	1335.848	.1	.04	.1
MEATHOUSE FORK	1191.458	.06	.04	.06

SUMMARY OF REACH LENGTHS

River: BIG ISAAC

Reach	River Sta.	Left	Channel	Right
LOWER	2531.399	423.58	165.83	116.04
LOWER	2364.929	251.58	300	228.64
LOWER	2037.082	273.96	288.77	271.42
LOWER	1730.807	28.48	59.01	21.33
LOWER	1669.175	25.17	121.96	42.25
LOWER	1539.840	14.05	89.52	50.18
LOWER	1419.259	11.01	96.75	78.52
LOWER	1318.016	9.6	50.46	66.09
LOWER	1291.256	Culvert		
LOWER	1266.884	11.19	93.06	33.76
LOWER	1172.189	6.65	73.2	10.56
LOWER	1096.461	695.49	85.68	11.22
LOWER	1000.000	1	1	1

River: LAUREL RUN

Reach	River Sta.	Left	Channel	Right
UPPER	6314.305	79.48	81.18	79.01
UPPER	6232.875	155.12	142.34	81.44
UPPER	6088.039	273.66	295.06	267.03
UPPER	5772.495	243.75	275.76	373.61
UPPER	5494.591	276.1	288.53	307.93
UPPER	5357.523	29.17	22.01	16.43
UPPER	5335.512	159.1	137.86	102.84
UPPER	5187.560	53.89	68.79	69.68
UPPER	5118.449	52.99	47.79	75.02
UPPER	5070.286	72.82	71.44	67.88

EntranceStudy.rep

UPPER	4998.406	188.11	226.48	286.17
UPPER	4765.350	323.07	300	176.86
UPPER	4431.983	228.19	154.06	150.95
UPPER	4266.832	271.31	315.07	314.36
UPPER	3949.469	56.48	48.84	50.59
UPPER	3900.631	41.49	46.21	40.51
UPPER	3853.996	75.96	62.46	59.87
UPPER	3791.489	108.21	99.65	103.15
UPPER	3691.713	18.17	15.92	16.89
UPPER	3675.796	23.79	17.98	13.95
UPPER	3657.812	31.6	25.08	28.39
UPPER	3632.733	136.38	147.69	46.47
UPPER	3465.882	17.32	127.69	123.64
UPPER	3309.640	39.21	40.11	39.84
UPPER	3269.177	34.53	26.06	33.76
UPPER	3257.286	Bridge		
UPPER	3243.083	31.99	36.23	30.39
UPPER	3206.856	103.5	84.47	280.23
UPPER	3119.439	148.04	169.96	53.13
UPPER	2947.900	148.98	300.31	367.39
UPPER	2616.159	249.11	158.86	23.1
UPPER	2447.349	177.57	199.84	195.55
UPPER	2242.734	290.24	300	301.49
UPPER	1937.711	284.2	300	268.28
UPPER	1633.916	76.45	74.44	89.65
UPPER	1559.375	42.97	41.79	35.71
UPPER	1517.572	126.34	122.91	10.28
UPPER	1393.455	52.96	64.88	11.76
UPPER	1327.528	72.26	78.97	14.21
UPPER	1246.668	77.35	87.84	15.82
UPPER	1158.443	78.36	95.44	10.64
UPPER	1055.088	33.6	54.67	605.44
UPPER	1000.000	1	1	1

River: MEATHOUSE FORK

Reach	River Sta.	Left	Channel	Right
MEATHOUSE FORK	1335.848	96.18	135.67	152.34
MEATHOUSE FORK	1191.458	1	1	1

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: BIG ISAAC

Reach	River Sta.	Contr.	Expan.
LOWER	2531.399	.1	.3

LOWER	2364.929	.1	.3
LOWER	2037.082	.1	.3
LOWER	1730.807	.1	.3
LOWER	1669.175	.1	.3
LOWER	1539.840	.1	.3
LOWER	1419.259	.1	.3
LOWER	1318.016	.1	.3
LOWER	1291.256	culvert	
LOWER	1266.884	.1	.3
LOWER	1172.189	.1	.3
LOWER	1096.461	.1	.3
LOWER	1000.000	.1	.3

River: LAUREL RUN

Reach	River Sta.	Contr.	Expan.
UPPER	6314.305	.1	.3
UPPER	6232.875	.1	.3
UPPER	6088.039	.1	.3
UPPER	5772.495	.1	.3
UPPER	5494.591	.1	.3
UPPER	5357.523	.1	.3
UPPER	5335.512	.1	.3
UPPER	5187.560	.1	.3
UPPER	5118.449	.1	.3
UPPER	5070.286	.1	.3
UPPER	4998.406	.1	.3
UPPER	4765.350	.1	.3
UPPER	4431.983	.1	.3
UPPER	4266.832	.1	.3
UPPER	3949.469	.1	.3
UPPER	3900.631	.1	.3
UPPER	3853.996	.1	.3
UPPER	3791.489	.1	.3
UPPER	3691.713	.1	.3
UPPER	3675.796	.1	.3
UPPER	3657.812	.1	.3
UPPER	3632.733	.1	.3
UPPER	3465.882	.1	.3
UPPER	3309.640	.1	.3
UPPER	3269.177	.1	.3
UPPER	3257.286	Bridge	
UPPER	3243.083	.1	.3
UPPER	3206.856	.1	.3
UPPER	3119.439	.1	.3
UPPER	2947.900	.1	.3
UPPER	2616.159	.1	.3
UPPER	2447.349	.1	.3
UPPER	2242.734	.1	.3
UPPER	1937.711	.1	.3

EntranceStudy.rep

UPPER	1633.916	.1	.3
UPPER	1559.375	.1	.3
UPPER	1517.572	.1	.3
UPPER	1393.455	.1	.3
UPPER	1327.528	.1	.3
UPPER	1246.668	.1	.3
UPPER	1158.443	.1	.3
UPPER	1055.088	.1	.3
UPPER	1000.000	.1	.3

River: MEATHOUSE FORK

Reach	River Sta.	Contr.	Expan.
MEATHOUSE FORK	1335.848	.1	.3
MEATHOUSE FORK	1191.458	.1	.3

Profile Output Table - Standard Table 1

River E.G. Slope (ft/ft)	Reach Vel Chnl (ft/s)	Flow Area (sq ft)	River Sta Top Width (ft)	Profile Froude # Chl	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)
MEATHOUSE FORK	MEATHOUSE FORK	1335.848	100 YR	3087.00	933.57	942.07		942.33	
0.001310	5.20	1210.61	230.11	0.33					
MEATHOUSE FORK	MEATHOUSE FORK	1191.458	100 YR	3087.00	933.53	942.00	938.76	942.15	
0.001005	4.47	1146.92	217.44	0.28					
LAUREL RUN	UPPER	6314.305	100 YR	1489.60	978.35	984.01	984.01	985.21	
0.007151	8.92	187.25	95.66	0.77					
LAUREL RUN	UPPER	6232.875	100 YR	1489.60	977.05	983.13	983.10	984.29	
0.007894	9.61	180.85	74.12	0.81					
LAUREL RUN	UPPER	6088.039	100 YR	1489.60	976.48	982.05	982.05	983.06	
0.009278	8.36	188.98	92.14	0.75					
LAUREL RUN	UPPER	5772.495	100 YR	1489.60	972.55	978.51	978.27	979.56	
0.007322	8.80	211.12	88.43	0.70					
LAUREL RUN	UPPER	5494.591	100 YR	1489.60	970.87	976.40	976.40	977.84	
0.004803	6.66	179.86	81.12	0.56					
LAUREL RUN	UPPER	5357.523	100 YR	1489.60	969.80	975.90		976.32	
0.002908	5.68	369.09	138.14	0.45					
LAUREL RUN	UPPER	5335.512	100 YR	1489.60	969.60	975.89		976.24	
0.002448	5.30	399.25	143.01	0.41					
LAUREL RUN	UPPER	5187.560	100 YR	1489.60	968.06	974.92		975.75	
0.004685	7.48	219.82	64.20	0.58					
LAUREL RUN	UPPER	5118.449	100 YR	1489.60	967.88	974.57	973.43	975.41	
0.005036	7.64	220.57	66.61	0.59					
LAUREL RUN	UPPER	5070.286	100 YR	1489.60	967.29	973.17	973.17	974.94	
0.014057	10.73	145.97	47.35	0.94					

				EntranceStudy.rep					
LAUREL RUN	UPPER	4998.406	100 YR	1489.60	967.13	972.45		973.49	
0.006990	8.47	195.10		0.70					
LAUREL RUN	UPPER	4765.350	100 YR	1489.60	963.67	969.79	969.79	971.34	
0.010968	11.27	213.27		0.87					
LAUREL RUN	UPPER	4431.983	100 YR	1489.60	961.56	968.32		968.93	
0.003286	6.69	252.65		0.48					
LAUREL RUN	UPPER	4266.832	100 YR	1489.60	961.56	966.74	966.74	968.06	
0.009658	9.85	183.06		0.80					
LAUREL RUN	UPPER	3949.469	100 YR	1489.60	956.78	964.07		964.45	
0.002679	5.95	331.69		0.42					
LAUREL RUN	UPPER	3900.631	100 YR	1489.60	956.39	963.85		964.30	
0.003396	6.50	327.18		0.46					
LAUREL RUN	UPPER	3853.996	100 YR	1489.60	956.21	963.11	963.11	964.03	
0.007652	8.69	229.91		0.69					
LAUREL RUN	UPPER	3791.489	100 YR	1489.60	955.91	962.24	962.24	963.05	
0.007758	8.41	255.17		0.69					
LAUREL RUN	UPPER	3691.713	100 YR	1489.60	955.72	959.92	959.86	960.68	
0.011096	8.78	241.30		0.81					
LAUREL RUN	UPPER	3675.796	100 YR	1489.60	955.34	959.80		960.47	
0.010759	7.72	241.68		0.77					
LAUREL RUN	UPPER	3657.812	100 YR	1489.60	955.24	959.58	959.58	960.28	
0.013249	8.19	229.03		0.81					
LAUREL RUN	UPPER	3632.733	100 YR	1489.60	955.14	959.29	959.29	959.95	
0.010998	7.98	249.96		0.80					
LAUREL RUN	UPPER	3465.882	100 YR	1489.60	952.55	959.03		959.21	
0.001091	3.55	466.71		0.28					
LAUREL RUN	UPPER	3309.640	100 YR	1489.60	951.98	958.77		959.04	
0.002686	4.87	365.75		0.41					
LAUREL RUN	UPPER	3269.177	100 YR	1489.60	951.98	958.72	957.60	958.93	
0.001965	4.43	437.25		0.36					
LAUREL RUN	UPPER	3257.286		Bridge					
LAUREL RUN	UPPER	3243.083	100 YR	1489.60	951.68	956.70	956.68	957.80	
0.012037	9.49	183.04		0.84					
LAUREL RUN	UPPER	3206.856	100 YR	1489.60	950.61	956.31	956.31	957.38	
0.011740	9.40	189.61		0.84					
LAUREL RUN	UPPER	3119.439	100 YR	1659.50	948.78	954.66	954.66	955.26	
0.005723	7.62	344.40		0.61					
LAUREL RUN	UPPER	2947.900	100 YR	1659.50	946.15	953.07	953.07	953.75	
0.007266	8.14	302.14		0.67					
LAUREL RUN	UPPER	2616.159	100 YR	1659.50	944.25	949.35	949.35	950.04	
0.007812	7.91	298.06		0.71					
LAUREL RUN	UPPER	2447.349	100 YR	1659.50	944.09	947.93	947.93	948.46	
0.009764	8.02	326.26		0.77					
LAUREL RUN	UPPER	2242.734	100 YR	1659.50	941.45	945.67	945.67	946.29	
0.011893	8.44	287.10		0.81					
LAUREL RUN	UPPER	1937.711	100 YR	1659.50	939.81	943.93		944.19	
0.003717	4.85	414.52		0.47					
LAUREL RUN	UPPER	1633.916	100 YR	1659.50	938.24	942.62		942.97	
0.005339	6.42	367.80		0.57					
LAUREL RUN	UPPER	1559.375	100 YR	1659.50	937.98	942.38		942.63	
0.002568	4.50	409.89		0.40					

			EntranceStudy.rep					
LAUREL RUN	UPPER		1517.572	100 YR	1659.50	937.65	942.39	942.54
0.001236	3.26	535.44	212.59		0.28			
LAUREL RUN	UPPER		1393.455	100 YR	1659.50	936.90	942.41	942.48
0.000874	3.22	904.97	311.90		0.25			
LAUREL RUN	UPPER		1327.528	100 YR	1659.50	936.34	942.40	942.45
0.000571	2.79	1083.24	351.41		0.21			
LAUREL RUN	UPPER		1246.668	100 YR	1659.50	935.97	942.40	942.43
0.000245	1.90	1386.02	398.29		0.14			
LAUREL RUN	UPPER		1158.443	100 YR	1659.50	935.97	942.40	942.42
0.000138	1.37	1764.76	496.44		0.10			
LAUREL RUN	UPPER		1055.088	100 YR	1659.50	934.80	942.40	942.41
0.000089	1.22	2442.60	508.62		0.08			
LAUREL RUN	UPPER		1000.000	100 YR	1659.50	933.57	942.29	942.35
0.000309	2.44	1259.92	230.83		0.16			
BIG ISAAC	LOWER		2531.399	100 YR	1390.00	943.72	946.74	946.74
0.009899	6.78	239.79	188.09		0.84			
BIG ISAAC	LOWER		2364.929	100 YR	1390.00	941.66	944.77	945.12
0.004632	5.42	312.16	176.73		0.60			
BIG ISAAC	LOWER		2037.082	100 YR	1390.00	938.88	942.85	942.85
0.008831	7.78	273.10	215.92		0.82			
BIG ISAAC	LOWER		1730.807	100 YR	1390.00	937.28	942.44	942.47
0.000260	1.70	896.70	273.84		0.15			
BIG ISAAC	LOWER		1669.175	100 YR	1390.00	937.20	942.44	942.47
0.000150	1.52	1075.55	284.47		0.12			
BIG ISAAC	LOWER		1539.840	100 YR	1390.00	935.94	942.40	942.45
0.000267	2.25	1016.18	292.48		0.16			
BIG ISAAC	LOWER		1419.259	100 YR	1390.00	935.32	942.40	942.44
0.000142	1.42	978.15	320.50		0.10			
BIG ISAAC	LOWER		1318.016	100 YR	1390.00	934.72	942.41	938.62
0.000067	1.07	1222.16	372.16		0.07			942.43
BIG ISAAC	LOWER		1291.256		culvert			
BIG ISAAC	LOWER		1266.884	100 YR	1390.00	934.65	942.36	942.38
0.000116	1.19	1276.62	372.91		0.09			
BIG ISAAC	LOWER		1172.189	100 YR	1390.00	934.19	942.36	942.37
0.000061	1.25	2052.06	461.69		0.08			
BIG ISAAC	LOWER		1096.461	100 YR	1390.00	933.69	942.36	942.37
0.000021	0.76	2785.15	560.56		0.05			
BIG ISAAC	LOWER		1000.000	100 YR	1390.00	933.57	942.31	942.35
0.000220	2.11	1264.11	230.89		0.13			

ERRORS WARNINGS AND NOTES

Errors Warnings and Notes for Plan : Existing

River: BIG ISAAC Reach: LOWER RS: 2531.399 Profile: 100 YR

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning:Divided flow computed for this cross-section.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: BIG ISAAC Reach: LOWER RS: 2364.929 Profile: 100 YR

Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

River: BIG ISAAC Reach: LOWER RS: 2037.082 Profile: 100 YR

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: BIG ISAAC Reach: LOWER RS: 1730.807 Profile: 100 YR

Warning:Divided flow computed for this cross-section.

River: BIG ISAAC Reach: LOWER RS: 1669.175 Profile: 100 YR

Warning:Divided flow computed for this cross-section.

River: BIG ISAAC Reach: LOWER RS: 1539.840 Profile: 100 YR

Warning:Divided flow computed for this cross-section.

River: BIG ISAAC Reach: LOWER RS: 1419.259 Profile: 100 YR

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

River: BIG ISAAC Reach: LOWER RS: 1291.256 Profile: 100 YR

Warning:The weir over culvert is submerged.

River: BIG ISAAC Reach: LOWER RS: 1291.256 Profile: 100 YR Culv: Culvert #1

Warning:During the culvert inlet control computations, the program could not balance the culvert/weir flow. The reported

inlet energy grade answer may not be valid.

River: BIG ISAAC Reach: LOWER RS: 1266.884 Profile: 100 YR

Warning:Divided flow computed for this cross-section.

River: BIG ISAAC Reach: LOWER RS: 1172.189 Profile: 100 YR

Warning:Divided flow computed for this cross-section.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

EntranceStudy.rep

This may indicate the need for additional cross sections.

River: BIG ISAAC Reach: LOWER RS: 1096.461 Profile: 100 YR

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

River: LAUREL RUN Reach: UPPER RS: 6314.305 Profile: 100 YR

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: LAUREL RUN Reach: UPPER RS: 6232.875 Profile: 100 YR

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

River: LAUREL RUN Reach: UPPER RS: 6088.039 Profile: 100 YR

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: LAUREL RUN Reach: UPPER RS: 5772.495 Profile: 100 YR

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

River: LAUREL RUN Reach: UPPER RS: 5494.591 Profile: 100 YR

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: LAUREL RUN Reach: UPPER RS: 5118.449 Profile: 100 YR

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

River: LAUREL RUN Reach: UPPER RS: 5070.286 Profile: 100 YR

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: LAUREL RUN Reach: UPPER RS: 4998.406 Profile: 100 YR

Warning:Divided flow computed for this cross-section.

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

River: LAUREL RUN Reach: UPPER RS: 4765.350 Profile: 100 YR

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: LAUREL RUN Reach: UPPER RS: 4431.983 Profile: 100 YR

Warning:Divided flow computed for this cross-section.

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

River: LAUREL RUN Reach: UPPER RS: 4266.832 Profile: 100 YR

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning:Divided flow computed for this cross-section.

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: LAUREL RUN Reach: UPPER RS: 3949.469 Profile: 100 YR

Warning:Divided flow computed for this cross-section.

River: LAUREL RUN Reach: UPPER RS: 3900.631 Profile: 100 YR

Warning:Divided flow computed for this cross-section.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

River: LAUREL RUN Reach: UPPER RS: 3853.996 Profile: 100 YR

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning:Divided flow computed for this cross-section.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: LAUREL RUN Reach: UPPER RS: 3791.489 Profile: 100 YR

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning:Divided flow computed for this cross-section.

Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: LAUREL RUN Reach: UPPER RS: 3691.713 Profile: 100 YR

Warning:Divided flow computed for this cross-section.

River: LAUREL RUN Reach: UPPER RS: 3675.796 Profile: 100 YR

Warning:Divided flow computed for this cross-section.

River: LAUREL RUN Reach: UPPER RS: 3657.812 Profile: 100 YR

Warning: Divided flow computed for this cross-section.

River: LAUREL RUN Reach: UPPER RS: 3632.733 Profile: 100 YR

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: LAUREL RUN Reach: UPPER RS: 3465.882 Profile: 100 YR

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

River: LAUREL RUN Reach: UPPER RS: 3269.177 Profile: 100 YR

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

River: LAUREL RUN Reach: UPPER RS: 3257.286 Profile: 100 YR Upstream

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

River: LAUREL RUN Reach: UPPER RS: 3257.286 Profile: 100 YR Downstream

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

used.

River: LAUREL RUN Reach: UPPER RS: 3206.856 Profile: 100 YR

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m) between the current and previous cross section. This may

indicate

the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: LAUREL RUN Reach: UPPER RS: 3119.439 Profile: 100 YR

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: LAUREL RUN Reach: UPPER RS: 2947.900 Profile: 100 YR

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: LAUREL RUN Reach: UPPER RS: 2616.159 Profile: 100 YR

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: LAUREL RUN Reach: UPPER RS: 2447.349 Profile: 100 YR

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

The water surface came back below critical depth. This indicates that there is not a valid subcritical answer.
 The program defaulted to critical depth.
 River: LAUREL RUN Reach: UPPER RS: 2242.734 Profile: 100 YR
 Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
 Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer.
 The program defaulted to critical depth.
 River: LAUREL RUN Reach: UPPER RS: 1937.711 Profile: 100 YR
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
 River: LAUREL RUN Reach: UPPER RS: 1633.916 Profile: 100 YR
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 River: LAUREL RUN Reach: UPPER RS: 1559.375 Profile: 100 YR
 Warning: Divided flow computed for this cross-section.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 River: LAUREL RUN Reach: UPPER RS: 1517.572 Profile: 100 YR
 Warning: Divided flow computed for this cross-section.
 River: LAUREL RUN Reach: UPPER RS: 1393.455 Profile: 100 YR
 Warning: Divided flow computed for this cross-section.
 River: LAUREL RUN Reach: UPPER RS: 1327.528 Profile: 100 YR
 Warning: Divided flow computed for this cross-section.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 River: LAUREL RUN Reach: UPPER RS: 1246.668 Profile: 100 YR
 Warning: Divided flow computed for this cross-section.
 River: LAUREL RUN Reach: UPPER RS: 1158.443 Profile: 100 YR
 Warning: Divided flow computed for this cross-section.
 River: LAUREL RUN Reach: UPPER RS: 1055.088 Profile: 100 YR
 Warning: Divided flow computed for this cross-section.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.

Supplement 3

HEC-RAS Analysis –Proposed Conditions Summary w/ Cross Sections

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX   XXXX      XXXX      XX      XXXX
X      X  X       X   X      X  X      X  X      X
X      X  X       X       X  X      X  X      X
XXXXXXXX XXXX     X       XXX  XXXX     XXXXXX   XXXX
X      X  X       X       X  X      X  X      X
X      X  X       X   X      X  X      X  X      X
X      X  XXXXXX   XXXX     X   X     X   X     XXXXX

```

PROJECT DATA

Project Title: MEATHOUSE
Project File : EntranceStudy.prj
Run Date and Time: 5/6/2013 12:32:04 PM

Project in English units

PLAN DATA

Plan Title: Lake Proposed
Plan File : x:\Navitus Jobfiles\Antero Resources\ANT019-Lake\Engineering\Drainage Comp\Floodplain\Entrance Study\Computations\HEC-RAS\EntranceStudy.p01

Geometry Title: Lake Proposed
Geometry File : x:\Navitus Jobfiles\Antero Resources\ANT019-Lake\Engineering\Drainage Comp\Floodplain\Entrance Study\Computations\HEC-RAS\EntranceStudy.g03

Flow Title : EX MEATHOUSE
Flow File : x:\Navitus Jobfiles\Antero Resources\ANT019-Lake\Engineering\Drainage Comp\Floodplain\Entrance Study\Computations\HEC-RAS\EntranceStudy.f01

Plan Summary Information:

Number of:	Cross Sections =	56	Multiple Openings =	0
	Culverts =	1	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3

Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary
 Conveyance Calculation Method: At breaks in n values only
 Friction Slope Method: Average Conveyance
 Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: EX MEATHOUSE
 Flow File : x:\Navitus Jobfiles\Antero Resources\ANT019-Lake\Engineering\Drainage Comp\Floodplain\Entrance Study\Computations\HEC-RAS\EntranceStudy.f01

Flow Data (cfs)

River	Reach	RS	100 YR
BIG ISAAC	LOWER	2531.399	1390
LAKE SOUTH	BREACLAKE SOUTH BREAC	1840.360	1
LAUREL RUN	UPPER	6314.305	1489.6
LAUREL RUN	UPPER	5494.591	1489.6
LAUREL RUN	UPPER	3119.439	1659.5
LAUREL RUN	MIDDLE	5494.591	1489.6
LAUREL RUN	MIDDLE	3119.439	1659.5
MEATHOUSE FORK	MEATHOUSE FORK	1335.848	3087

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
BIG ISAAC	LOWER	100 YR	Normal S = 0.007	
LAUREL RUN	UPPER	100 YR	Normal S = 0.016	
MEATHOUSE FORK	MEATHOUSE FORK	100 YR		Known WS = 942

GEOMETRY DATA

Geometry Title: Lake Proposed
 Geometry File : x:\Navitus Jobfiles\Antero Resources\ANT019-Lake\Engineering\Drainage Comp\Floodplain\Entrance Study\Computations\HEC-RAS\EntranceStudy.g03

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
BIG ISAAC	LOWER		1

LAUREL RUN UPPER
MEATHOUSE FORK MEATHOUSE FORK 1

JUNCTION INFORMATION

Name: 1
Description:
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
BIG ISAAC	LOWER	to MEATHOUSE FORK	MEATHOUSE FORK	1	0
LAUREL RUN	UPPER	to MEATHOUSE FORK	MEATHOUSE FORK	1	0

CROSS SECTION

RIVER: BIG ISAAC
REACH: LOWER RS: 2531.399

INPUT
Description:

Station Elevation Data		num= 108									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	958.51	.98	958	2.07	957.44	4.9	956	6.56	955.62		
8.7	955.07	11.26	954.44	12.79	954	17.03	953.17	22.73	952		
25.08	951.75	27.47	951.53	34.18	950.86	40.48	950.32	41.62	950.22		
43.55	950	47.54	950	47.74	949.98	47.9	950	56.14	950		
56.47	949.86	58.53	948.94	62.75	948	66.59	946.8	67.45	946.52		
69.55	946	75.59	946	76.38	946.33	80.26	948	80.46	948.09		
80.85	948.25	93.96	948.07	97.25	948.03	99.12	948.02	99.28	948.01		
99.37	948	100.28	947.96	101.14	947.91	101.68	947.88	102.01	947.87		
102.4	947.84	103.16	947.8	105.08	947.69	107.21	947.58	108.3	947.51		
109.7	947.41	111.69	947.25	118.5	946.83	121.59	946.52	125.26	946		
125.82	946	126.95	945.62	128.12	945.33	130.94	944.55	132.97	944		
133.17	943.96	133.32	943.94	133.64	943.91	134.41	943.91	146.64	943.75		
149.96	943.78	154.5	943.72	158.48	943.94	162.88	943.97	163.58	943.98		
166.86	944	170.14	944.25	176.75	944.74	181.78	945.07	184.86	945.25		
187.16	945.27	189.15	945.38	189.34	945.39	194.32	945.59	195.31	945.62		
196.18	945.64	207.05	946	267.69	946	268.74	946.02	268.86	946.02		
283.34	946.22	287.3	946.28	289.24	946.37	291.01	946.46	293.45	946.57		
295.79	946.68	300.75	946.92	309.64	947.34	313.76	947.54	321.84	947.92		
323.47	948	331.02	948.65	337.15	949.17	346.5	950	354.99	950.7		
364.99	951.51	368.07	951.76	371.15	952	382.81	952.94	388.06	953.34		
397.65	954	400.86	954.28	408.62	954.88	410.15	954.99	413.45	955.24		
415.71	955.36	417.22	955.47	420.33	955.59						

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	121.59	.035	207.05	.035

EntranceStudy.rep
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 121.59 207.05 423.58 165.83 116.04 .1 .3

CROSS SECTION

RIVER: BIG ISAAC
 REACH: LOWER RS: 2364.929

INPUT
 Description:

Station Elevation Data		num= 132									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	971.57	.54	971.12	1.91	970	3.27	968.87	4.34	968		
6.15	966.49	6.75	966	7.81	965.13	9.13	964	10.18	963.02		
11.23	962	12.39	960.84	13.22	960	15.17	958.04	15.22	958		
15.32	957.9	17.12	956	18.12	954.9	18.96	954	21.14	954		
23.59	955.12	24.8	955.47	25.54	955.49	27.4	955.56	38.09	955.96		
39.65	955.97	42.42	954.89	45.04	954	47.86	952.51	48.8	952		
49.26	951.68	51.64	950	52.35	949.5	54.49	948	55.49	947.29		
57.33	946	58.69	945.04	60.17	944	75.31	943.63	79.3	943.54		
106.7	942.87	107.52	942.86	115.48	942.69	143.43	942.09	145.14	942.05		
147.82	942	148.57	941.86	148.97	941.8	149.34	941.75	153.9	941.81		
158.34	941.66	160.51	941.98	160.65	942	160.83	942	162.12	942.05		
162.51	942.06	170.72	942.33	175.37	942.49	182.62	942.74	186.31	942.86		
191.74	943.06	196.09	943.21	197.12	943.24	199.99	943.32	203.54	943.41		
206.69	943.52	211.96	943.65	213.86	943.72	223.39	943.93	223.73	943.94		
224.5	943.96	226.45	944	233.96	944.57	236.46	944.84	240.5	945.18		
246.75	945.81	247.48	945.88	248.76	946	255.62	946.24	255.88	946.25		
262.77	946.5	263.68	946.53	268.95	946.73	271.16	946.78	275.07	946.94		
280.37	947.11	284.77	947.19	287.22	947.25	292.17	947.34	294.6	947.4		
298.18	947.45	300.15	947.51	309.18	947.66	313.01	947.73	313.96	947.76		
318.16	947.83	318.75	947.84	324.03	947.92	324.34	947.92	329.33	948		
333.07	948.08	333.5	948.1	345.58	948.41	347.69	948.47	357.44	948.75		
360.75	948.81	366.57	948.99	370.29	949.04	374	949.1	380.19	949.24		
383.89	949.35	396.36	949.66	397.99	949.7	400	949.75	400.67	949.76		
409.92	950	412.31	950.12	413.47	950.21	414.57	950.31	421	950.75		
423.79	951.06	424.53	951.12	424.96	951.16	431.89	952	432.36	952.25		
435.73	954	438.9	955.66	439.56	956	440.28	956.34	443.75	958		
447.64	959.78	448.01	959.95								

Manning's n Values		num= 7									
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	24.8	.013	42.42	.05	75.31	.035	115.48	.035		
175.37	.035	431.89	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 115.48 175.37 251.58 300 228.64 .1 .3

CROSS SECTION

EntranceStudy.rep

RIVER: BIG ISAAC
REACH: LOWER

RS: 2037.082

INPUT

Description:

Station Elevation Data		num= 94		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	970.28	.52	970	3.08	968.4	3.71	968	4.3	967.64
6.81	966	7.64	965.43	9.61	964	12.01	962.08	12.11	962
12.18	961.94	14.41	960	16.15	958.43	16.61	958	16.75	957.87
18.75	956	23.34	956	25.67	957.24	33.63	957.27	41.31	957.25
43.39	956.28	43.97	956	46.18	954.86	47.8	954	49.63	952.66
50.27	952.18	50.51	952	51.46	951.31	53.29	950	54.87	948.92
56.18	948	57.85	946.87	59.19	946	59.87	945.56	62.27	944
65.31	942.22	65.81	942	66.72	941.83	67.81	941.66	69.76	941.32
71.06	941.07	77.93	940	78.66	939.75	79.37	939.49	79.52	939.42
79.75	939.33	80.8	939.29	90.47	938.88	92	939.83	92.2	940
92.77	940.04	95.45	940.25	96.4	940.25	101.87	940.54	104.23	940.66
106.98	940.66	109.43	940.77	111.41	940.87	115.34	940.87	117.2	940.95
120.52	941.37	125.54	942	211.51	942	238.94	941.83	240.21	941.83
240.77	941.83	246.21	941.88	255.23	941.95	255.49	941.95	261.27	942
265.03	942.09	267.48	942.16	268.23	942.18	277.65	942.74	286	943.12
292.43	943.44	295.4	943.65	296.63	943.72	297.47	943.77	300.6	944
314.77	945.33	321.3	945.89	322.42	946	333.82	947.82	334.33	947.92
334.69	948	335.02	948.09	335.91	948.33	342.37	950	347.58	951.62
348.85	952	349.23	952.14	353.87	954	354.47	954.27		

Manning's n Values		num= 7		Sta n Val		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	25.67	.013	41.31	.05	65.31	.035	95.45	.05
117.2	.035	333.82	.1						

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
65.31 95.45 273.96 288.77 271.42 .1 .3

CROSS SECTION

RIVER: BIG ISAAC
REACH: LOWER

RS: 1730.807

INPUT

Description:

Station Elevation Data		num= 69		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	955.75	2.8	954.65	4.52	954	6.88	953.48	12.4	952
14.92	950.31	15.41	950	17.66	948.47	18.36	948	18.54	947.88
21.29	946	22.4	945.23	24.19	944	26.86	942.12	27.03	942
30.44	942	31.61	942.57	34.53	944	35.15	944.31	35.88	944.66
36.1	944.77	36.33	944.77	37.79	944.77	41.18	944.76	54.18	944.47
54.38	944.47	55.79	944.45	56.8	944.4	58.32	944.24	60.83	944
64.79	943.26	70.75	942	78.87	940.32	80.74	940	82.07	939.53

EntranceStudy.rep

86.67	938.01	88.72	937.88	96.71	937.28	105.69	938.43	116.9	939.74
119.62	939.74	119.63	939.74	119.64	939.74	119.78	939.74	120.17	939.71
126.42	939.33	129.11	939.17	133.35	939.71	134.76	940	165.38	940
167.3	939.89	167.36	939.89	281.25	938	310.77	938	311.76	938.12
329.39	940	331.48	940.57	336.34	942	339.58	943.13	342.09	944
343.95	944.75	346.8	946	350.06	947.5	351.23	948	354.16	949.38
355.68	950	359.17	951.51	360.25	952	361.2	952.39		

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	36.1	.013	56.8	.035	78.87	.035	116.9	.035
329.39	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

78.87	116.9	28.48	59.01	21.33	.1	.3
-------	-------	-------	-------	-------	----	----

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	55.79		T

CROSS SECTION

RIVER: BIG ISAAC
REACH: LOWER

RS: 1669.175

INPUT
Description:

Station Elevation Data num= 99

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	957.8	1.44	957.13	3.82	956	6.34	954.85	8.13	954
11.67	952.4	12.52	952	16.65	950.19	17.08	950	17.29	949.9
21.33	948	23.37	947	25.5	946	28.67	944.42	29.56	944
33.2	942.18	33.56	942	37.68	942	39.01	942.77	40.88	943.81
47.15	943.73	59.1	943.37	65.17	943.22	70.15	943.11	74.85	942.27
75.66	942	77.86	940.74	79.66	940	83.72	940	84.01	940.06
84.03	940.06	85.17	940.28	85.31	940.24	85.82	940.19	87.42	940.37
88.61	940.43	90.37	940.62	91.72	940.78	94.88	940.67	96.89	940.53
100.36	940.31	102.32	940.23	102.94	940.2	103.68	940.17	104.44	940.15
105.03	940.16	109.16	940	112.51	940	113.89	939.64	116.01	939.38
119.46	938.79	121.29	938.54	127.02	938	128.69	937.59	128.78	937.57
128.84	937.56	131.49	937.48	134.76	937.47	147.01	937.2	150.64	937.2
152.26	937.54	153.93	938	162.11	938.3	162.47	938.31	166.11	938.43
169.87	938.54	170.74	938.52	172.98	938.56	175.32	938.59	179.2	938.62
180.7	938.64	182.01	938.59	190.57	938.57	191.77	938.56	193.12	938.51
194.56	938.52	196.58	938.55	197.88	938.48	200.9	938.53	202.01	938.46
202.73	938.49	238.35	938	330.04	938	334.9	938.68	345.07	940
349.81	941.53	351.51	942	352.32	942.31	356.13	944	359.68	945.54
360.73	946	361.23	946.21	365.21	948	366.91	948.73	369.58	950
373.12	951.52	374.24	952	376.52	952.95	381.27	955.08		

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val

EntranceStudy.rep

0 .1 40.88 .013 70.15 .035 127.02 .035 153.93 .035
 334.9 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 127.02 153.93 25.17 121.96 42.25 .1 .3
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 70.15 T

CROSS SECTION

RIVER: BIG ISAAC
 REACH: LOWER RS: 1539.840

INPUT
 Description:

Station Elevation Data num= 106

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	951.23	3.36	950	5.91	949.08	8.98	948	9.72	947.78
12.37	946.95	14.77	946.21	15.35	946	19.28	944.55	20.62	944
22.39	943.26	25.48	942	28.41	942	29.27	942.71	29.79	943.25
30.46	943.81	32.17	943.77	32.89	943.76	70.37	942.55	70.78	942.68
74.97	942.45	79.9	942.27	87.33	942.03	88.08	942	88.54	941.98
89.21	942	90.9	941.91	94.82	941.79	98.27	941.65	113.23	941.32
113.65	941.3	116.47	941.3	126.39	941.04	129.06	940.93	136.51	940.72
139.55	940.53	145.17	940.24	150.61	940	156.71	939.65	159.07	939.63
168.39	939.27	174.18	939.25	178.69	939.1	180.45	939.08	184.7	939.02
188.82	938.87	192.09	938.83	201.45	938.49	204.13	938.4	204.78	938.37
205.06	938.36	214.9	938.05	216.32	938	219.03	936.81	222.75	935.99
228.2	936.05	230.38	936.01	235.89	937.07	237.75	937.01	244.8	936.04
248.83	936	251.58	936	254.22	935.94	261.11	935.99	261.77	936
261.86	936	262.51	936.27	263.67	936.55	266.43	937.45	270.9	938
296	938	314.42	938	317.7	937.71	318.43	937.73	324.76	938
344.87	938	350.33	938.74	360.54	940	362.75	941.42	363.84	942
366.47	943.75	366.9	944	369.58	945.83	369.84	946	369.89	946.03
370.24	946.27	372.95	948	373.53	948.36	376.16	950	377.85	951.05
379.37	952	382.62	953.74	383.06	954	384.38	954.73	388.32	956.76
392.99	959.09	394.81	960	397.6	961.96	397.67	962	399.96	963.65
400.16	963.75	400.66	964	403.78	965.33	404.81	966	405.23	966.23
405.48	966.39								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	30.46	.013	113.23	.035	214.9	.035	270.9	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 214.9 270.9 14.05 89.52 50.18 .1 .3
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 32.89 T

CROSS SECTION

RIVER: BIG ISAAC
REACH: LOWER

RS: 1419.259

INPUT

Description:

Station Elevation Data		num= 108		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	951.28	4.04	950	5.83	949.41	10.07	948	11.14	947.67		
13.81	946.84	15.09	946.45	15.38	946.36	15.6	946.29	16.54	946		
19.67	945.04	23.04	944	29.73	944	31.06	943.74	31.56	943.97		
32.9	943.98	34.65	943.93	41.67	943.55	45.66	943.52	53.84	943.34		
63.89	943.1	74.07	942.78	74.16	942.81	83.69	942.29	84.17	942.27		
85.02	942.24	85.59	942.23	86.39	942.22	92.55	942.13	95.04	942.06		
95.58	942.04	96.28	942	96.57	942	105.7	941.55	107.67	941.5		
108.56	941.47	118.48	941.15	120.88	941.11	133.14	940.82	155.86	940.36		
156.13	940.35	157.15	940.35	175.3	940.36	178.88	940.36	180.23	940.34		
191.7	940.25	199.42	940.03	201.29	940.01	202.23	940	204.61	940		
206.58	939.96	209.3	939.92	227.52	939.69	231.71	939.64	238.26	939.65		
256.1	939.31	259.81	939.3	264.43	939.25	287.74	938.61	289.41	938.61		
290.76	938.61	300.29	938.48	305.2	938.41	315.13	938.46	327.13	938		
333.18	938	338.9	936.15	339.4	936	339.49	935.97	341.12	935.32		
346.39	935.32	350.03	935.32	350.21	935.37	353.14	936	355.64	936		
362.74	936.41	367.03	936.59	386.38	938	388.61	938.39	393.92	939.31		
398.61	940	400.22	941.13	401.54	942	403.14	943.11	404.5	944		
406.05	945.08	407.47	946	408.66	947.15	409.55	948	410.03	948.58		
411.4	950	411.54	950.15	413.42	952	414.13	952.76	415.39	954		
418.48	955.93	418.6	956	421.13	957.22	422.64	958	425.73	959.56		
427.14	960.28	430.55	962	432.64	963.11	434.26	964	437.15	965.64		
438.65	966.45	441.47	968	441.61	968.07						

Manning's n Values

num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	31.56	.013	95.04	.035	155.86	.013	238.26	.035
333.18	.04	388.61	.1						

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
333.18 388.61 11.01 96.75 78.52 .1 .3

CROSS SECTION

RIVER: BIG ISAAC
REACH: LOWER

RS: 1318.016

INPUT

Description:

Station Elevation Data		num= 103		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	952.48	1.39	952	4.34	950.97	7.21	950	11.36	948.64		

EntranceStudy.rep

13.31	948	14.37	947.65	18.33	946.41	19.36	946.09	19.63	946
25.88	944.05	26.02	944	32.16	944	32.48	944.38	32.86	944.76
39.26	944.37	44.55	944	49.61	943.78	54.08	943.49	58.99	943.22
61.92	943.06	68.42	943	69.95	943.04	70.45	943.06	75.95	942.97
94.48	942.33	101.81	942	106.37	941.88	111.05	941.76	115.48	941.61
126.77	941.42	134.57	941.25	148.48	940.98	174.39	940.21	175.21	940.21
187.98	940.16	189.91	940.15	190.86	940.12	200.01	940	216.33	940
236.24	939.68	257.89	939.32	258.06	939.32	258.29	939.32	271.49	939.17
288.43	938.98	295.41	938.86	308.24	938.8	324.14	938.84	354.87	938.81
355.73	938.8	355.77	938.8	355.81	938.79	356.11	938.78	372.12	938.37
385.56	938.18	389.61	938.12	395.88	938.07	400.42	938.03	403.3	938
408.79	937.4	412.25	936.01	412.28	936	414.7	934.93	414.9	934.84
420.56	934.91	430.58	934.88	434.21	934.84	443.06	934.72	446.9	934.94
447.45	935.66	447.99	936	448.67	936.12	451.33	936.54	456.77	938
458.65	938.8	459.59	939.16	461.97	940	462.82	940.82	463.97	942
464.88	942.89	466.82	944.86	468.02	946	468.48	946.46	470.01	948
471.79	949.7	472.11	950	472.26	950.14	475.08	952	477.52	953.59
478.2	954	480.94	955.87	481.16	956	481.33	956.13	484.01	958
484.5	958.41	486.83	960	487.52	960.55	489.62	962	491.09	963.08
492.4	964	493.45	964.69	494.85	965.58				

Manning's n Values	num=	7							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	32.86	.013	69.95	.035	271.49	.013	354.87	.035
403.3	.04	456.77	.1						

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	403.3	456.77		9.6	50.46		.1	.3

CULVERT

RIVER: BIG ISAAC
REACH: LOWER

RS: 1291.256

INPUT

Description:

Distance from Upstream XS = 20.52
Deck/Roadway width = 14.6
Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num=	10								
Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	
44	944	944	61.92	943.8	943.06	115.48	942.2	941.61	
134.57	942	941.25	174.39	941.5	940.21	414.9	939.3	934.84	
430.58	939.3	934.88	448.67	939.3	936.12	456.77	940.4	938	
462.82	940.82	940.82							

Upstream Bridge Cross Section Data

Station Elevation Data	num=	103							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	952.48	1.39	952	4.34	950.97	7.21	950	11.36	948.64

EntranceStudy.rep

13.31	948	14.37	947.65	18.33	946.41	19.36	946.09	19.63	946
25.88	944.05	26.02	944	32.16	944	32.48	944.38	32.86	944.76
39.26	944.37	44.55	944	49.61	943.78	54.08	943.49	58.99	943.22
61.92	943.06	68.42	943	69.95	943.04	70.45	943.06	75.95	942.97
94.48	942.33	101.81	942	106.37	941.88	111.05	941.76	115.48	941.61
126.77	941.42	134.57	941.25	148.48	940.98	174.39	940.21	175.21	940.21
187.98	940.16	189.91	940.15	190.86	940.12	200.01	940	216.33	940
236.24	939.68	257.89	939.32	258.06	939.32	258.29	939.32	271.49	939.17
288.43	938.98	295.41	938.86	308.24	938.8	324.14	938.84	354.87	938.81
355.73	938.8	355.77	938.8	355.81	938.79	356.11	938.78	372.12	938.37
385.56	938.18	389.61	938.12	395.88	938.07	400.42	938.03	403.3	938
408.79	937.4	412.25	936.01	412.28	936	414.7	934.93	414.9	934.84
420.56	934.91	430.58	934.88	434.21	934.84	443.06	934.72	446.9	934.94
447.45	935.66	447.99	936	448.67	936.12	451.33	936.54	456.77	938
458.65	938.8	459.59	939.16	461.97	940	462.82	940.82	463.97	942
464.88	942.89	466.82	944.86	468.02	946	468.48	946.46	470.01	948
471.79	949.7	472.11	950	472.26	950.14	475.08	952	477.52	953.59
478.2	954	480.94	955.87	481.16	956	481.33	956.13	484.01	958
484.5	958.41	486.83	960	487.52	960.55	489.62	962	491.09	963.08
492.4	964	493.45	964.69	494.85	965.58				

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	32.86	.013	69.95	.035	271.49	.013	354.87	.035
403.3	.04	456.77	.1						

Bank Sta: Left Right Coeff Contr. Expan.

403.3	456.77	.1	.3
-------	--------	----	----

Downstream Deck/Roadway Coordinates

num= 14

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
50.26	944.21	944.21	65.7	944.15	943.4	92.88	944.1	942.44
115.34	944	942	217.99	943	939.3	289.13	942	938.41
311.26	941.7	938	393.68	941	938	454.92	939.3	938.26
462.61	939.3	934.65	476.93	939.3	935.3	479.64	939.3	935.31
482.6	939.3	937.56	492.41	940.85	940.85			

Downstream Bridge Cross Section Data

Station Elevation Data num= 105

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	953.28	3.6	952	6.68	950.84	8.98	950	11.69	948.89
14.16	948	15.45	947.49	19.59	946.04	19.67	946.01	19.7	946
23.97	944.48	25.49	944	29.07	944	29.23	944.14	29.83	944.72
30.51	945.56	38.86	944.98	50.26	944.21	52.37	944.12	53.84	944
54.82	944	56.04	943.93	56.35	943.91	56.89	943.89	57.27	943.86
65.7	943.4	70.83	943.2	71.74	943.23	72.35	943.22	76.07	943.1
92.88	942.44	101.38	942.28	109.88	942.11	115.34	942	121.6	942
131.3	941.85	133.24	941.81	136.47	941.76	193.66	940.14	198.15	940
202.64	940	217.99	939.3	239.38	939.15	265.36	938.68	267.5	938.66
270.44	938.65	289.13	938.41	293.26	938.4	300.68	938.38	311.26	938
393.68	938	403.2	938.61	405.17	938.62	417.58	938.72	425.37	938.78

EntranceStudy.rep

430.65	938.78	434.94	938.78	452.52	939.17	454.92	938.26	460.05	936.15
461.56	935.29	462.17	934.85	462.61	934.65	476.93	935.3	478.87	935.51
478.9	934.74	479.64	935.31	480.4	936	482.6	937.56	483.09	938
483.95	938.73	485.3	939.39	488.07	940	489.16	940.19	492.41	940.85
501.85	941.08	512.21	941.18	516.87	941.62	518.04	941.74	521.9	942
522.94	943	524.03	944	524.45	944.42	526.08	946	526.57	946.51
528.11	948	528.94	948.75	529.52	949.28	530.25	950	530.83	950.68
532.15	952	533.36	953.24	533.98	954	535.27	955.33	536.34	956
539.29	957.27	540.94	958	542.79	958.82	545.56	960	549.83	961.89
550.12	962	551	962.38	554.89	964	556.12	964.55	556.78	964.84

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	30.51	.013	56.04	.035	452.52	.04	492.41	.013
512.21	.1								

Bank Sta: Left Right Coeff Contr. Expan.

452.52	492.41	.1	.3	
--------	--------	----	----	--

Blocked Obstructions num= 1

Sta L	Sta R	Elev
116.29	168.42	955

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span						
Culvert #1	Box	5	16						
FHWA Chart # 8 - flared wingwalls									
FHWA Scale # 1 - wingwall flared 30 to 75 deg.									
Solution Criteria = Highest U.S. EG									
Culvert	Upstrm	Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef	
		7.54	37.35	.012	.035	0	.2	1	
Upstream	Elevation = 933.95								
	Centerline Station = 440								
Downstream	Elevation = 933.76								
	Centerline Station = 471.72								

CROSS SECTION

RIVER: BIG ISAAC
 REACH: LOWER RS: 1266.884

INPUT
 Description:

EntranceStudy.rep

Station Elevation Data				num=	105				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	953.28	3.6	952	6.68	950.84	8.98	950	11.69	948.89
14.16	948	15.45	947.49	19.59	946.04	19.67	946.01	19.7	946
23.97	944.48	25.49	944	29.07	944	29.23	944.14	29.83	944.72
30.51	945.56	38.86	944.98	50.26	944.21	52.37	944.12	53.84	944
54.82	944	56.04	943.93	56.35	943.91	56.89	943.89	57.27	943.86
65.7	943.4	70.83	943.2	71.74	943.23	72.35	943.22	76.07	943.1
92.88	942.44	101.38	942.28	109.88	942.11	115.34	942	121.6	942
131.3	941.85	133.24	941.81	136.47	941.76	193.66	940.14	198.15	940
202.64	940	217.99	939.3	239.38	939.15	265.36	938.68	267.5	938.66
270.44	938.65	289.13	938.41	293.26	938.4	300.68	938.38	311.26	938
393.68	938	403.2	938.61	405.17	938.62	417.58	938.72	425.37	938.78
430.65	938.78	434.94	938.78	452.52	939.17	454.92	938.26	460.05	936.15
461.56	935.29	462.17	934.85	462.61	934.65	476.93	935.3	478.87	935.51
478.9	934.74	479.64	935.31	480.4	936	482.6	937.56	483.09	938
483.95	938.73	485.3	939.39	488.07	940	489.16	940.19	492.41	940.85
501.85	941.08	512.21	941.18	516.87	941.62	518.04	941.74	521.9	942
522.94	943	524.03	944	524.45	944.42	526.08	946	526.57	946.51
528.11	948	528.94	948.75	529.52	949.28	530.25	950	530.83	950.68
532.15	952	533.36	953.24	533.98	954	535.27	955.33	536.34	956
539.29	957.27	540.94	958	542.79	958.82	545.56	960	549.83	961.89
550.12	962	551	962.38	554.89	964	556.12	964.55	556.78	964.84

Manning's n Values				num=	6				
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	30.51	.013	56.04	.035	452.52	.04	492.41	.013
512.21	.1								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	452.52	492.41		11.19	93.06		.1	.3

Blocked Obstructions			num=	1
Sta L	Sta R	Elev		
116.29	168.42	955		

CROSS SECTION

RIVER: BIG ISAAC
 REACH: LOWER
 RS: 1172.189

INPUT
 Description:

Station Elevation Data				num=	115				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	953.77	.96	953.42	4.74	952	7.59	950.6	9.04	950
12.44	948.38	13.28	948	16.99	946.24	17.56	946	21.64	944.11
21.9	944	22.72	944	23.77	944.77	26.64	946	27.86	946
29.67	945.98	36.05	945.68	47.44	944.92	50.81	944.44	51.67	944.28
53.01	944.18	54.25	944.11	55.57	944	55.97	944	59.83	943.82
74.68	943.17	81.67	942.87	85.53	942.81	101.61	942.46	102.92	942.44
108.63	942.29	110.78	942.29	129.29	942	134.59	942	162.96	940.97

EntranceStudy.rep

169.17	940.79	197.33	940	201.84	939.71	202.33	939.67	206.13	939.41
208.81	939.2	209.58	939.18	213.19	938.87	215.46	938.68	216.99	938.72
223.93	938.39	265.32	938	366.3	938	375.69	937.64	375.87	937.64
382.75	937.63	405.66	937.57	415.5	937.58	423.44	937.43	426.82	937.43
451.27	937.58	452.03	937.56	453.88	937.57	465.09	937.71	473.52	937.76
476.9	937.79	479.14	937.79	479.57	937.8	482.43	937.79	484.39	937.82
484.53	937.82	487.76	937.8	490.58	937.76	491.09	937.77	524.55	936
538.91	936	540.03	934.95	540.77	934.44	547.66	934.32	550.68	934.32
556.3	934.19	557.08	934.93	558.22	936	576.64	936.72	589.94	937.25
606.18	938	607.87	939.27	608.81	940	610.75	941.66	611.24	942
611.85	942.43	613.6	944	614.33	944.13	615.3	944.37	618.84	945.25
619.14	945.3	619.32	945.28	620.08	945.28	632.93	945.05	633.65	945.04
633.99	945.03	634.09	945.03	634.14	945.02	638.06	946	638.78	946
639.11	946.35	640.59	948	641.39	949	642.26	950	643.28	950.94
644.04	952	644.45	952.4	645.96	954	647.13	955.34	647.8	956
649.88	957.55	650.47	958	652.65	959.72	653.02	960	654.58	961.22

Manning's n Values

Sta	n Val	Sta	num=	8	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	26.64	.013	47.44	.035	223.93	.05	538.91	.035	
558.22	.06	619.14	.013	634.09	.1					

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

538.91	558.22	6.65	73.2	10.56	.1	.3		
--------	--------	------	------	-------	----	----	--	--

Blocked Obstructions num= 1

Sta L	Sta R	Elev
120.69	164.9	955

CROSS SECTION

RIVER: BIG ISAAC
 REACH: LOWER RS: 1096.461

INPUT
 Description:

Station Elevation Data num= 115

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	952.07	.2	952	2.6	950.67	3.8	950	6.79	948.36
7.48	948	10.51	946.35	11.2	946	16.86	946	17.05	946.15
24.93	946.16	29.15	946	35.31	945.71	40.97	944.93	42.34	944.65
44.4	944.5	50.49	944	63.43	943.46	85.2	942.87	89.31	942.8
94.74	942.62	95.83	942.58	97.28	942.53	122.39	942.13	133.34	942
165.4	940.81	174.24	940.48	178.24	940.33	181.45	940.23	181.89	940.22
184.69	940.12	185.39	940.1	185.66	940.09	188.77	940	190.34	940
195.25	939.68	203.71	939.28	205.42	939.19	216.56	938.68	221.48	938.47
226.72	938.18	227.23	938.16	229.45	938	378.84	938	418.34	936.54
419.13	936.53	421.55	936.52	429.25	936.48	432.4	936.48	455.91	936
490.95	936	491.85	936.01	492.01	936	499.68	936	563.8	936
563.94	935.93	567.55	934.07	571.27	933.97	576.8	933.82	580.15	933.79
584.45	933.69	588.18	935.14	590.71	935.76	592.07	936	620.34	936
627.83	936.19	636.33	936.29	641.46	936.35	645.57	936.46	647.6	936.51

EntranceStudy.rep

648.84	936.53	653.73	936.61	659.71	936.71	689.38	937.76	690.8	937.79
691.61	937.82	696.2	938	696.63	938.33	698.71	940	701.32	941.95
701.39	942	701.58	942.12	701.72	942.22	703.9	944	707.59	945.64
708.08	946	709.45	946.26	710.08	946.36	710.27	946.39	710.37	946.38
710.82	946.37	714.16	946.29	721.23	946.12	723.72	946	724	945.99
725.4	946.03	726.05	945.82	726.75	946	729.46	946	730.68	947.32
731.27	948	731.6	948.42	732.94	950	734.48	951.47	734.85	952
736.49	953.66	736.8	954	737.05	954.29	738.71	956	739.57	956.67
741.25	958	742.61	959.11	743.76	960	745.15	961.15	745.8	961.67

Manning's n Values	num=	7							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.05	17.05	.013	35.31	.035	563.8	.035	592.07	.1
710.82	.013	726.75	.1						

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	563.8	592.07		695.49	85.68	11.22		.1	.3
Blocked Obstructions			num=	1					
Sta L	Sta R	Elev							
136.38	170.07	955							

CROSS SECTION

RIVER: BIG ISAAC
REACH: LOWER

RS: 1000.000

INPUT
Description:

Station Elevation Data	num=	76							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	956.44	.84	956	1.31	955.75	7.83	952.35	8.46	952
8.68	951.88	12.3	950	12.57	949.87	16.42	948	19	946.85
20.92	946	25.24	944	28.65	942.46	29.67	942	30.56	941.6
34.1	940	37.83	939.16	40.83	938.48	43.1	938	81.46	938
85.41	937.34	86.64	937.11	86.77	937.09	94.5	936	97.61	935.57
104.78	934.39	110.63	934.24	115.51	934.05	125.72	933.73	129.87	933.59
131.85	933.57	137.68	935.1	138.92	936	148.52	936	159.7	936
236.31	937.68	237.41	937.68	238.14	937.68	251.55	937.97	252.93	938
255.48	939.29	256.38	939.88	256.54	940	256.71	940.11	257.28	940.52
259.46	942	261.4	943.39	262.36	944	263.05	944.42	265.43	946
267.98	947.43	269.36	947.66	271.97	947.91	271.98	947.91	271.99	947.91
272.02	947.91	272.04	947.91	290.15	946.97	290.32	946.97	291.31	948
293.88	948	294.29	948.32	295.76	950	297.77	951.84	297.92	952
298.15	952.22	299.87	954	301.72	955.68	302.02	956	302.6	956.37
304.79	958	304.93	958.09	305.64	958.62	307.46	960	308.21	960.6
309.42	961.54								

Manning's n Values	num=	3							
Sta	n Val	Sta	n Val	Sta	n Val				
0	.1	86.64	.04	138.92	.1				

Bank Sta: Left Right Lengths: Left Channel Right EntranceStudy.rep
 86.64 138.92 1 1 1 Coeff Contr. Expan.
 .1 .3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 6314.305

INPUT
 Description:

Station Elevation Data num= 88

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1001.78	1.85	1000.54	2.61	1000	5.08	998.34	5.55	998
7.99	996.17	8.21	996	8.49	995.76	9.65	994.76	10.59	994
11.6	993.11	12.68	992.19	12.89	992	13.46	991.52	15.26	990
17.14	988.46	17.66	988	19.8	986.13	19.98	986	20.4	985.9
28.82	984	30.87	984	34.92	983.83	35.54	983.83	46.09	983.58
82.01	982.06	82.12	982.06	83.11	982.01	83.12	982.01	83.16	982.01
83.33	982	98.91	982	108.17	982	109.86	981.69	112.48	980.65
113.66	980.22	114.11	980	114.54	979.78	116.06	978.99	117.1	978.47
118.96	978.38	125.47	978.35	127.25	979.31	128.56	980	128.77	980.11
132.4	982	132.56	982.08	133.69	982.67	139.11	982.55	140.13	982.54
148.72	982.47	151.26	983.3	152.23	983.59	153.29	983.96	153.37	984
153.6	984.26	155.14	986	155.95	986.9	156.93	988	157.76	988.92
158.72	990	159.55	990.93	160.51	992	161.35	992.94	162.29	994
163.72	995.51	164.25	996	164.84	996.43	167.02	998	167.59	998.39
170.31	1000	173.83	1001.83	174.2	1002	174.97	1002.32	178.96	1004
180.41	1004.65	183.31	1006	186.12	1007.73	186.57	1008	187.1	1008.33
189.48	1009.52	190.51	1010	193.82	1010.99	198.22	1011.97	198.28	1011.99
198.34	1012	205.88	1013.69	206.07	1013.74				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	20.4	.035	108.17	.035	133.69	.013	148.72	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 108.17 133.69 79.48 81.18 79.01 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
57.73	86.65	995

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 6232.875

INPUT
 Description:

Station Elevation Data num= 74

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-----	------	-----	------	-----	------	-----	------

EntranceStudy.rep

0	1003.36	.99	1002.71	1.96	1002	4.06	1000.62	4.91	1000
7.18	998.51	7.89	998	8.13	997.78	10.81	996	13.13	994.39
13.56	994	14.92	992.77	15.88	992	16.78	991.33	18.35	990
19.89	988.72	20.85	988	21.78	987.3	23.45	986	25.76	984.28
26.1	984	26.11	984	29.59	983.58	40.75	982	86.08	980.34
86.13	980.34	95.68	980	98.03	978.67	99.44	977.87	100.97	977.05
103.96	977.35	110.43	978.37	113.56	979.99	113.59	980	113.91	980.2
116.55	982	116.8	982.14	117.24	982.4	117.53	982.56	119.99	982.51
123.57	982.43	133.28	982.19	136.03	983.22	137.79	984	141.78	985.93
141.95	986	142.08	986.09	144.7	988	147.35	989.7	148.03	990
150.81	991.1	153.6	992	155.12	992.52	156.08	992.86	157.54	993.45
158.81	994	159.81	994.7	161.52	996	163.43	997.41	164.21	998
166.56	999.73	166.93	1000	167.03	1000.08	167.19	1000.18	168.97	1001.35
170.16	1002	172.66	1003.2	174.22	1004	175.87	1004.45	181.02	1006
181.71	1006.23	184.16	1007.02	186.68	1007.81	187.23	1007.98		

Manning's n Values

num=	5								
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val		
0	.1	29.59	.035	95.68	.035	117.24	.013	133.28	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

95.68	117.53	155.12	142.34	81.44	.1	.3
Blocked Obstructions						
num=	1					
Sta L	Sta R	Elev				
42.61	71.54	995				

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 6088.039

INPUT
 Description:

num=	98								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1025.12	2.43	1024	4.47	1023.09	6.78	1022	10.13	1020.09
10.3	1020	10.36	1020	10.49	1019.93	10.72	1019.8	11.78	1019.19
13.88	1018	16.57	1016.49	17.44	1016	18.26	1015.55	21.03	1014
21.4	1013.79	24.51	1012	25.48	1011.44	27.91	1010	29.84	1008.6
30.8	1008	31.81	1006.71	32.17	1006.25	32.37	1006	32.51	1005.82
33.91	1004	34.57	1003.11	35.42	1002	36.55	1000.46	36.89	1000
37.99	998.48	38.34	998	38.56	997.69	39.77	996	40.87	994.69
41.46	994	42.98	992.32	43.28	992	44.25	990.92	44.96	990.13
45.08	990	46.71	988.18	46.87	988	46.88	987.99	48.66	986
48.74	985.9	50.44	984	50.59	983.83	52.22	982	52.42	981.77
53.99	980	54.36	979.7	56.09	978	57.49	976.56	57.55	976.52
57.59	976.48	57.81	976.49	76.55	977.72	77.29	977.91	78.4	978
81.69	978.62	84.47	979.02	87.1	979.4	89.25	980	90.49	980.7
92.66	982	98.71	982	104.29	981.73	116.9	981.12	119.84	980.98
126.07	980.64	132.15	981.06	142.49	981.74	142.97	981.83	143.97	982
156.83	984	162.48	985.17	167.08	986	169.55	987.68	170.05	988

EntranceStudy.rep

170.51	988.42	172.22	990	173.05	990.87	173.87	992	175.89	993.85
176.01	994	176.17	994.15	176.94	994.53	179.83	996	182.5	997.25
183.95	998	185.92	998.94	188.25	1000	191.65	1001.39	193.2	1002
193.94	1002.3	198.37	1004	201.13	1005.09				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	52.42	.04	92.66	.035	126.07	.013	142.97	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

52.42	92.66	273.66	295.06	267.03	.1	.3
-------	-------	--------	--------	--------	----	----

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 5772.495

INPUT

Description:

Station Elevation Data num= 113

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1018.21	.33	1018.03	.38	1018	.54	1017.91	4.08	1016
5.23	1015.39	7.81	1014	10.28	1012.7	11.6	1012	13.33	1011.15
15.64	1010	18.71	1008.48	19.69	1008	22.76	1006.48	23.74	1006
27.05	1004.37	27.8	1004	30.74	1002.26	31.17	1002	32.1	1001.33
33.95	1000	34.35	999.72	36.73	998	37.88	997.18	39.52	996
41.7	994.45	42.33	994	43.66	993.06	45.08	992	45.62	991.58
47.74	990	49.81	988.1	49.92	988	50.14	987.8	51.95	986
53.3	984.64	53.94	984	55.86	982.06	55.92	982	56.23	981.69
59.78	978	65.06	977.38	66.43	977.21	74.43	976.33	77.37	976
78.32	975.15	79.62	974	80.44	973.29	81.26	972.55	86.6	972.87
95.81	973.22	96.07	973.3	96.25	973.35	96.64	973.45	98.65	973.87
99.28	974	101.9	974.55	102.16	974.63	102.46	974.71	104.53	975.31
105.72	975.61	106.14	975.74	106.9	976	111.53	976.28	112.24	976.33
117.12	976.64	127.93	977.9	128.57	977.93	129.57	977.99	129.78	978
133.68	978.19	134.3	978.23	136.13	978.34	137.99	978.45	139.84	978.55
148.59	979.05	155.84	978.4	157.15	978.22	158.75	978	161.68	978
166.6	979.6	167.87	980	168.16	980.18	171.14	982	172.12	982.61
174.2	984	175.95	985.17	177.14	986	181.28	987.67	182.05	988
183.28	988.5	187.07	990	189.66	991.04	191.85	992	191.92	992.03
196.82	994	197.46	994.24	201.86	996	204.45	997.1	206.59	998
208.63	998.98	210.69	1000	214.06	1001.87	214.3	1002	214.75	1002.27
217.65	1004	218.24	1004.37	220.91	1006	221.62	1006.28	225.36	1008
226.74	1008.38	231.99	1009.75	232.35	1009.84				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	77.37	.04	106.14	.035	128.57	.013	148.59	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

77.37	106.14	243.75	275.76	373.61	.1	.3
-------	--------	--------	--------	--------	----	----

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 5494.591

INPUT

Description:

Station Elevation Data		num= 73		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1007.28	2.31	1006	3.7	1005.23	5.91	1004	7.51	1003.11		
9.51	1002	11.54	1000.87	13.11	1000	16.48	998.13	16.71	998		
17.2	997.72	20.17	996	23.5	994.03	26.89	992	27.13	991.85		
30.21	990	30.63	989.74	33.53	988	34.02	987.64	36.42	986		
38.72	984.12	38.87	984	39.9	983.16	41.34	982	41.7	981.71		
43.83	980	45.09	979.01	46.36	978	48.62	976.25	48.95	976		
55.02	975.51	69.35	974.35	73.73	974	75.57	973.59	83.53	972		
83.59	971.98	84.35	971.73	89.09	971.26	94.71	970.87	95.77	971.76		
96.03	972	98.1	973.88	98.24	974	100.23	974.32	102.69	974.86		
108.98	974.97	109.94	974.98	120.15	975.13	127.29	975.94	127.93	976		
129.4	976.37	135.82	978	136.92	978.34	138.91	978.98	142.12	980		
143.75	980.75	146.4	982	148.33	982.93	150.59	984	154.22	985.76		
154.73	986	156.15	986	180.93	987.49	182.12	987.92	182.14	987.91		
182.36	988	183.4	988.39	187.83	990	191.5	991.32	193.37	992		
194.52	992.5	198.05	994	198.14	994.04						

Manning's n Values

num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.01	75.57	.04	98.1	.035	102.69	.013	120.15	.035
136.92	.06								

Bank Sta: Left 75.57 Right 98.1
 Lengths: Left Channel 276.1 Right 288.53
 Right 307.93
 Coeff Contr. .1
 Expan. .3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 5357.523

INPUT

Description:

Station Elevation Data		num= 55		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1002	3.78	1000	5.93	998.85	7.57	998	11.13	996.19		
11.51	996	11.94	995.78	15.21	994	17.93	992.51	18.86	992		
22.18	990.17	22.44	990.03	22.48	990	25.61	988.26	26.06	988		
27.13	987.27	29.1	986	30.54	984.4	30.91	984	31.45	983.4		
32.68	982	33.19	981.41	34.42	980	35.75	978.45	36.14	978		
36.85	977.16	37.71	976	44.01	975.34	56.96	974	85.73	972.55		
89.87	972.34	96.68	972	104.08	971.03	107.88	970.59	111.84	970.35		

EntranceStudy.rep

118.84	969.8	120.79	970.99	122.11	971.84	122.32	972	125.84	972.91
130.33	973.45	131.53	973.67	134.02	974	134.81	974.01	136.57	974.03
140.41	974.08	158.13	974.13	162.78	974	164.98	974	186.39	976
202.42	978	213.16	978.29	216.73	980	220.7	982	224.69	984

Manning's n Values

num=		6							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val		
0	.1	96.68	.04	125.84	.035	140.41	.013	162.78	.033
202.42	.035								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	96.68	125.84		29.17	22.01		.1	.3

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 5335.512

INPUT

Description:

Station Elevation Data		num=		61					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1002	4.02	1000	5.86	999.03	5.88	999.02	7.87	998
10.32	996.49	11.07	996	13.99	994.09	14.12	994	14.15	994
14.39	993.83	14.64	993.67	17.18	992	17.21	992	18.73	990.98
20.22	990	22.24	988.61	23.06	988	23.63	987.18	24.5	986
25.21	984.69	25.61	984	26.43	982.46	26.69	982	27.62	980.26
27.76	980	28.78	978.08	28.82	978	29.33	977.04	29.86	976.1
29.93	976	40.63	974.52	43.79	974	45.48	973.91	50.24	973.7
67.68	972.9	72.28	972.69	83.72	972.15	84.79	972.1	86.88	972
96.3	970.62	100.35	970.06	101.78	969.97	114.5	969.6	115.05	970.2
116.16	972	119.09	973.65	119.72	974	120.15	974	122.05	974.01
129.41	974.04	129.9	974.04	132.73	974.05	135.38	974.06	142.97	974.17
160.95	974.3	170.62	976	181.15	978	193.46	980	206.74	982
223.13	984								

Manning's n Values

num=		5							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val		
0	.1	86.88	.04	119.72	.035	142.97	.013	181.15	.033

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	86.88	119.72		159.1	137.86		.1	.3

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 5187.560

INPUT

Description:

EntranceStudy.rep

Station Elevation Data		num=		86							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1004.45	1.16	1004	4.5	1002.6	6.12	1002	8.38	1001.17		
11.14	1000	15.44	998.33	16.34	998	19.32	996.42	20.23	996		
20.25	996	20.84	995.62	21.37	995.26	22.48	994.53	23.26	994		
23.96	993.56	26.35	992	28.93	990.33	29.43	990	30.49	989.32		
32.65	988	34.44	986.98	36.09	986	37.16	984.66	37.72	984		
38.04	983.59	39.28	982	39.64	981.54	40.84	980	41.23	979.49		
42.39	978	42.81	977.45	43.95	976	44.4	975.42	45.5	974		
46.69	973.29	46.94	973.15	48.93	972	54.56	970.88	58.9	970		
59.32	969.79	59.69	969.59	60.06	969.37	65.95	968.85	76.08	968.06		
80.14	969.88	80.4	970	81.07	970.29	85.1	972	89.61	973.12		
92.29	973.79	93.35	974	135.37	976	140.59	976.2	143.14	976.28		
144.07	976.3	144.54	976.31	147.24	976.08	147.7	976.06	148.13	976.04		
149.72	976.04	151.61	976.04	163.2	976.29	165.73	976.33	166.57	976.35		
166.84	976.36	167.68	976.34	168.26	976.33	174.59	976	177.59	975.85		
184.11	975.51	187.63	975.56	189.49	976	191.64	977.51	192.44	978		
193.26	978.64	195.07	980	197.37	981.41	198.22	982	201.97	984		
202.02	984.02	205.8	986	208.03	987.13	209.71	988	211.22	988.87		
213.36	990										

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	48.93	.04	85.1	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	48.93	85.1		53.89	68.79		.1	.3

Blocked Obstructions			num=	1
Sta L	Sta R	Elev		
108.99	143.76	985		

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 5118.449

INPUT

Description:

Station Elevation Data		num=		92							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1004.15	.34	1004	3.93	1002.52	5.13	1002	9.76	1000.11		
10.02	1000	10.37	999.85	11.08	999.58	15.22	998	19.93	996.21		
20.47	996	20.48	996	22.12	995.23	22.43	995.09	24.77	994		
28.57	992.2	29	992	29.66	991.67	33.14	990	36.65	988.36		
37.41	988	38.17	987.65	41.73	986	45	984.34	45.6	984		
46.9	982.77	47.57	982.14	47.74	982	49.48	980.38	49.94	980		
51.52	978.55	52.17	978	53.64	976.67	54.43	976	55.79	974.82		
56.7	974	57.13	973.84	58.65	973.27	62.48	972	66.38	971.04		
70.31	970	70.86	969.82	71.4	969.64	73.86	968.79	87.08	968.02		
89.12	967.88	89.7	968.15	89.92	968.27	90.24	968.43	90.78	968.74		
92.69	969.89	92.89	970	93	970.07	93.05	970.09	93.25	970.16		

EntranceStudy.rep

96.06	971.38	97.02	971.84	98.36	972	98.71	972.04	98.72	972.04
99.06	972.07	102.33	972.48	104.74	972.76	106.12	972.92	108.7	973.26
111.64	973.67	117.12	973.97	117.44	974	117.65	974	120.85	974.18
121.4	974.2	127.21	974.64	141.74	976	152.68	977.33	158.24	978
159.64	978	190.71	978.84	196.31	978.92	209.23	978.65	213.65	978.94
217.5	979.78	218.49	980	218.67	980.17	220.42	982	223.09	983.98
223.12	984	223.23	984.05	227.42	986	228.3	986.42	231.69	988
234.38	988.88	238.04	990						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	62.48	.04	97.02	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

62.48	97.02	52.99	47.79	75.02	.1	.3
-------	-------	-------	-------	-------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
122.68	157.44	985

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 5070.286

INPUT
Description:

Station Elevation Data num= 97

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1002.56	1.22	1002.14	1.68	1002	3.28	1000.96	4.77	1000
6.24	999.05	7.87	998	10.91	996.13	11.11	996	11.24	995.92
14.86	994	15.97	993.41	18.77	992	22.1	990.11	22.3	990
22.68	989.79	26.24	988	27.91	987.22	30.59	986	32.69	985.01
35.04	984	37.37	982.71	38.74	982	41.17	980.73	42.57	980
43.17	979.68	46.25	978	48.43	976.75	49.77	976	52.69	974.79
54.53	974	55.83	973.49	56.44	973.28	60.08	972	61.88	971.47
66.86	970	70.21	969.38	71.74	969.05	75.44	968	75.69	968.11
75.78	968.14	77.9	968.01	87.52	967.29	87.76	967.53	88.15	967.95
88.16	968	88.29	968.11	90.1	970	91.29	970.49	95.75	972
98.92	972.45	104.41	973.22	105.52	973.38	107.72	973.7	108.01	973.74
108.53	973.74	109.99	973.85	111.01	973.91	111.82	973.96	112.49	974
124.09	975.05	126.08	975.23	127.25	975.33	127.42	975.34	130.5	975.63
130.65	975.64	130.69	975.65	133.6	975.7	149.49	977.22	155.2	978.14
155.57	978.17	169.58	979.21	170.19	979.25	172.95	979.42	180.97	979.89
182.61	980	190.31	980	193.09	980.06	199.28	980.04	201.26	980.14
203.09	980.05	203.28	980	204.65	980	204.84	980.02	205.3	980.06
207.49	980.15	208.7	980.12	224.2	981.15	227.58	981.37	227.59	981.37
227.62	981.37	231.99	981.66	232.53	981.69	234.02	981.81	236.01	982
237.24	982.33	245.39	984						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-----	-------	-----	-------	-----	-------

EntranceStudy.rep

0 .1 61.88 .04 95.75 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 61.88 95.75 72.82 71.44 67.88 .1 .3
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 130.44 169.44 985

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 4998.406

INPUT

Description:

Station Elevation Data num= 77

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1003.16	.35	1003.02	2.91	1002	5.06	1001.16	12.43	998.16
12.82	998	14.1	997.48	17.71	996	18.5	995.68	22.62	994
24.7	993.06	27.05	992	29.75	990.38	30.38	990	30.81	989.74
33.69	988	36.08	986.55	36.99	986	38.83	984.88	40.26	984
40.87	983.64	43.56	982	45.87	980.37	46.39	980	47.44	979.15
48.89	978	49.92	977.2	51.46	976	53.17	974.69	53.87	974.15
54.07	974	54.53	973.65	56.72	972	58.17	971.04	59.54	970
64.82	969.11	70.86	968	71.1	967.94	71.24	967.91	71.44	967.85
75.06	967.6	81.15	967.13	82.14	967.55	83.29	968	93.14	968
98.77	968.43	101.21	969.34	101.5	969.46	102.92	970	109.08	970.94
115.81	972	137.14	974	154.01	976.08	154.19	976.1	158.34	976
165.25	978	178.04	980	186.62	980.49	191.67	980.81	207.11	981.75
220.99	981.84	225.94	981.79	227.66	981.88	227.89	981.89	228.08	981.9
228.31	981.91	229.05	981.93	230.77	982	232.58	983.55	233.13	984
234.1	984.85	235.42	986	236.15	986.64	237.7	988	238.71	988.54
239.96	989.2	241.67	990						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	64.82	.04	83.29	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 64.82 83.29 188.11 226.48 286.17 .1 .3
 Blocked Obstructions num= 2
 Sta L Sta R Elev Sta L Sta R Elev
 107.17 116.31 980 136.51 176.93 985

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 4765.350

INPUT

EntranceStudy.rep

Description:

Station Elevation Data		num= 113		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1014.48	1.1	1014	3.26	1012.7	4.49	1012	5.78	1011.24		
7.98	1010	9.71	1008.94	11.33	1008	13	1007.12	14.97	1006		
17.66	1004.69	18.88	1004	22.6	1002.16	23.31	1001.81	24.1	1001.43		
27.3	1000	30.09	998.91	32.23	998	36.13	996.48	37.55	996		
37.56	996	43.06	994.19	43.63	994	46.4	993.1	49.75	992		
50.48	991.76	51.85	991.26	54.95	990	55.35	989.7	57.65	988		
60.67	986.05	60.75	986	63.94	984	66.62	982.48	67.42	982		
69.69	980.63	70.72	980	71.06	979.73	73.22	978	75.24	976.33		
75.63	976	76.03	975.67	78.01	974	79.69	972.54	80.3	972		
80.69	971.64	82.5	970	84.08	968.55	84.68	968	88.92	967.6		
89.03	967.59	104.72	966	105.75	965.29	105.86	965.22	105.94	965.19		
107.88	965	121.45	963.67	122.67	964.73	123.36	965.33	124.22	966		
130.9	967.57	132.07	967.84	132.98	968	139.91	968	141.9	968		
142.45	968.07	142.54	968.08	142.67	968.09	143.36	968.21	143.67	968.23		
145.53	968.54	146.22	968.59	149.64	969.1	150.89	969.14	152.43	969.18		
155.4	969.53	157.2	969.54	158.58	969.53	160.07	969.67	165.65	970		
192.71	970	194.85	971.54	195.49	972	197.35	973.33	198.31	974		
198.81	974.33	201.25	976	203.91	977.78	204.27	978	204.58	978.07		
211.89	979.68	214.1	979.65	219.24	979.52	228.03	979.51	230.71	979.85		
232.05	979.92	233.65	980	235.54	981.64	235.99	982	236.71	982.54		
238.62	984	240.35	985.32	241.24	986	243.42	987.67	243.86	988		
246.31	989.87	246.48	990	246.98	990.33	249.53	992	252.57	993.99		
252.59	994	252.64	994.03	254.38	995.21						

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	104.72	.04	124.22	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	104.72	124.22		323.07	300	176.86	.1	.3

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 4431.983

INPUT

Description:

Station Elevation Data		num= 99		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1002	4.03	1000.73	6.26	1000	9.64	998.9	12.5	998		
18.64	996.05	18.81	996	18.98	995.95	19.49	995.78	24.23	994.21		
24.83	994	25.66	993.69	30.18	992	34.53	990.39	35.56	990		
36.71	989.57	40.77	988	45.21	986.36	46.1	986	47.95	985.3		
49.48	984.71	50.96	984	55.13	982.03	55.18	982	58.9	980.16		
59.21	980	60.16	979.46	62.94	978	64.31	976.85	65.29	976.03		
65.33	976	66.68	974.84	67.67	974	69.71	972.24	70	972		
71.04	971.1	72.3	970	72.88	969.49	74.59	968	77.2	966.89		

EntranceStudy.rep

79.62	966	81.99	964.24	82.26	964	82.37	963.85	83.17	962.86
83.97	962.03	104.42	961.61	106.9	961.56	107.19	962	107.86	962.82
108.8	964	111.98	964.55	119.44	966	127.47	966	152.08	966
154.66	966.05	154.81	966.05	185.06	966.02	185.09	966.02	185.63	966.04
186.25	966.09	187.81	966.16	202.42	966.79	212.03	967.68	213.86	967.81
215.62	968	233.43	969.27	243.82	970	244.75	970.64	246.77	972
249.42	973.85	249.62	974	250.09	974.33	252.55	976	254.49	977.31
255.5	978	267.47	978	274.75	977.54	275.42	977.49	277.43	977.35
277.98	977.31	281.17	977.03	282.72	977.31	286.58	978	288.52	979.73
288.83	980	291.5	982	294.17	983.73	294.58	984	295.3	984.47
297.66	986	299.13	986.93	300.83	988	302.91	989.17	304.38	990
306.98	991.46	307.95	992	308.36	992.22	310.91	993.65		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	79.62	.04	108.8	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

79.62	108.8	228.19	154.06	150.95	.1	.3
-------	-------	--------	--------	--------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
131.43	209.66	980

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 4266.832

INPUT

Description:

Station Elevation Data num= 105

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1005.94	3.39	1005.07	7.18	1004	11.84	1002.61	13.95	1002
17.04	1000.61	19.97	999.12	21.97	998	24.06	997.23	27.11	996
33.26	994.19	33.92	994	36.88	993.12	40.67	992	42.57	991.29
46.13	990	49.98	988.54	51.35	988	56.3	986.13	56.64	986
56.8	985.91	60.3	984	62.25	982.28	62.56	982	64.02	980.71
64.41	980.36	64.81	980	64.92	979.91	67.06	978	68.05	977.15
69.34	976	70.67	974.58	71.22	974	72.63	972.46	73.05	972
73.17	971.86	74.86	970	75.68	969.08	76.66	968	78.19	966.26
78.42	966	78.86	965.89	79.04	965.84	81.72	965.09	85.57	964
85.96	963.63	87.53	962	87.67	961.85	87.84	961.65	96.68	961.6
103.95	961.56	104.51	961.74	105.15	961.94	105.32	962	109.32	963.1
112.58	964	127.38	965.48	128.03	965.54	133.51	966	134.24	966
135.7	965.95	135.88	965.96	136.74	965.97	197.53	965.43	205.73	965.29
206.23	965.18	212.01	965.1	214.85	965	219.03	965.24	222.51	965.48
229.91	966	232.12	966.16	238.52	966.62	243.07	966.99	245.16	967.14
249.81	967.41	259.3	968	261.6	968.57	265.03	970	268.07	971.66
268.69	972	269.74	972.57	272.44	974	276.61	974.58	283.24	975.64
287.16	975.72	289.35	975.76	291.75	975.8	293.45	975.83	302.52	974.51
303.86	974	304.4	974	305.92	975.67	306.23	976	306.55	976.35

EntranceStudy.rep

307.9 978 309.55 980 309.81 980.23 311.81 982 314.24 983.83
 314.46 984 314.75 984.15 318.44 986 319.32 986.32 320.08 986.6

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 85.57 .04 112.58 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 85.57 112.58 271.31 315.07 314.36 .1 .3
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 136.06 226.13 980

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 3949.469

INPUT
 Description:

Station Elevation Data num= 105

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	995.06	3.17	994.07	3.36	994	3.43	993.97	9.6	992
14.49	990.19	14.63	990.13	15	990	15.22	989.92	15.59	989.79
20.19	988	22.16	987.36	25.81	986	31.06	984.42	32.42	984
34.33	983.46	39.31	982	45.73	980.13	46.18	980	46.2	980
47.52	979.48	51.34	978	52.2	977.67	56.42	976	58.23	975.3
60.16	974.55	61.54	974	64.79	972.69	66.43	972	67.09	971.44
68.76	970	69.75	969.16	71.09	968	72.21	967.04	73.42	966
74.64	964.96	75.75	964	80	962	80.01	962	80.02	962
86.29	960	86.38	959.86	87.1	958.71	87.58	958	87.59	958
88.06	957.28	96.79	956.84	97.44	956.78	98.37	957.37	99.39	958
99.42	958	101	959.03	102.52	960	103.84	960.61	123.48	961.05
165.38	962	198.36	962	210.29	963.56	213.69	964	227.46	964
231.77	964.44	238.9	966	245.27	967.49	247.21	968	249.36	968.23
252.02	968.43	255.91	968.78	265.21	969.56	269.28	969.8	271.97	969.98
272.25	970	273.31	970.08	274.21	970.11	274.53	970.11	276.59	970.87
281.09	972	283.87	973.84	284.1	974	284.66	974.43	286.7	976
288.25	976.95	290.68	978	292.03	978.41	293.26	978.72	295.34	979.29
297.51	979.82	298.16	980	299.28	980.55	300.8	981.22	301.61	981.63
302.61	982	303.84	982.92	305.25	984	305.43	984.13	305.5	984.19
305.59	984.26	306.78	985.24	307.58	985.89	307.7	986	309.58	987.17
310.65	988	313.51	989.54	314.35	990	315.2	990.43	316.62	991.18

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 86.29 .04 103.84 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 86.29 103.84 56.48 48.84 50.59 .1 .3
 Blocked Obstructions num= 1

EntranceStudy.rep

Sta L Sta R Elev
177.22 208.08 975

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 3900.631

INPUT

Description:

Station	Elevation	Data	num=	115	Sta	Elev	Sta	Elev	Sta	Elev
0	990.88	4.05	990.14	4.18	990.11	4.47	990	4.94	989.83	
11.24	988	16.1	986.61	18.3	986	20.09	985.51	25.15	984	
28.74	982.94	32.02	982	37.25	980.52	39.05	980	40.22	979.64	
45.93	978	50.56	976.22	51.06	976	55.99	974.13	56.32	974	
57.33	973.62	59.47	972.84	60.84	972.35	61.84	972	63.01	971.34	
65.7	970	67.62	968.16	67.79	968	68.4	967.42	69.89	966	
70.89	964.99	71.91	964	72.88	962.99	73.76	962	76.23	961.36	
80.27	960.31	81.46	960	81.77	959.61	83.11	958	83.16	958	
84.18	956.93	84.43	956.6	89.5	956.48	94.18	956.39	94.62	956.65	
96.78	958	96.85	958	98.12	959.15	99.12	960	101.05	961.94	
101.11	962	122.07	962	178.59	962	179.57	961.99	179.93	961.99	
181.15	961.98	181.41	961.98	182.26	961.98	199.68	961.85	201.23	961.83	
203.03	961.85	204.38	961.86	207.65	961.82	208.27	961.83	208.75	961.86	
210.03	961.9	212.15	961.95	213.57	961.98	213.99	962	214.38	962.03	
214.62	962.05	215.99	962.2	227.98	963.31	228.27	963.36	230.92	964	
235.27	964.65	238.4	965.17	239.68	965.4	242.77	966	244.89	966.36	
248.87	967.11	254.3	967.86	257.17	968	264.95	968.28	267.17	968.36	
269.96	968.49	270.64	968.62	271.12	968.74	272.34	969.03	276.34	970	
278.4	971.58	278.99	972	279.34	972.25	281.76	974	283.33	975.41	
284	976	285.85	977.67	286.23	978	288.37	979.94	288.45	980	
288.87	980.38	290.63	982	291.07	982.41	292.88	984	295.05	985.01	
296.53	985.71	297.14	986	299.78	987.24	301.37	988	303.79	989.15	
305.59	990	307.91	991.1	309.8	992	311.81	992.93	312.99	993.47	

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.1	80.27	.04
		101.05	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
80.27 101.05 41.49 46.21 40.51 .1 .3

Blocked Obstructions num= 1
Sta L Sta R Elev
176.43 201.59 975

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 3853.996

EntranceStudy.rep

INPUT

Description:

Station Elevation Data		num= 96		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	991.99	6.85	990.82	10.41	990.1	10.83	990	11.44	989.84
18.62	988	21.77	987.17	26.01	986	33.83	984	34.79	983.75
41.14	982	44.94	980.96	48.12	980	53.27	978.47	55.08	978
58.94	976.79	61.47	976	63.28	975.4	65.67	974.64	67.7	974
72.35	972.38	73.39	972	74.32	971.66	78.36	970	78.42	969.96
80.49	968	81.8	966.6	82.34	966	82.98	965.33	84.36	964
85.71	962.78	86.54	962	87.42	961.49	90	960	93.07	958.89
95.26	958	95.3	958	96.26	956.97	97.2	956.21	99.53	956.32
103.71	956.39	106.17	957.36	108.12	958	109.23	958.67	111.37	960
112.11	961.08	112.8	962	131.34	962	152.36	962	173.99	961.69
175	961.7	175.95	961.71	176.98	961.71	184.97	961.72	186.27	961.74
197.98	961.95	214.81	961.95	219.76	961.97	224.64	962	243.05	963.73
244.16	963.83	245.15	964	246.28	964.27	253.71	966	256.51	966.47
265.88	967.72	270.53	967.96	276.13	968	288.24	968	289.98	969.87
290.1	970	290.21	970.1	292.13	972	293.61	973.35	294.46	974
296.17	975.52	296.7	976	298.8	977.88	298.93	978	300.54	979.44
301.17	980	301.27	980.09	303.43	982	304.43	982.89	305.68	984
306.71	984.9	308	986	311.16	987.4	312.5	988	313.16	988.25
317.58	990	320.12	990.99	322.69	992	325.67	993.25	327.48	994
328.36	994.4								

Manning's n Values		num= 3		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	87.42	.04	112.8	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	87.42	112.8		75.96	62.46	59.87	.1	.3

Blocked Obstructions			num= 1
Sta L	Sta R	Elev	
152.59	182.04	975	

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 3791.489

INPUT

Description:

Station Elevation Data		num= 112		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	992.04	.11	992	4.96	990.15	5.35	990	5.68	989.87
10.33	988	11.79	987.44	15.33	986	19.19	984.3	19.99	984
21.08	983.35	23.53	982	26.07	980.48	28	979.41	30.37	978
31.39	977.44	33.78	976	34.79	975.39	37.05	974	38.45	973.15
39.79	972.36	40.34	972	40.86	971.68	41.66	971.38	45.52	970
45.66	969.96	48.18	969.23	51.47	968.59	54.29	968	56.86	967.22

EntranceStudy.rep

59.05	966.47	60.05	966	60.73	965.63	61.84	965.07	63.94	964
65.07	963.38	67.76	962	74.9	960.84	82.21	960	83.67	959.35
86.63	958	86.69	958	86.78	957.94	87.9	957.24	89.69	955.91
94.45	956.13	99	956.39	101.13	957.5	102.14	958	102.23	958
103.63	958.82	104.36	959.31	105.31	960	106.28	960.83	107.62	962
113.47	962	115.27	961.88	125.11	961.22	126.94	961.12	129.18	960.99
136.17	960.55	141.37	960.34	143.53	960.21	148.34	960.1	148.85	960.07
153.34	960.02	153.43	960.02	153.56	960.02	153.62	960.01	153.93	960.01
160.35	960.04	160.55	960.04	161.8	960.05	166.32	960.14	182.28	960.45
205.08	961.07	234.13	961.65	239.87	962	245.11	963.37	247.54	964
250.74	964.8	255.18	966	257.07	966.17	265.26	966.83	278.38	966.3
286.44	967.38	287.35	968	289.42	969.6	289.97	970	290.57	970.38
292.92	972	294.71	973.66	295.07	974	297.1	975.77	297.36	976
299.55	977.91	299.65	978	301.66	979.76	301.93	980	301.95	980.01
304.22	982	304.34	982.11	306.5	984	309.57	985.83	309.87	986
314.24	987.58	315.53	988	319.08	989.34	320.56	990	323.2	991.38
324.46	992	325.48	992.47						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	82.21	.04	107.62	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

82.21	107.62	108.21	99.65	103.15	.1	.3
-------	--------	--------	-------	--------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
153.84	183.33	975

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 3691.713

INPUT

Description:

Station Elevation Data num= 123

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	992.57	.81	992.39	1.51	992.2	1.73	992.15	2.1	992
4.19	991.19	7.13	990	8.27	989.54	11.98	988	14.37	987.04
16.93	986	21.01	984.38	21.94	984	22.11	983.9	26.55	982
28.87	980.51	29.81	980	32.49	978.51	33.37	978	35.16	977.02
37.1	976	37.68	975.69	40.86	974	41.79	973.48	44.6	972
47.57	970.14	47.83	970	48.09	969.81	48.78	969.37	51.24	968
54.24	966.44	55.25	966	59.44	964.24	59.96	964	61.98	963.1
64.42	962	67.93	960.89	70.23	960	71.72	960	74.58	960
79.76	959.38	83.02	959.14	98.11	958	99.37	957.24	101.45	956
101.92	955.72	109.31	955.9	111.2	956.05	111.25	956	111.29	956.03
114.32	958	114.33	958	117.43	959.5	118.46	960	127.02	960
127.54	959.98	140.02	959.39	169.35	958	202.46	958	202.76	958.01
202.89	958.01	209.95	958.13	210.4	958.15	221.07	958.3	225.93	958.32
226.7	958.36	227.62	958.42	232.9	958.48	234.02	958.56	235.62	958.66

EntranceStudy.rep

237.71	958.79	242.79	958.97	244.8	959.13	247.83	959.39	248.55	959.45
249.37	959.52	252.34	959.77	253.39	959.83	255.18	960	261.36	961.42
263.93	962	267.07	962.62	271.58	963.47	273.41	963.82	274.4	964
276.78	964.33	277.64	964.45	278	964.5	278.27	964.54	279.1	964.51
279.85	964.48	281.21	964.42	282.81	964.36	285.19	964.27	292.2	964
299.74	964	301.42	965.56	301.87	966	303.65	967.48	304.3	968
306.51	969.79	306.78	970	308.3	971.24	309.24	972	309.37	972.11
311.68	974	312.1	974.35	314.12	976	314.84	976.68	316.22	978
317.98	979.88	318.08	980	318.19	980.11	320.23	982	322.19	983.4
323.07	984	324.27	984.43	328.98	986	331.19	986.82	334.69	988
337.43	989.06	339.66	990	341.5	990.78				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	98.11	.04	114.32	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

98.11	114.32	18.17	15.92	16.89	.1	.3
-------	--------	-------	-------	-------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
130.29	154.49	970

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 3675.796

INPUT
 Description:

Station Elevation Data num= 112

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	991.29	4.86	990	7.77	989.04	10.52	988	16.12	986.03
16.21	986	16.28	985.98	22.05	984	23.92	983.3	27.48	982
30.92	980.57	32.36	980	35.96	978.47	36.91	978	39.28	976.78
40.29	976.23	40.8	976	41.05	975.86	44.44	974	46.77	972.74
48.11	972	50.77	970.59	51.87	970	52.29	969.78	55.66	968
59.22	966	63.01	964	63.85	963.75	64.68	963.59	69.42	962.48
69.69	962.45	70.44	962.38	73.13	962.05	73.56	962	77.18	961.44
78.76	961.14	83.35	960	84.39	959.91	84.63	959.88	84.95	959.85
88.6	959.47	101.19	958	101.42	958	102.13	957.32	103.43	956
104.09	955.39	104.14	955.35	104.15	955.34	104.16	955.34	104.2	955.34
114.55	956.12	114.68	956.01	114.78	956	115.35	956.33	117.24	957.51
117.97	958	117.98	958	118.32	958.19	118.48	958.23	120.18	959.07
122.43	960	127.89	960	132.91	959.63	142.77	959.24	165.52	958.35
173.24	958	242.09	958	244.27	958.18	245.37	958.3	251.53	958.98
257.57	959.62	260.67	960	266.8	961.31	269.97	962	271.95	962.36
277.11	963.3	281.13	964	281.37	964.04	282.75	964.25	288.34	964.02
288.72	964	289.59	963.96	299	963.53	303.87	963.93	304.31	964
305	964.76	306.19	966	306.93	966.58	308.77	968	310.72	969.51
311.37	970	313.79	971.87	313.96	972	314.67	972.54	318.84	975.8
319.09	976	320.88	977.81	321.06	978	321.2	978.15	322.77	980

EntranceStudy.rep

323.55	980.93	324.43	982	324.94	982.46	326.89	984	330.59	985.45
331.93	986	333.27	986.51	337.52	988	342.77	989.57	344.18	990
345.07	990.34	348.21	991.3						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	101.42	.04	122.43	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

101.42	122.43	23.79	17.98	13.95	.1	.3
--------	--------	-------	-------	-------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
132.92	157.12	970

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 3657.812

INPUT
 Description:

Station Elevation Data num= 131

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	989.74	4.78	988.26	8.32	986.94	8.51	986.83	10.33	986.27
10.55	986.23	11.86	986	13.1	985.81	13.21	985.76	13.33	985.73
17.03	985.18	23.76	984	24.57	983.9	24.65	983.84	24.93	983.78
27.04	983.01	31.89	982.43	32.93	982.18	33.8	982	34.29	982
35.11	981.74	36.81	980.88	38.53	980.52	40.19	980	42.25	979.21
43.83	978.5	46.06	978	46.53	977.82	48.15	977.02	50.25	976.37
51.19	976	52.19	975.39	54.3	974	55.95	973.27	56.99	972.76
58.4	972	63.92	970.12	64.34	970	66.55	969.3	70.68	968
70.9	967.9	71.29	967.83	73.98	967.11	78.48	966	86.29	964.33
86.31	964.33	87.72	964	91.97	963.06	95.62	962.6	98.14	962.3
98.85	962.18	100.36	962	100.81	962	101.13	961.95	101.17	961.94
101.18	961.94	102.71	961.66	102.89	961.63	103.48	961.53	104.66	961.28
106.2	960.98	108.56	960.48	110.61	960	111.04	959.78	113.83	958
113.86	958	114.28	957.6	115.97	956	116.26	955.7	116.7	955.24
120.77	955.36	126.91	955.71	127.17	955.97	127.19	956	127.51	956.43
128.6	958	128.62	958	129.52	959.16	130.07	960	138	960
138.54	959.92	142.33	959.51	143.62	959.47	146.65	959.17	151.18	959.05
153.37	958.85	158.14	958.51	158.19	958.5	171.15	958	256.21	958
256.27	958.01	272.8	960	283.28	961.89	284.01	962	284.38	962.05
296.86	963.76	297.35	963.76	311.46	963.22	312.81	963.17	312.93	963.13
313.15	963.06	313.63	962.93	317.48	962.93	318.52	964	319.77	965.6
320.08	966	320.37	966.38	321.74	968	321.94	968.26	323.05	969.54
323.47	970	323.67	970.17	325.63	972	327.26	972.97	329.36	974
330.24	974.66	332.17	976	332.91	976.77	334.06	978	335.19	979.27
336.93	981.24	337.61	982	339.6	983.33	340.61	984	341.39	984.34
345.02	986	348.71	987.57	349.75	988	351.27	988.49	356.14	990
359.53	990.88								

EntranceStudy.rep

Manning's n Values num= 3
 Sta n Val Sta n Val
 0 .1 110.61 .04 130.07 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 110.61 130.07 31.6 25.08 28.39 .1 .3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 3632.733

INPUT
 Description:

Station Elevation Data		num= 110									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	984.92	4.46	983.59	8.21	983.17	9.46	983.01	10.8	982.69		
13.09	982.56	13.73	982.42	16.85	982	18.38	981.77	18.79	981.82		
18.99	981.83	19.34	981.82	19.63	981.79	20	981.74	24.33	981.25		
25.75	981.02	30.21	980.32	32.03	980	32.14	980	36.37	979.12		
38.97	978.55	41.5	978	47.5	976.75	50.72	976	52.35	975.52		
57.61	974	64.25	972.1	64.57	972	69.62	970.28	70.42	970		
70.81	969.82	71	969.74	75.36	968	77.04	967.54	79.48	966.92		
80.15	966.72	81.69	966	83	965.49	83.46	965.2	84.54	964.75		
86.34	964	92.99	964	98.99	961.42	100.63	960	102.24	960		
104.49	958.79	105.98	958	107.48	958	111.94	956.5	113.12	956		
115.07	955.69	117.34	955.38	117.82	955.3	118.48	955.14	120.07	955.16		
128.6	955.15	128.93	955.45	129.53	956	129.55	956	130.23	956.59		
131.81	958	131.83	958	132.44	958.18	146.77	958.94	151.03	958.59		
156.8	958	158.05	958	263.96	958	264.98	958.14	270.45	958.84		
277.63	959.77	279.6	960	291.32	961.32	297.24	962	297.41	962.02		
302.43	962.73	313.56	962.49	319.01	962.26	319.78	962	323.12	962		
324.38	963.68	324.62	964	326.23	965.89	326.32	966	326.93	966.49		
328.78	968	329.32	968.45	331.21	970	332.3	970.92	333.61	972		
334.67	973.03	335.72	974	337.15	975.49	337.65	976	339.27	977.71		
339.54	978	339.62	978.09	341.35	980	341.87	980.6	343.12	982		
345.97	983.71	346.46	984	347.68	984.63	350.33	986	351.13	986.4		
354.23	988	359.49	989.27	362.96	990	367.4	991.26	367.57	991.31		

Manning's n Values num= 3
 Sta n Val Sta n Val
 0 .035 104.49 .04 132.44 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 104.49 132.44 136.38 147.69 46.47 .1 .3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 3465.882

INPUT

Description:

Station	Elevation	Data	num= 147							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	984.74	19.47	978.76	21.17	978	24.53	976.97	26.2	976.44	
27.4	976	30.06	975.07	33.2	974	36.53	972.98	38.5	972.35	
39.54	972	41.41	971.56	43.82	971.05	49.29	970	58.96	968.56	
61.19	968.24	62.97	968	71.93	966.27	73.99	966	77.94	965.57	
80.66	965.31	86.03	964.77	91.38	964.32	92.79	964.2	95.59	964	
96.9	963.94	97.16	963.93	108.07	963.51	109.82	963.47	114.36	963.32	
116.38	963.29	118.56	963.24	122.51	963.2	124.26	963.18	128.34	963.02	
131.76	962.79	132.59	962.77	139.59	962.24	142.59	962	150.51	960.8	
154.92	960	156.62	959.71	157.69	959.64	161.23	959.22	162.46	959.16	
166.36	958.79	166.72	958.78	167.01	958.77	168.3	958.72	171.76	958.6	
172.72	958.51	173.28	958.46	179.82	958.24	186.09	958	188.29	957.39	
193.09	956.56	194.79	956.15	196.1	956	196.17	956	198.44	954.97	
200.09	954	200.37	954	200.73	953.85	201.53	953.13	202.61	953.15	
203.11	953.15	204.17	953.15	209.78	953.17	210.33	953.18	213.08	953.09	
216.06	953.04	217.63	953	219.49	952.88	221.36	952.8	223.68	952.75	
225.68	952.7	227.23	952.69	228.24	952.65	230.78	952.55	238.84	953.35	
243.16	953.69	246.52	954	246.55	954	249.3	954.25	249.65	954.32	
251.02	954.46	251.23	954.49	251.79	954.55	252.66	954.72	253.7	954.86	
253.93	954.89	256.71	955.46	258.2	955.68	259.51	956	259.59	956	
263.21	956.09	266.69	956.17	268.74	956.22	275.86	956.7	289.12	957.62	
290.89	957.73	291.7	957.78	293.02	957.86	293.77	957.9	294.89	958	
298.96	958	317.54	959.81	318.14	959.86	319.33	960	324.52	960.03	
334.75	960.6	342.13	960.49	345.49	961.29	345.98	961.03	346.34	960.91	
347.59	961.78	347.92	962	348.13	962.18	350.38	964	350.88	964.41	
352.78	966	353.84	966.91	355.03	968	356.57	969.57	357	970	
357.63	970.73	358.76	972	360.09	973.61	360.42	974	361.83	975.77	
362.01	976	363.28	977.32	363.75	977.8	363.97	978	364.6	978.55	
366.26	980	367.06	980.54	369.04	982	370.91	983.2	372.22	984	
374.01	985.38	374.91	986	379.54	987.48	381.18	988	381.91	988.21	
388.05	990	392.54	990.77							

Manning's n Values

Sta	n Val	Sta	num= 3			
Sta	n Val	Sta	n Val	Sta	n Val	
0	.035	186.09	.04	259.51	.035	

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	186.09	259.51		17.32	127.69	123.64	.1	.3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 3309.640

INPUT

Description:

Station	Elevation	Data	num= 128			
---------	-----------	------	----------	--	--	--

EntranceStudy.rep

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	982.22	1.02	981.95	2.11	981.65	7.66	980	9.84	979.61
11.51	978.98	13.87	978	13.91	977.98	19.09	976	21.71	975.03
24.41	974	26.35	973.25	30.09	972	33.55	971.2	35.56	970.72
38.1	970.05	38.25	970	38.51	969.94	46.66	968	54.14	966.06
54.38	966	60.27	964.51	62.65	964	64.19	963.77	72.33	962.92
79.43	962.15	81.1	962	81.18	962	86.38	961.73	87.77	961.66
100.71	961.18	104.74	960.99	108.6	960.83	121.18	960.27	122.33	960.22
123.03	960.2	123.48	960.19	128.12	960.02	131.2	960	131.77	960
132.01	960	136.09	960	140.74	959.96	144.54	959.9	144.66	959.9
146.67	959.85	147.02	959.86	158.4	959.45	161.67	959.33	164.95	959.2
186.24	958.12	186.76	958.1	188.72	958	195.74	957.68	234.89	956.71
244.65	956.45	257.29	956	268.64	956	296.92	956	304.37	954.53
306.82	954	306.84	954	308.37	952.59	309.18	951.98	310.79	952.01
315.99	952.08	317.41	952.72	318.98	953.71	319.44	954	321.66	955.54
322.54	956.14	325.26	958	327.59	958.91	328.25	959.18	328.48	959.27
328.72	959.34	330.46	959.36	333.18	959.5	348.76	960	350.18	961.41
350.75	962	351.74	962.96	352.85	964	353.37	964.47	355.03	966
356.31	967.08	357.39	968	359.09	969.42	359.7	969.94	359.77	970
362.01	971.88	362.16	972	362.69	972.45	364.56	974	365.75	974.96
367.01	976	367.88	976.68	369.58	978	370.66	978.48	373.91	980
377.29	981.46	379.07	982	385.14	982.92	390.54	983.7	391.44	983.83
392.6	984	396.07	985.16	397.76	986	399.69	987.24	401.12	988
403.41	989.36	404.52	990	405.24	990.45	407.79	992	410.3	993.47
411.35	994	413.34	994.58	418.16	996	423.92	997.71	424.93	998
426.93	998.61	431.53	1000	436.98	1001.41	439.46	1002	446.91	1003.36
450.19	1004	455.04	1005.05	455.32	1005.11				

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	296.92	.04	328.25	.013	348.76	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 296.92 327.59 39.21 40.11 39.84 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
164.35	187.25	970

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 3269.177

INPUT

Description:

Station Elevation Data num= 189

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	978.86	3.53	978.23	9.74	976.55	11.31	976	14.97	974.6
16.57	974	20.75	972.4	21.83	972	24.11	971.23	27.88	970
32.9	968.36	33.95	968	34.41	967.83	35.7	967.35	38.78	966.24
39.49	966	41.22	965.4	45.17	964	50.35	963.32	54	962.83

EntranceStudy.rep

60.02	962	62.03	961.28	63.3	960.79	65.36	960	68.12	959.82
69.16	959.77	70.56	959.7	82.69	959.38	85.96	959.33	89.35	959.13
92.52	959	97.65	958.72	103.14	958.43	105.91	958.29	109.67	958.17
110.26	958.14	110.76	958.12	114.51	958.11	115.15	958.09	120.04	958.11
120.49	958.11	120.71	958.11	135.37	958.15	135.71	958.14	135.98	958.14
138.28	958.16	138.45	958.16	143.03	958.25	149.87	958	175.46	958
175.91	957.99	178.92	957.78	180.58	957.72	180.94	957.69	186.7	957.43
188.57	957.39	190.03	957.33	192.03	957.3	193.66	957.28	194.86	957.27
198.94	957.32	204.5	956.98	211.37	956.88	226.1	956.37	233.19	956.22
247.54	956.18	261.66	956.28	261.7	956.28	262.11	956.27	262.54	956.26
262.94	956.25	263.32	956.25	263.73	956.24	268.76	956.17	277.32	956.08
281.08	956	282.76	955.93	283.08	955.9	289.96	955.66	291.1	955.5
295.09	955.38	296.27	955.15	298.16	955.02	299.48	954.72	301.07	954.39
301.57	954.33	301.97	954.31	302.73	954	302.77	954	305.12	952.48
305.89	952	305.95	951.98	305.98	951.98	306.31	951.98	311.69	952.05
314.43	952.08	314.48	952.07	315.22	952	317.29	953.1	318.63	954
319.62	954.9	320.75	956	321.97	957.11	323.03	958	324.92	958.23
326.1	958.37	326.54	958.43	326.99	958.49	327.5	958.55	328.43	958.82
331.74	958.85	345.82	958.84	346.13	958.92	346.62	959.11	349	960
349.75	961.01	350.5	962	351.36	963.16	352	964	353.05	965.42
353.49	966	354.91	967.96	354.94	968	355.01	968.05	355.16	968.17
357.51	970	358.6	970.73	360.52	972	361.83	972.87	363.51	974
365.73	975.1	367.35	976	369.6	977.18	371.34	978	371.87	978.09
376.36	978.77	379.18	979.15	381.58	979.41	382.9	979.57	387.21	979.99
387.28	980	391.04	980.87	393.06	982	394.27	982.98	395.51	984
396.78	985.03	397.95	986	399.36	987.14	400.39	988	402.28	989.59
402.88	990	402.89	990	403.12	990	405.2	990.61	410.21	992
411.36	992.27	414.24	992.92	417.32	993.61	417.81	993.72	419.13	994
423.01	994.8	424.69	995.07	425.62	995.21	428.15	995.59	428.64	995.69
430.79	996	432.5	996	432.93	996.28	435.47	998	435.87	998.08
436.01	998.1	438.6	998.58	439.53	998.68	441.28	998.98	442.72	999.2
444.41	999.33	445.36	999.46	447.65	999.65	448.05	999.7	451.05	999.95
451.1	999.96	451.59	1000	454.35	1000.39	456.09	1000.71	457.89	1001.11
459.89	1001.48	461.91	1002	464.93	1002.81	467.32	1003.45		

Manning's n Values num= 5
 Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
 0 .035 289.96 .04 323.03 .035 328.43 .013 345.82 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 289.96 323.03 34.53 26.06 33.76 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev
 142 163.45 970

BRIDGE

RIVER: LAUREL RUN
 REACH: UPPER

RS: 3257.286

INPUT

EntranceStudy.rep

Description:

Distance from Upstream XS = 3.59
 Deck/Roadway width = 15.8
 Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 3			
Sta	Hi Cord	Lo Cord	
277.32	956.08	956.08	295.09
Sta	Hi Cord	Lo Cord	
323.03	958	957.5	

Upstream Bridge Cross Section Data

Station Elevation Data num= 189											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	978.86	3.53	978.23	9.74	976.55	11.31	976	14.97	974.6		
16.57	974	20.75	972.4	21.83	972	24.11	971.23	27.88	970		
32.9	968.36	33.95	968	34.41	967.83	35.7	967.35	38.78	966.24		
39.49	966	41.22	965.4	45.17	964	50.35	963.32	54	962.83		
60.02	962	62.03	961.28	63.3	960.79	65.36	960	68.12	959.82		
69.16	959.77	70.56	959.7	82.69	959.38	85.96	959.33	89.35	959.13		
92.52	959	97.65	958.72	103.14	958.43	105.91	958.29	109.67	958.17		
110.26	958.14	110.76	958.12	114.51	958.11	115.15	958.09	120.04	958.11		
120.49	958.11	120.71	958.11	135.37	958.15	135.71	958.14	135.98	958.14		
138.28	958.16	138.45	958.16	143.03	958.25	149.87	958	175.46	958		
175.91	957.99	178.92	957.78	180.58	957.72	180.94	957.69	186.7	957.43		
188.57	957.39	190.03	957.33	192.03	957.3	193.66	957.28	194.86	957.27		
198.94	957.32	204.5	956.98	211.37	956.88	226.1	956.37	233.19	956.22		
247.54	956.18	261.66	956.28	261.7	956.28	262.11	956.27	262.54	956.26		
262.94	956.25	263.32	956.25	263.73	956.24	268.76	956.17	277.32	956.08		
281.08	956	282.76	955.93	283.08	955.9	289.96	955.66	291.1	955.5		
295.09	955.38	296.27	955.15	298.16	955.02	299.48	954.72	301.07	954.39		
301.57	954.33	301.97	954.31	302.73	954	302.77	954	305.12	952.48		
305.89	952	305.95	951.98	305.98	951.98	306.31	951.98	311.69	952.05		
314.43	952.08	314.48	952.07	315.22	952	317.29	953.1	318.63	954		
319.62	954.9	320.75	956	321.97	957.11	323.03	958	324.92	958.23		
326.1	958.37	326.54	958.43	326.99	958.49	327.5	958.55	328.43	958.82		
331.74	958.85	345.82	958.84	346.13	958.92	346.62	959.11	349	960		
349.75	961.01	350.5	962	351.36	963.16	352	964	353.05	965.42		
353.49	966	354.91	967.96	354.94	968	355.01	968.05	355.16	968.17		
357.51	970	358.6	970.73	360.52	972	361.83	972.87	363.51	974		
365.73	975.1	367.35	976	369.6	977.18	371.34	978	371.87	978.09		
376.36	978.77	379.18	979.15	381.58	979.41	382.9	979.57	387.21	979.99		
387.28	980	391.04	980.87	393.06	982	394.27	982.98	395.51	984		
396.78	985.03	397.95	986	399.36	987.14	400.39	988	402.28	989.59		
402.88	990	402.89	990	403.12	990	405.2	990.61	410.21	992		
411.36	992.27	414.24	992.92	417.32	993.61	417.81	993.72	419.13	994		
423.01	994.8	424.69	995.07	425.62	995.21	428.15	995.59	428.64	995.69		
430.79	996	432.5	996	432.93	996.28	435.47	998	435.87	998.08		
436.01	998.1	438.6	998.58	439.53	998.68	441.28	998.98	442.72	999.2		
444.41	999.33	445.36	999.46	447.65	999.65	448.05	999.7	451.05	999.95		
451.1	999.96	451.59	1000	454.35	1000.39	456.09	1000.71	457.89	1001.11		
459.89	1001.48	461.91	1002	464.93	1002.81	467.32	1003.45				

Manning's n Values

num= 5

EntranceStudy.rep

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	289.96	.04	323.03	.035	328.43	.013	345.82	.06

Bank Sta: Left Right Coeff Contr. Expan.
 289.96 323.03 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev
 142 163.45 970

Downstream Deck/Roadway Coordinates

num=	6								
Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	
264.07	955.4	955.4	280.78	955.6	954	302.24	955.8	954	
309.78	956	955	316.84	956.5	956	324.51	958	958	

Downstream Bridge Cross Section Data

Station	Elevation	Data	num=	135					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	976.99	6.52	974.99	15.39	972.06	15.55	972	15.62	971.97
20.81	970	22.46	969.41	26.28	968	30.73	966.43	31.9	966
37.21	964.14	37.6	964	39.12	963.56	43.87	962	49.65	960.88
51.61	960.55	52.65	960.43	53.28	960.38	53.54	960.35	54.47	960
84.83	958	84.84	958	93.16	957.77	133.3	957.86	160.38	957.8
161.37	957.81	163.74	957.83	164.69	957.88	166.01	957.91	168.01	957.89
175.17	957.86	178.11	957.84	182.46	957.73	188.33	957.54	227.02	956.62
239.68	956.48	241.07	956.46	248.59	956.22	249.97	956.15	252.75	956.05
254.14	956	255.28	956	264.07	955.4	277.47	954.49	280.78	954
302.24	954	305.62	952.78	307.73	952	309.09	951.71	309.14	951.7
309.2	951.68	309.56	951.71	309.78	951.72	316.84	952.08	317.18	952.05
317.46	952	319.53	953.55	320.05	954	321.22	955.18	321.91	956
322.69	956.89	324.51	958	325.08	958	325.96	958.13	330.41	958.53
331	958.53	342.78	958.43	347.81	958.41	348.85	958.87	349.24	959.08
350.98	960	351.28	960.46	352.26	962	353.42	963.78	353.56	964
353.71	964.23	354.87	966	356.57	967.65	357	968	358.38	968.71
358.41	968.72	360.9	970	361.98	970.59	364.68	972	368.86	973.94
369.01	974	375.73	975.19	380.83	975.86	381.31	975.93	381.98	976
385.31	976.37	387.63	976.85	390.6	977.28	393.01	978	394.74	979.33
395.63	980	396.16	980.41	398.22	982	398.99	982.6	400.8	984
402.9	985.03	404.95	986	408.82	987.44	410.35	988	411.61	988.41
414.32	989.25	417.53	990	418.54	990.14	422.39	990.59	423.67	990.75
426.13	991.03	429.09	991.4	429.99	991.5	430.44	991.55	430.79	991.59
434	992	435.93	992.26	436.75	992.39	440.46	992.89	443.71	993.46
444.58	993.57	446.44	994	448.93	994.61	453.69	996	455.47	996.59
456.27	996.84	459.21	997.72	459.85	997.91	460.21	998	462.12	998.44
463.7	998.8	469.08	1000	469.75	1000.16	470.9	1000.38	471.55	1000.52

Manning's n Values num= 5
 Sta n Val Sta n Val Sta n Val Sta n Val
 0 .035 302.24 .04 324.51 .035 331 .013 347.81 .06

Bank Sta: Left Right Coeff Contr. Expan.
 302.24 324.51 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev
 198.18 247.93 975

Upstream Embankment side slope = 1.5 horiz. to 1.0 vertical
 Downstream Embankment side slope = 1.5 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Energy

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add weight component to Momentum

Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: LAUREL RUN

REACH: UPPER

RS: 3243.083

INPUT

Description:

Station Elevation Data		num=		135							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	976.99	6.52	974.99	15.39	972.06	15.55	972	15.62	971.97		
20.81	970	22.46	969.41	26.28	968	30.73	966.43	31.9	966		
37.21	964.14	37.6	964	39.12	963.56	43.87	962	49.65	960.88		
51.61	960.55	52.65	960.43	53.28	960.38	53.54	960.35	54.47	960		
84.83	958	84.84	958	93.16	957.77	133.3	957.86	160.38	957.8		
161.37	957.81	163.74	957.83	164.69	957.88	166.01	957.91	168.01	957.89		
175.17	957.86	178.11	957.84	182.46	957.73	188.33	957.54	227.02	956.62		
239.68	956.48	241.07	956.46	248.59	956.22	249.97	956.15	252.75	956.05		
254.14	956	255.28	956	264.07	955.4	277.47	954.49	280.78	954		
302.24	954	305.62	952.78	307.73	952	309.09	951.71	309.14	951.7		
309.2	951.68	309.56	951.71	309.78	951.72	316.84	952.08	317.18	952.05		
317.46	952	319.53	953.55	320.05	954	321.22	955.18	321.91	956		
322.69	956.89	324.51	958	325.08	958	325.96	958.13	330.41	958.53		
331	958.53	342.78	958.43	347.81	958.41	348.85	958.87	349.24	959.08		

EntranceStudy.rep

350.98	960	351.28	960.46	352.26	962	353.42	963.78	353.56	964
353.71	964.23	354.87	966	356.57	967.65	357	968	358.38	968.71
358.41	968.72	360.9	970	361.98	970.59	364.68	972	368.86	973.94
369.01	974	375.73	975.19	380.83	975.86	381.31	975.93	381.98	976
385.31	976.37	387.63	976.85	390.6	977.28	393.01	978	394.74	979.33
395.63	980	396.16	980.41	398.22	982	398.99	982.6	400.8	984
402.9	985.03	404.95	986	408.82	987.44	410.35	988	411.61	988.41
414.32	989.25	417.53	990	418.54	990.14	422.39	990.59	423.67	990.75
426.13	991.03	429.09	991.4	429.99	991.5	430.44	991.55	430.79	991.59
434	992	435.93	992.26	436.75	992.39	440.46	992.89	443.71	993.46
444.58	993.57	446.44	994	448.93	994.61	453.69	996	455.47	996.59
456.27	996.84	459.21	997.72	459.85	997.91	460.21	998	462.12	998.44
463.7	998.8	469.08	1000	469.75	1000.16	470.9	1000.38	471.55	1000.52

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	302.24	.04	324.51	.035	331	.013	347.81	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

302.24	324.51	31.99	36.23	30.39	.1	.3
--------	--------	-------	-------	-------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
198.18	247.93	975

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 3206.856

INPUT

Description:

Station Elevation Data num= 133

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	973.69	1.24	973.27	11.76	969.59	15.53	970.63	18.01	970
18.91	968.91	21.79	966	22.99	965.57	27.16	964	30.77	962.62
32.37	962	38.12	960.6	41.07	960	44.58	959.35	50.48	958
55.91	958	71.19	957.41	72.66	957.4	74.23	957.37	76.25	957.33
78.41	957.3	85.45	957.1	88.41	957.07	92.17	957.04	98.37	956.85
103.57	956.84	107.09	956.74	138.4	956.79	143.67	956.79	158.59	956.81
163.91	956.8	171.87	956.77	177.29	956.78	179.93	956.78	185.27	956.77
187.52	956.78	240.44	956	250.21	956	262.48	954.91	268.05	954.41
271.2	954	299.68	954	300.21	953.72	303.4	952	303.66	951.82
305.35	950.61	310.41	950.9	311.92	951.06	312.66	951.52	313.47	952
316.22	952.75	320.92	954	321.41	954.28	324.09	956	327.24	956.4
330.03	956.75	331.41	956.94	334.6	957.23	338.26	957.47	344.43	957.66
351.64	958	353.96	958	355.96	960	357.82	962	357.93	962.11
358.04	962.24	359.82	964	361.81	965.97	361.85	966	361.93	966.03
366.24	968	369.56	969.15	370.86	969.61	372.37	970	374.64	970.43
375.4	970.44	377.91	970.67	379.74	970.75	381.31	970.8	383.08	970.89
385.05	971.06	388.26	971.44	389.53	971.54	393.14	972	394.11	972.19
394.62	972.37	397.82	973.23	399.36	974	400.68	974.83	402.53	976

EntranceStudy.rep

403.06	976.34	404.47	977.23	405.71	978	406.37	978.4	408.96	980
410.8	981.07	413.67	982	414.42	982.13	418.97	982.77	421.82	983.02
424.52	983.3	428.75	983.57	429.64	983.63	432.33	984	433.82	984
435.44	984.76	438.14	986	438.78	986.27	443.2	988	443.43	988.07
445.18	988.45	446.65	988.66	448.11	988.9	448.95	989.03	449.48	989.09
450.23	989.17	453.86	989.63	454.5	989.7	456.95	990	457.86	990.11
458.02	990.14	458.12	990.15	460.48	990.47	460.83	990.53	461.37	990.63
463.28	990.94	464.25	991.14	467.49	991.82	467.83	991.89	468.31	992
474.16	993.35	477.01	994	477.23	994.05				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	299.68	.04	324.09	.035	334.6	.013	351.64	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

299.68	324.09	103.5	84.47	280.23	.1	.3
--------	--------	-------	-------	--------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
192.46	241.63	970

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 3119.439

INPUT

Description:

Station Elevation Data num= 109

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	966.48	4.81	965.59	18.2	962.36	45.3	956	51.58	956
96.77	954.47	109.27	954.12	113.12	954.04	113.46	954.04	113.67	954.03
113.77	954.03	116.48	954.01	116.56	954.01	116.77	954.01	119.75	954.04
119.95	954.04	185.35	954.15	186.09	954.16	186.47	954.16	188.36	954.18
195.87	954.05	195.94	954.05	201.67	954.06	201.78	954.05	204.78	954
244.05	954	244.15	954	252.63	953.58	259.15	953.26	284.3	952
284.31	952	284.72	951.51	286	950	286.1	949.82	286.9	948.78
290.28	948.9	291.53	948.89	297.93	949.01	298.46	949.11	298.63	949.14
298.88	949.2	299.64	949.45	301.26	950	303.26	950.44	305.09	950.82
307.55	951.35	308.66	951.58	310.61	952	313.37	952.44	313.99	952.34
317.88	952.72	321.91	952.58	324.7	952.71	328.65	952.9	332.34	953.08
334.98	953.21	338.05	953.37	340.18	953.47	341.94	953.56	350.88	954
350.92	954.01	350.99	954.03	355.99	955.48	357.74	956	361.59	956.24
363.28	956.35	363.73	956.37	363.93	956.38	364.86	956.43	382.82	957.12
387.98	957.38	390.9	957.5	399.57	957.69	400.61	957.73	401.67	957.76
402.99	957.81	405.25	957.88	408.85	958	409.42	958.05	409.53	958.05
412.59	958.27	421.95	960	428.82	960	428.98	960.04	429.77	960.45
432.06	961.61	432.43	961.82	432.75	962	435.83	963.82	436.13	964
436.17	964.02	439.26	966	439.72	966.11	439.97	966.14	444.44	967.06
450.04	968	453.68	968	453.82	968.09	457.23	970	458.6	971.38
459.29	972	459.5	972.18	460.95	973.5	461.5	974	461.62	974.07
464.99	976	467.72	977.55	468.63	978	469.51	978.42		

EntranceStudy.rep

Manning's n Values num= 5
 Sta n Val Sta n Val Sta n Val Sta n Val
 0 .035 284.3 .04 310.61 .035 364.86 .013 390.9 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 284.3 310.61 148.04 169.96 53.13 .1 .3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 2947.900

INPUT

Description:

Station Elevation Data num= 80
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 0 961.29 8.9 960.49 32.15 958 33.5 958 40.29 957.31
 53.94 956 59.32 954.94 64.1 954 64.64 954 78.94 953.65
 98.26 953.18 117.65 952.71 124.66 952.54 150.34 952 240.68 952
 242.74 951.88 249.07 951.49 249.99 951.44 253.05 951.24 256.66 951
 264.24 950.5 271.98 950 275.22 948.47 276.21 948 276.44 947.85
 279.01 946.15 283.37 946.51 286.45 946.79 287.43 947.46 288.25 948
 288.52 948.18 291.35 950 292.89 950.87 294.9 952 297.49 953.35
 298.76 954 300.14 954.72 301.8 955.58 302.63 956 315.09 957.22
 321.46 957.57 322.33 957.64 325.86 957.9 329.67 958 331.31 958.04
 331.83 958 335.95 958 343.54 958 347.92 959.88 348.19 960
 348.35 960.07 352.66 962 354.15 962.77 356.33 964 357.52 965.22
 358.27 966 359.8 967.55 360.23 968 362.11 969.91 362.2 970
 362.42 970.22 364.21 972 365.19 972.87 366.32 974 368.34 975.3
 369.64 976 372.96 977.7 373.54 978 374.65 978.57 377.51 980
 378.96 980.72 381.73 982 384.76 983.58 385.17 983.79 385.6 984
 386.31 984.27 391.04 986 393.68 987 396.38 988 397.93 988.51

Manning's n Values num= 5
 Sta n Val Sta n Val Sta n Val Sta n Val
 0 .035 271.98 .04 302.63 .035 321.46 .013 335.95 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 271.98 302.63 148.98 300.31 367.39 .1 .3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 2616.159

INPUT

Description:

Station Elevation Data num= 75
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 Sta Elev Sta Elev Sta Elev Sta Elev

EntranceStudy.rep

0	956.56	9.39	956	10.96	955.9	28.46	954.77	39.31	954.07
40.36	954	67.42	952.43	69.56	952.31	75.28	952	94.52	950.89
109.48	950	131.92	949.29	150.24	948.58	165.25	948	174.28	948
175.54	947.61	180.68	946	181.37	945.65	183.84	944.39	188.3	944.38
198.16	944.25	199.69	944.78	202.95	946	206.11	947.14	208.56	948
231.44	948	276.95	948	280.92	948.08	288.38	948.27	289.93	948.32
296.73	948.51	299.65	948.59	304.81	948.73	311.99	948.87	315.55	948.97
317.63	949.02	320.89	949.1	323.09	949.16	329.93	949.22	333.06	949.33
335.11	949.3	339.26	949.52	344.42	949.81	344.93	949.81	347.82	950
348.35	950.23	352.39	952	353.13	952.33	356.95	954	359.35	955.05
361.57	956	364.56	956.45	365.84	956.63	366.47	956.73	366.95	956.84
367.87	957.1	379.85	957.92	381.01	958	384.63	958.24	387.41	958.44
387.72	958.24	388.11	958	390.71	956.46	392.93	957.04	393.79	957.63
394.29	958	394.78	958.37	396.99	960	398.52	961.15	399.66	962
401.88	963.69	402.27	964	402.42	964.11	404.87	966	406.04	966.64

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .035 174.28	.04 208.56	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
174.28	208.56	249.11	158.86	23.1	.1	.3	

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 2447.349

INPUT
 Description:

Station Elevation Data	num=	76		
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
0 977.55	2.91 976.1	16.13 970	23.79 968.85	25.86 968.53
29.13 968	33.44 966.61	35.19 966	37.87 964.16	38.23 964
38.91 963.53	40.89 962	40.95 961.96	43.32 960	45.27 958.47
45.86 958	46.23 957.72	47.85 956	48.7 955.04	50.34 953.09
51.34 952	52.8 950.29	53.06 950	53.15 949.88	54.83 948
55.52 947.42	57.31 946	58.78 944.72	59.69 944.09	70.23 944.09
73.63 944.88	78.34 946	103.09 946	145.49 946	158.04 946.59
159.21 946.61	164.59 946.66	165.31 946.67	169.89 946.76	173.6 946.86
181.35 947.08	182.09 947.07	204.83 947.25	271.22 947.33	278.06 947.41
280.46 947.42	290.36 947.49	327.5 948	340.75 948	341.35 948.29
345.81 950	349.63 951.98	349.67 952	349.7 952.02	353.14 954
356.82 955.59	357.74 956	358.11 956.12	361.91 956	379.22 956
380.3 956.97	381.45 958	382.54 958.97	383.69 960	384.77 960.97
385.92 962	387.01 962.97	388.16 964	390.06 965.69	390.41 966
391.95 967.01	392.41 967.31	393.41 968	394.08 968.43	396.44 970
396.48 970.03				

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val

0 .1 57.31 .04 78.34 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 57.31 78.34 177.57 199.84 195.55 .1 .3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 2242.734

INPUT
 Description:

Station Elevation Data		num= 96		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	981.02	2.91	980	4.52	979.41	8.57	978	11.94	976.54		
13.31	976	14.91	975.12	16.92	974	19.69	972.53	20.61	972		
21.45	971.55	24.42	970	26.67	968.82	28.15	968	29.67	966.83		
29.83	966.66	30.47	966	30.91	965.54	32.2	964	33.8	962.27		
34.06	962	35.58	960.26	35.83	960	37.39	958.22	37.6	958		
37.9	957.66	39.28	956.2	39.45	956	41.13	954.14	41.27	953.97		
43.06	952	43.12	951.94	44.95	950	46.22	948.73	47.03	948		
48.16	947.49	49.94	946.64	51.17	946	52.23	945.74	57.89	944		
58.6	943.01	59.52	942	59.8	942.42	60.14	942.84	67.44	941.8		
71.94	941.45	72.92	942	75.59	943.72	76.08	944	103.6	944		
104.41	944.01	162.6	944.51	174.17	944.44	175.26	944.44	183.48	944.41		
196.41	944.39	216.28	944.67	220.91	944.69	224.33	944.74	248.89	945.25		
269.38	945.76	270.42	945.77	278.85	946	284.61	946.53	291.71	947.36		
295.98	947.22	299.78	947.17	306.05	947.79	309.19	948	313.91	949.64		
315.03	950	319.09	951.84	319.45	952	324.96	952.74	326.6	953		
328.3	953.09	328.99	953.12	329.94	953.17	330.62	953.21	333.87	952.57		
345.28	952	346.27	952	351.64	956	352.14	956.37	354.33	958		
355.05	958.54	357.01	960	358.11	960.82	359.7	962	361.56	963.38		
362.39	964	363.4	964.57	366.05	966	366.35	966.11	371.59	968		
372.89	968.48										

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	57.89	.04	76.08	.035		

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 57.89 76.08 290.24 300 301.49 .1 .3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 1937.711

INPUT
 Description:

Station Elevation Data		num= 77	
------------------------	--	---------	--

EntranceStudy.rep

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	973.8	2.76	972.4	4.34	971.56	7.37	970	8.24	969.54
11.23	968	12.14	967.51	15.08	966	16.05	965.48	18.93	964
21.45	962.52	22.3	962	24.3	960.53	25.67	959.47	27.62	958
28.44	957.37	30.17	956	30.6	955.69	31.44	955.04	32.79	954
33.68	953.36	35.45	952	36.34	951.34	38.09	950	38.77	949.5
40.66	948	46.36	946.28	47.32	946	48.27	945.74	55.06	944
56.78	943	59.38	942	60.5	941.4	61.32	940.85	64.33	940.54
70.97	939.81	74.06	941.2	75.82	942	101.3	942	250.9	942
254.83	942.34	258.85	942.87	264.86	943.49	267.46	944	274.64	945.48
277.24	946	278.78	946.2	292.46	948	294.95	948.22	297.65	948.46
300.66	948.68	313.94	949.09	316.48	949.18	317.03	948.94	317.34	948.8
318.44	948.32	319.19	948	321.54	948	322.49	948.86	323.77	950
324.95	951.02	326.06	952	327.56	953.28	328.43	954	328.8	954.3
330.86	956	332.8	957.52	333.39	958	334.33	958.6	336.61	960
337.9	960.79	339.85	962	341.97	963.15	343.46	964	346.91	965.44
348.25	966	349.31	966.45						

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.1	59.38	.04
		75.82	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	59.38	75.82		284.2	300		.1	.3
					268.28			

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 1633.916

INPUT
 Description:

Station	Elevation	Data	num=	85					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	971.83	1.13	971.36	4.84	970	9.36	968.31	10.17	968
10.71	967.79	12.01	967.32	15.66	966	16.27	965.53	19.54	964
21.09	962.32	21.32	962	22.49	960.66	23.06	960	23.52	959.61
25.49	958	26.19	957.4	27.88	956	28.78	955.21	30.24	954
31.32	953.05	33.62	951.14	34.87	950	35.35	949.55	37.2	948
37.73	947.51	39.52	946	40.1	945.45	41.78	944	42.84	942.91
43.69	942	44.72	940.85	45.56	940	45.97	939.57	46.6	938.93
50.03	938.67	57.38	938.24	58.96	939.29	60.24	940	92.04	940
129.6	940	129.99	940.02	156.77	940.8	157.47	940.88	159.4	941.04
162.6	941.27	165.46	941.38	168.1	941.54	170.22	941.63	172.79	941.71
184.64	942	230.62	942	295.77	943.61	299.82	943.68	301.64	943.71
305.08	943.77	310.66	944	314.7	944.4	316.24	944.52	320.17	944.82
321.05	944.85	324.66	944.99	334.79	946	336.41	946.27	346.19	948
349.43	949.16	351.81	950	356.16	950.84	357.03	951.01	357.22	951.04
357.55	951.11	358.04	951.14	358.23	951.15	358.6	951.17	358.89	951.18
375.08	951.87	382.57	951.95	383.73	952	387.69	953.69	388.38	954
390.49	954.92	393.07	956	395.93	956.87	399.46	958	400.18	958.22

EntranceStudy.rep

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 45.56 .04 60.24 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 45.56 60.24 76.45 74.44 89.65 .1 .3

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 1559.375

INPUT
 Description:

Station Elevation Data num= 85

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	974.95	2.53	974	5.55	972.97	8.74	972	13.16	970.74
15.46	970.26	16.43	970	17.78	969.35	19.63	969.12	20.78	968.91
24.3	968	24.62	967.93	25	967.84	30.95	966.45	31.04	966.43
32.62	966	35.48	964.79	37.34	964	38.37	963.56	41.56	962
43.48	961.04	45.54	960	46.27	959.59	49.51	958	52.25	956.2
52.56	956	54.22	954.02	54.25	953.98	54.74	953.39	55.94	952
56.09	951.84	57.69	950	58.03	949.65	59.48	948	60.42	946.89
61.21	946	61.69	945.53	63	944	63.73	943.26	65.08	942
66.7	940.42	67.1	940	68.15	938.98	69	938.12	76.79	938.05
81.59	937.98	82.47	938.4	85.43	940	102.34	940	119.38	939.67
140.43	939.27	141.7	939.25	183.16	939.59	188.05	939.75	194.61	940
217.92	940.94	221.79	941	227.38	941.2	234.46	941.39	256.57	942
275.16	942	374.7	943.88	381.14	944	382.09	944.13	396.14	946
397.81	946.76	400.64	948	403.29	948.3	404.36	948.41	404.78	948.45
405.16	948.48	405.44	948.51	405.84	948.55	411.67	949.05	423.56	949.98
427.11	949.99	428.15	950	431.58	951.78	431.99	952	432.3	952.16
435.74	954	439.27	955.93	439.4	956	439.6	956.09	442.16	957.34

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 66.7 .04 85.43 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 66.7 85.43 42.97 41.79 35.71 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev
 200.22 241.03 950

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 1517.572

INPUT

Description:

Station Elevation Data		num= 86		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	970.88	2.45	970	6.59	968.61	8.19	968	11.39	967		
14.47	966	17.87	964.92	21.29	964	23.35	963.33	26.99	962.28		
27.98	962	32.93	960.5	34.58	960	37.36	959.15	41.23	958		
45.1	956.63	46.56	956	49.71	954.57	51.04	954	51.38	953.82		
53.24	952	54.48	950.61	55.05	950	56.43	948.45	56.85	948		
57.59	947.22	58.54	946	60.02	944.35	60.3	944	60.61	943.55		
61.98	942	62.44	941.47	64.27	940	65.9	938.32	66.19	937.98		
66.21	938	68.66	937.94	79.42	937.65	79.73	937.82	80.15	938		
82.63	939.22	83.93	940	92.79	940	112.55	939.34	116.97	939.18		
145.47	938.2	147.62	938.13	151.44	938	153.94	938	173.86	938.76		
178.86	938.95	212.97	940	255.55	941.18	270.08	941.6	283.84	942		
286.91	942	350.84	942.88	357.18	943.05	367.06	943.31	381.07	943.65		
395.22	944	400.7	945.05	404.49	945.77	405.5	946	408.12	946.64		
413.2	948	413.98	948.08	414.36	948.09	415.69	948.06	418.88	948		
420.38	947.98	421	947.99	430.83	947.74	431.27	947.77	433.9	948		
436.81	949.85	437.02	950	438.49	951.05	439.85	952	440.06	952.14		
442.72	954	443.6	954.56	445.69	956	448.25	957.66	448.73	958		
449.89	958.52										

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	64.27	.04	83.93	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	64.27	83.93		126.34	122.91		.1	.3
Blocked Obstructions			num=	1				
Sta L	Sta R	Elev						
204.37	245.18	950						

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 1393.455

INPUT

Description:

Station Elevation Data		num= 83		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	970.98	1.81	970	4.47	968.5	5.37	968	6.5	967.36		
8.97	966	10.59	965.06	11.61	964.5	12.45	964	13.8	963.06		
15.35	962	16.16	961.36	18.03	960	19.79	958.8	21.94	957.11		
23.49	956	24.77	954.98	26.14	954	27.92	952.57	28.73	952		
30.31	950.77	31.35	950	33.69	948.62	34.77	948	37.55	946.39		
38.24	946	39.32	945.38	39.52	945.26	41.76	944	44.5	942.39		
45	942.11	45.19	942	47.22	941.67	56.82	940	71.69	938.32		
73.99	938	74.7	937.58	74.91	937.47	75.11	937.4	76.46	937.36		
84.12	937.22	94.66	936.9	95.01	937.08	97.16	938	137.61	938		

EntranceStudy.rep

195.1	938	215.64	938.82	235.69	939.57	237.02	939.61	242.32	939.88
244.99	940	248.45	940	270.14	940.47	273.18	940.53	277.25	940.61
338.17	942	365.18	942	373.8	942.22	376.93	942.3	381.87	942.43
405.42	943.03	430.83	943.68	443.41	944	447.06	945.51	448.4	946
454.66	947.03	456.77	947.43	457.02	947.43	457.4	947.43	470.94	947.75
473.86	947.68	475.99	947.84	478.07	948	480.45	949.72	480.84	950
481.05	950.15	483.59	952	483.79	952.14	486.35	954	486.53	954.13
489.1	956	489.36	956.18	491.48	957.72				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	71.69	.04	97.16	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

71.69	97.16	52.96	64.88	11.76	.1	.3
-------	-------	-------	-------	-------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
269.32	293.88	950

CROSS SECTION

RIVER: LAUREL RUN
REACH: UPPER

RS: 1327.528

INPUT

Description:

Station Elevation Data num= 84

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	966.05	.09	966	2.28	964.39	2.92	964	3.3	963.73
8.09	960.28	8.47	960	8.89	959.7	11.25	958	11.68	957.69
14.03	956	15.4	955.05	16.87	954	17.88	953.26	19.6	952
20.76	951.26	21.4	950.85	22.77	950	24.44	949.02	26.25	948
27.1	947.51	29.74	946	32.38	944.43	33.14	944	35.25	942.76
36.58	942	41.62	940.11	42.01	940	42.6	939.92	60.41	938
62.54	937.52	63.57	937.34	65.75	936.63	77.45	936.34	83.33	936.35
86.4	937.28	88.72	938	124.54	938	207.1	938	209.86	938.07
211.14	938.11	219.44	938.37	226.21	938.58	230.74	938.74	242.86	939.09
248.91	939.31	250.94	939.38	253.4	939.47	260.12	939.66	262.21	939.73
271.44	940	271.84	940	276.38	940.08	279.94	940.16	293.15	940.44
304.9	940.69	308.68	940.77	319.73	940.99	327.71	941.17	343.34	941.5
344.23	941.51	345.43	941.54	366.23	942	396.78	942	402.39	942.15
408.63	942.31	454.42	943.47	469.86	943.86	475.49	944	479.69	945.74
480.32	946	487.07	946.65	488.72	946.92	496.64	947.19	506.23	947.61
506.66	947.4	507.88	947.76	510.25	947.94	511.08	948	513.62	949.85
513.83	950	516.39	951.86	516.58	952	518.92	953.7		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	60.41	.04	88.72	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

60.41 88.72 72.26 78.97
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 304.42 329.31 950

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 1246.668

INPUT
 Description:

Station Elevation Data		num= 92									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	969.45	1.28	968	2.62	966.82	3.37	966	5.78	965.5		
5.97	965.46	10.92	964.78	11.9	964.6	12.38	964.39	12.86	964		
13.3	963.68	15.07	962.45	15.74	962	15.94	961.87	18.64	960		
20.94	958.28	21.82	957.7	24.22	956	24.78	955.63	27.08	954		
28.16	953.27	29.95	952	31.44	951.17	33.2	950	35.23	948.97		
37.01	948	39.66	946.63	40.86	946	44.09	944.37	44.52	944.12		
44.74	944	44.92	943.9	45.02	943.84	45.7	943.54	49.34	942		
50.83	941.25	53.07	940	54.21	938.32	54.49	938	54.77	937.58		
55.39	936.34	63.89	936.07	67.12	936.03	72.83	935.97	82.49	936.11		
82.59	936.11	92.53	936.14	93.08	936.15	107.21	936.35	108.51	936.39		
109.12	936.4	117.57	936.73	119.5	936.75	121.2	936.77	121.47	936.81		
129.81	938	268.16	938	300.61	939.41	303.37	939.47	318.04	940		
330.89	940.27	364.28	940.87	368.47	940.94	404.68	941.71	406.56	941.75		
408.3	941.79	417.37	941.98	418.45	942	462.49	942	523.71	943.8		
526.53	943.87	531.72	944	532.82	944.43	536.92	946	540.78	946.66		
541.75	946.79	544.3	946.92	545.26	946.96	545.5	946.97	546.08	946.99		
554.52	947.04	563.27	947.42	565.71	946.25	566.84	946.58	569.06	948		
571.11	949.52	571.75	950	573.81	951.53	574.45	952	576.54	953.57		
577.13	954	578.41	954.97								

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.1	54.21	.04
		129.81	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 54.21 129.81 77.35 87.84 15.82 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev
 397.79 427.13 950

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 1158.443

INPUT

EntranceStudy.rep

Description:

Station Elevation Data		num= 93		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	968.01	.03	968	.28	967.79	2.24	966	8.06	964.65
10.42	964	13.07	963.13	15.7	962	19.2	960.39	20.02	960
24.23	958.08	24.41	958	24.44	957.98	27.46	956	29.43	954.01
29.44	954	29.56	953.88	31.41	952	31.54	951.87	33.35	950
34.6	948.84	35.44	948	35.92	947.48	36.85	946.55	37.49	946
37.88	945.72	39.93	944	42.37	942.18	42.56	942	44.03	940.71
44.74	940	46.42	938.35	46.73	938	51.57	937.28	60.26	936
60.41	935.98	60.58	936.09	66.76	936.06	71.79	935.97	71.85	935.99
71.86	936	80.2	936	95.97	936.37	114.79	936.69	127.46	936.88
128.08	936.89	128.36	936.9	170.26	938	358.38	938	375.32	939.99
375.42	940	402.08	940	464.8	941.8	473.19	941.97	473.74	941.98
474.16	941.99	474.87	942	478.94	942.28	479.74	942.29	486.5	942.28
488.53	942.28	490.34	942.28	494.86	942.28	499.35	942.25	501.53	942.25
503.8	942.24	504.69	942.24	516.79	942.2	518.41	942.17	518.85	942.16
519.5	942.14	523.15	942	542.6	942	542.97	942.01	595.08	944
596.06	944.32	601.2	946	602.11	946	602.81	946.09	607.49	946.61
610.08	946.67	624.16	947.1	628.1	947.18	628.42	946.95	629.43	946.32
629.95	946	632.22	946	634.14	947.31	635.19	948	635.61	948.26
638.21	950	639.03	950.51	640.42	951.44				

Manning's n Values

num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	46.73	.04	170.26	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 46.73 170.26 78.36 95.44 10.64 .1 .3

Blocked Obstructions

num= 2		Sta L Sta R Elev		Sta L Sta R Elev	
Sta L	Sta R	Elev	Sta L	Sta R	Elev
464.19	466.71	950	474.56	486.67	950

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER

RS: 1055.088

INPUT

Description:

Station Elevation Data		num= 110		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	958.86	1.92	958	3.9	957	5.84	956	7.21	955.3
9.43	954.16	9.74	954	10.47	953.63	13.65	952	16.12	950.77
17.6	950	18.3	949.71	19.67	949.1	21.95	948	27.04	946.01
27.05	946	27.09	945.98	32.23	944	36.84	942.34	37.74	942
38.15	941.82	39.73	941.07	41.88	940	44.77	939.47	49.04	939.25
59.44	938	68.09	938	69.46	936.16	69.57	936	70.23	935.07
70.46	934.8	71.26	934.84	84.33	935.19	85.55	935.82	85.84	936
151.32	936	153.74	936	192.57	936.91	235.9	936.92	238.12	936.74
241.13	936.69	241.22	936.69	241.56	936.69	248.47	936.63	253.38	936.59

EntranceStudy.rep

257.33	936.57	265.9	936.49	268.39	936.47	270.75	936.43	272.14	936.41
272.99	936.43	273.82	936.41	274.56	936.39	275.56	936.45	276.55	936.42
278.74	936.57	280.32	936.52	281.57	936.48	282.21	936.45	325.16	938
470.7	938	471.98	938.18	476.04	938.61	478.02	938.89	497.75	940
500.64	940	505.82	940.16	514	940.33	535.28	940.79	536.22	940.83
540.89	940.94	542.4	940.99	545.15	941.07	548.33	941.15	551.54	941.23
559.73	941.48	560.45	941.51	563.26	941.58	576.73	942	577.31	942
579.31	942.04	581.45	942.06	588.44	942.17	602.67	942.34	615.46	942.47
618.66	942.57	624.34	942.52	625.65	942.56	627.67	942.56	661.93	943.73
670.81	944	673.02	944.17	680.16	945.37	683.4	945.91	683.99	946
684.52	946.08	686.18	946.27	687.27	946.34	692.72	946.53	704.75	946.8
705.6	946.21	705.88	946	709.89	946	712.65	947.59	713.32	948
715.66	949.36	716.69	950	718.7	951.18	720.04	952	720.59	952.32

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	68.09	.04	85.84	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

68.09	85.84	33.6	54.67	605.44	.1	.3
-------	-------	------	-------	--------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
542.9	606.41	950

CROSS SECTION

RIVER: LAUREL RUN
 REACH: UPPER RS: 1000.000

INPUT

Description:

Station Elevation Data num= 76

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	956.44	.84	956	1.31	955.75	7.83	952.35	8.46	952
8.68	951.88	12.3	950	12.57	949.87	16.42	948	19	946.85
20.92	946	25.24	944	28.65	942.46	29.67	942	30.56	941.6
34.1	940	37.83	939.16	40.83	938.48	43.1	938	81.46	938
85.41	937.34	86.64	937.11	86.77	937.09	94.5	936	97.61	935.57
104.78	934.39	110.63	934.24	115.51	934.05	125.72	933.73	129.87	933.59
131.85	933.57	137.68	935.1	138.92	936	148.52	936	159.7	936
236.31	937.68	237.41	937.68	238.14	937.68	251.55	937.97	252.93	938
255.48	939.29	256.38	939.88	256.54	940	256.71	940.11	257.28	940.52
259.46	942	261.4	943.39	262.36	944	263.05	944.42	265.43	946
267.98	947.43	269.36	947.66	271.97	947.91	271.98	947.91	271.99	947.91
272.02	947.91	272.04	947.91	290.15	946.97	290.32	946.97	291.31	948
293.88	948	294.29	948.32	295.76	950	297.77	951.84	297.92	952
298.15	952.22	299.87	954	301.72	955.68	302.02	956	302.6	956.37
304.79	958	304.93	958.09	305.64	958.62	307.46	960	308.21	960.6
309.42	961.54								

Manning's n Values num= 3

EntranceStudy.rep

Sta	n Val	Sta	n Val	Sta	n Val						
0	.1	81.46	.04	138.92	.1						
Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.			
	81.46	138.92		1	1		.1	.3			

CROSS SECTION

RIVER: MEATHOUSE FORK
 REACH: MEATHOUSE FORK RS: 1335.848

INPUT
 Description:

Station Elevation Data	num=	76									
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
0 956.44	.84 956	1.31 955.75	7.83 952.35	8.46 952	12.57 949.87	16.42 948	19 946.85	25.24 944	30.56 941.6	37.83 939.16	40.83 938.48
8.68 951.88	12.3 950	28.65 942.46	29.67 942	30.56 941.6	34.1 940	37.83 939.16	40.83 938.48	43.1 938	81.46 938	85.41 937.34	86.44 937.15
20.92 946	25.24 944	28.65 942.46	29.67 942	30.56 941.6	34.1 940	37.83 939.16	40.83 938.48	43.1 938	81.46 938	104.78 934.39	110.63 934.24
34.1 940	37.83 939.16	40.83 938.48	43.1 938	81.46 938	85.41 937.34	86.44 937.15	115.51 934.05	125.75 933.73	129.87 933.59	131.82 933.57	137.65 935.11
85.41 937.34	86.44 937.15	86.77 937.09	94.5 936	97.61 935.57	104.78 934.39	110.63 934.24	115.51 934.05	125.75 933.73	129.87 933.59	131.82 933.57	137.65 935.11
104.78 934.39	110.63 934.24	115.51 934.05	125.75 933.73	129.87 933.59	131.82 933.57	137.65 935.11	138.88 936	148.18 936	159.74 936	236.22 937.67	237.34 937.68
131.82 933.57	137.65 935.11	138.88 936	148.18 936	159.74 936	236.22 937.67	237.34 937.68	238.07 937.68	251.44 937.96	253.03 938	255.45 939.22	256.44 939.87
236.22 937.67	237.34 937.68	238.07 937.68	251.44 937.96	253.03 938	255.45 939.22	256.44 939.87	256.62 940	256.8 940.12	257.43 940.57	259.53 942	261.41 943.34
255.45 939.22	256.44 939.87	256.62 940	256.8 940.12	257.43 940.57	259.53 942	261.41 943.34	262.44 944	263.19 944.45	265.52 946	268.01 947.39	269.37 947.62
259.53 942	261.41 943.34	262.44 944	263.19 944.45	265.52 946	268.01 947.39	269.37 947.62	271.91 947.86	271.97 947.88	272.05 947.9	272.35 947.89	272.62 947.86
268.01 947.39	269.37 947.62	271.91 947.86	271.97 947.88	272.05 947.9	272.35 947.89	272.62 947.86	290.26 946.95	290.44 946.95	291.46 948	293.95 948	294.35 948.31
272.35 947.89	272.62 947.86	290.26 946.95	290.44 946.95	291.46 948	293.95 948	294.35 948.31	295.83 950	297.85 951.86	297.99 952	298.21 952.2	299.94 954
293.95 948	294.35 948.31	295.83 950	297.85 951.86	297.99 952	298.21 952.2	299.94 954	301.8 955.7	302.1 956	302.65 956.35	304.86 958	304.95 958.06
298.21 952.2	299.94 954	301.8 955.7	302.1 956	302.65 956.35	304.86 958	304.95 958.06	305.43 958.42	307.53 960	308.38 960.69	308.72 960.95	
304.86 958	304.95 958.06	305.43 958.42	307.53 960	308.38 960.69	308.72 960.95						

Manning's n Values	num=	3									
Sta n Val	Sta n Val	Sta n Val									
0 .1	94.5 .04	138.88 .1									

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.			
	94.5	138.88		96.18	135.67	152.34	.1	.3			

CROSS SECTION

RIVER: MEATHOUSE FORK
 REACH: MEATHOUSE FORK RS: 1191.458

INPUT
 Description:

Station Elevation Data	num=	62									
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
0 944.97	2.1 944.09	2.34 944	2.42 943.96	7.27 942	10.72 940.57	12.12 940	18.54 939.18	26.34 938	52.22 936.96		

EntranceStudy.rep

54.37	936.91	59.92	936.8	74.44	936.48	78.46	936.36	80.49	936.3
96.95	936.03	98.03	936	143.34	936	158.22	936	160.96	934.13
161.59	933.67	161.78	933.56	163.85	933.55	177.64	933.53	179.13	934.9
182.43	935.47	186.38	936	189.18	936.14	190.27	936.24	197.65	936.75
199.55	936.94	210.08	938	216.09	939.73	217.06	940	220.88	941.04
224.71	942	229.82	943.75	230.6	944	230.73	944.09	233.48	946
234.88	946.94	236.38	948	238.76	949.58	239.38	950	241.5	951.45
242.36	952	243.43	952.7	245.98	954	248.57	954.57	249.49	954.74
250.87	954.88	252.06	954.95	264.88	955.68	266.64	955.69	271.14	956
273.47	956	274	956.46	277.89	959.86	278.06	960	278.36	960.25
280.27	962	281.05	962.67						

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .06	158.22 .04	186.38 .06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
158.22	186.38	1	1	1	.1	.1	.3

SUMMARY OF MANNING'S N VALUES

River:BIG ISAAC

Reach	River Sta.	n1	n2	n3	n4	n5	n6	n7	n8
LOWER	2531.399	.035	.035	.035					
LOWER	2364.929	.1	.013	.05	.035	.035	.035	.1	
LOWER	2037.082	.1	.013	.05	.035	.05	.035	.1	
LOWER	1730.807	.1	.013	.035	.035	.035	.1		
LOWER	1669.175	.1	.013	.035	.035	.035	.1		
LOWER	1539.840	.1	.013	.035	.035	.1			
LOWER	1419.259	.1	.013	.035	.013	.035	.04	.1	
LOWER	1318.016	.1	.013	.035	.013	.035	.04	.1	
LOWER	1291.256	culvert							
LOWER	1266.884	.1	.013	.035	.04	.013	.1		
LOWER	1172.189	.1	.013	.035	.05	.035	.06	.013	.1
LOWER	1096.461	.05	.013	.035	.035	.1	.013	.1	
LOWER	1000.000	.1	.04	.1					

River:LAUREL RUN

Reach	River Sta.	n1	n2	n3	n4	n5	n6
UPPER	6314.305	.1	.035	.035	.013	.05	
UPPER	6232.875	.1	.035	.035	.013	.05	
UPPER	6088.039	.1	.04	.035	.013	.035	
UPPER	5772.495	.1	.04	.035	.013	.06	
UPPER	5494.591	.01	.04	.035	.013	.035	.06
UPPER	5357.523	.1	.04	.035	.013	.033	.035

EntranceStudy.rep					
UPPER	5335.512	.1	.04	.035	.013 .033
UPPER	5187.560	.1	.04	.035	
UPPER	5118.449	.1	.04	.035	
UPPER	5070.286	.1	.04	.035	
UPPER	4998.406	.1	.04	.035	
UPPER	4765.350	.1	.04	.06	
UPPER	4431.983	.1	.04	.035	
UPPER	4266.832	.1	.04	.035	
UPPER	3949.469	.1	.04	.035	
UPPER	3900.631	.1	.04	.035	
UPPER	3853.996	.1	.04	.035	
UPPER	3791.489	.1	.04	.035	
UPPER	3691.713	.1	.04	.035	
UPPER	3675.796	.1	.04	.035	
UPPER	3657.812	.1	.04	.035	
UPPER	3632.733	.035	.04	.035	
UPPER	3465.882	.035	.04	.035	
UPPER	3309.640	.035	.04	.013	.06
UPPER	3269.177	.035	.04	.035	.013 .06
UPPER	3257.286	Bridge			
UPPER	3243.083	.035	.04	.035	.013 .06
UPPER	3206.856	.035	.04	.035	.013 .06
UPPER	3119.439	.035	.04	.035	.013 .035
UPPER	2947.900	.035	.04	.035	.013 .035
UPPER	2616.159	.035	.04	.035	
UPPER	2447.349	.1	.04	.035	
UPPER	2242.734	.1	.04	.035	
UPPER	1937.711	.1	.04	.035	
UPPER	1633.916	.1	.04	.035	
UPPER	1559.375	.1	.04	.035	
UPPER	1517.572	.1	.04	.035	
UPPER	1393.455	.1	.04	.06	
UPPER	1327.528	.1	.04	.06	
UPPER	1246.668	.1	.04	.06	
UPPER	1158.443	.1	.04	.06	
UPPER	1055.088	.1	.04	.06	
UPPER	1000.000	.1	.04	.1	

River:MEATHOUSE FORK

Reach	River Sta.	n1	n2	n3
MEATHOUSE FORK	1335.848	.1	.04	.1
MEATHOUSE FORK	1191.458	.06	.04	.06

SUMMARY OF REACH LENGTHS

River: BIG ISAAC

EntranceStudy.rep

Reach	River Sta.	Left	Channel	Right
LOWER	2531.399	423.58	165.83	116.04
LOWER	2364.929	251.58	300	228.64
LOWER	2037.082	273.96	288.77	271.42
LOWER	1730.807	28.48	59.01	21.33
LOWER	1669.175	25.17	121.96	42.25
LOWER	1539.840	14.05	89.52	50.18
LOWER	1419.259	11.01	96.75	78.52
LOWER	1318.016	9.6	50.46	66.09
LOWER	1291.256	Culvert		
LOWER	1266.884	11.19	93.06	33.76
LOWER	1172.189	6.65	73.2	10.56
LOWER	1096.461	695.49	85.68	11.22
LOWER	1000.000	1	1	1

River: LAUREL RUN

Reach	River Sta.	Left	Channel	Right
UPPER	6314.305	79.48	81.18	79.01
UPPER	6232.875	155.12	142.34	81.44
UPPER	6088.039	273.66	295.06	267.03
UPPER	5772.495	243.75	275.76	373.61
UPPER	5494.591	276.1	288.53	307.93
UPPER	5357.523	29.17	22.01	16.43
UPPER	5335.512	159.1	137.86	102.84
UPPER	5187.560	53.89	68.79	69.68
UPPER	5118.449	52.99	47.79	75.02
UPPER	5070.286	72.82	71.44	67.88
UPPER	4998.406	188.11	226.48	286.17
UPPER	4765.350	323.07	300	176.86
UPPER	4431.983	228.19	154.06	150.95
UPPER	4266.832	271.31	315.07	314.36
UPPER	3949.469	56.48	48.84	50.59
UPPER	3900.631	41.49	46.21	40.51
UPPER	3853.996	75.96	62.46	59.87
UPPER	3791.489	108.21	99.65	103.15
UPPER	3691.713	18.17	15.92	16.89
UPPER	3675.796	23.79	17.98	13.95
UPPER	3657.812	31.6	25.08	28.39
UPPER	3632.733	136.38	147.69	46.47
UPPER	3465.882	17.32	127.69	123.64
UPPER	3309.640	39.21	40.11	39.84
UPPER	3269.177	34.53	26.06	33.76
UPPER	3257.286	Bridge		
UPPER	3243.083	31.99	36.23	30.39
UPPER	3206.856	103.5	84.47	280.23
UPPER	3119.439	148.04	169.96	53.13
UPPER	2947.900	148.98	300.31	367.39

EntranceStudy.rep

UPPER	2616.159	249.11	158.86	23.1
UPPER	2447.349	177.57	199.84	195.55
UPPER	2242.734	290.24	300	301.49
UPPER	1937.711	284.2	300	268.28
UPPER	1633.916	76.45	74.44	89.65
UPPER	1559.375	42.97	41.79	35.71
UPPER	1517.572	126.34	122.91	10.28
UPPER	1393.455	52.96	64.88	11.76
UPPER	1327.528	72.26	78.97	14.21
UPPER	1246.668	77.35	87.84	15.82
UPPER	1158.443	78.36	95.44	10.64
UPPER	1055.088	33.6	54.67	605.44
UPPER	1000.000	1	1	1

River: MEATHOUSE FORK

Reach	River Sta.	Left	Channel	Right
MEATHOUSE FORK	1335.848	96.18	135.67	152.34
MEATHOUSE FORK	1191.458	1	1	1

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: BIG ISAAC

Reach	River Sta.	Contr.	Expan.
LOWER	2531.399	.1	.3
LOWER	2364.929	.1	.3
LOWER	2037.082	.1	.3
LOWER	1730.807	.1	.3
LOWER	1669.175	.1	.3
LOWER	1539.840	.1	.3
LOWER	1419.259	.1	.3
LOWER	1318.016	.1	.3
LOWER	1291.256	culvert	
LOWER	1266.884	.1	.3
LOWER	1172.189	.1	.3
LOWER	1096.461	.1	.3
LOWER	1000.000	.1	.3

River: LAUREL RUN

Reach	River Sta.	Contr.	Expan.
UPPER	6314.305	.1	.3
UPPER	6232.875	.1	.3

UPPER	6088.039	.1	.3
UPPER	5772.495	.1	.3
UPPER	5494.591	.1	.3
UPPER	5357.523	.1	.3
UPPER	5335.512	.1	.3
UPPER	5187.560	.1	.3
UPPER	5118.449	.1	.3
UPPER	5070.286	.1	.3
UPPER	4998.406	.1	.3
UPPER	4765.350	.1	.3
UPPER	4431.983	.1	.3
UPPER	4266.832	.1	.3
UPPER	3949.469	.1	.3
UPPER	3900.631	.1	.3
UPPER	3853.996	.1	.3
UPPER	3791.489	.1	.3
UPPER	3691.713	.1	.3
UPPER	3675.796	.1	.3
UPPER	3657.812	.1	.3
UPPER	3632.733	.1	.3
UPPER	3465.882	.1	.3
UPPER	3309.640	.1	.3
UPPER	3269.177	.1	.3
UPPER	3257.286	Bridge	
UPPER	3243.083	.1	.3
UPPER	3206.856	.1	.3
UPPER	3119.439	.1	.3
UPPER	2947.900	.1	.3
UPPER	2616.159	.1	.3
UPPER	2447.349	.1	.3
UPPER	2242.734	.1	.3
UPPER	1937.711	.1	.3
UPPER	1633.916	.1	.3
UPPER	1559.375	.1	.3
UPPER	1517.572	.1	.3
UPPER	1393.455	.1	.3
UPPER	1327.528	.1	.3
UPPER	1246.668	.1	.3
UPPER	1158.443	.1	.3
UPPER	1055.088	.1	.3
UPPER	1000.000	.1	.3

River: MEATHOUSE FORK

Reach	River Sta.	Contr.	Expan.
MEATHOUSE FORK	1335.848	.1	.3
MEATHOUSE FORK	1191.458	.1	.3

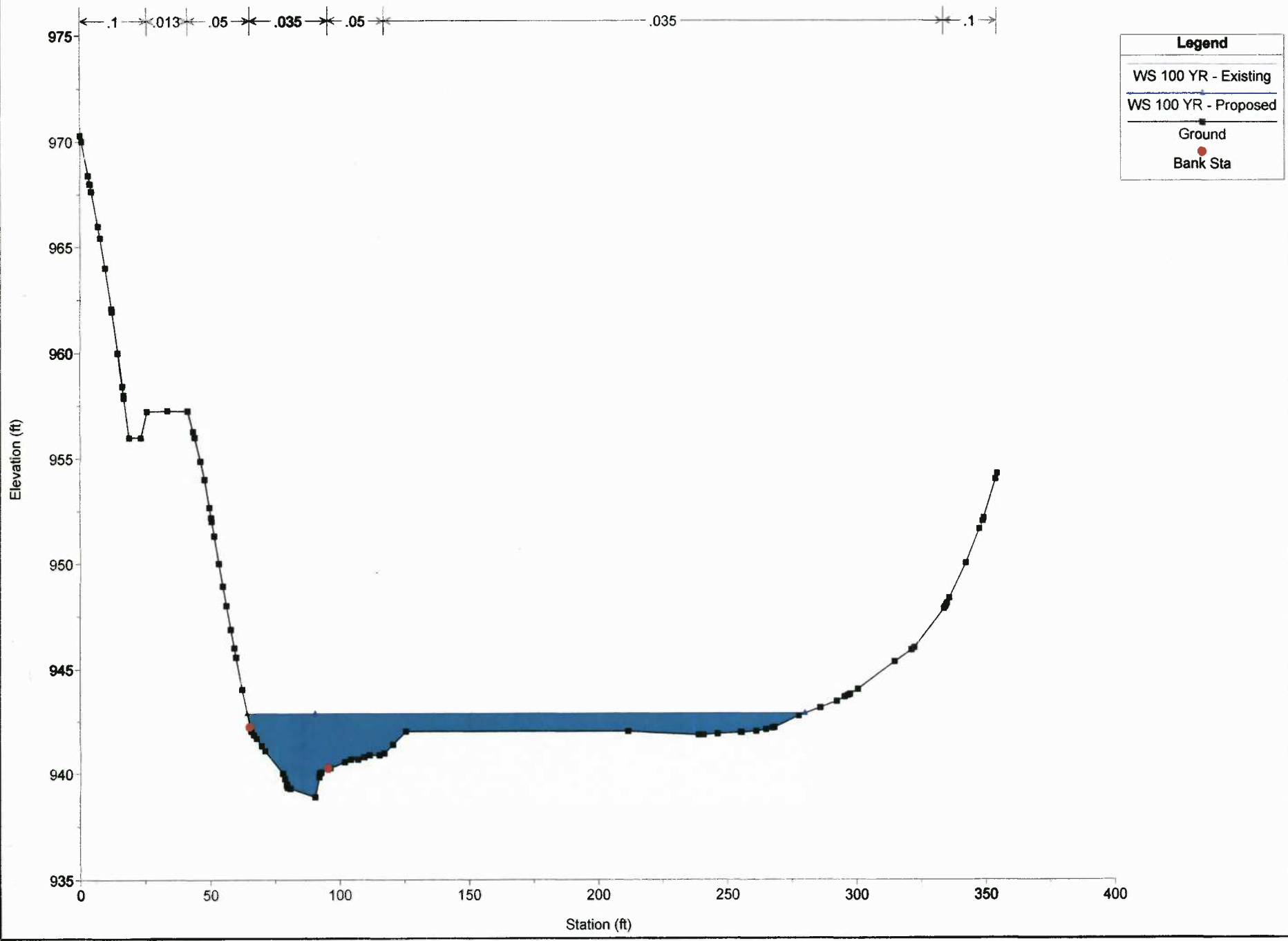
EntranceStudy.rep

River E.G. Slope (ft/ft)	Reach Vel Chnl (ft/s)	Flow Area (sq ft)	River Sta Top Width (ft)	Profile Froude # Chl	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)
MEATHOUSE FORK 0.001310	MEATHOUSE FORK 5.20	MEATHOUSE FORK 1210.61	1335.848 230.11	100 YR 0.33	3087.00	933.57	942.07		942.33
MEATHOUSE FORK 0.001005	MEATHOUSE FORK 4.47	MEATHOUSE FORK 1146.92	1191.458 217.44	100 YR 0.28	3087.00	933.53	942.00	938.76	942.15
LAUREL RUN 0.007151	UPPER 8.92	187.25	6314.305 95.66	100 YR 0.77	1489.60	978.35	984.01	984.01	985.21
LAUREL RUN 0.007894	UPPER 9.61	180.85	6232.875 74.12	100 YR 0.81	1489.60	977.05	983.13	983.10	984.29
LAUREL RUN 0.009278	UPPER 8.36	188.98	6088.039 92.14	100 YR 0.75	1489.60	976.48	982.05	982.05	983.06
LAUREL RUN 0.007322	UPPER 8.80	211.12	5772.495 88.43	100 YR 0.70	1489.60	972.55	978.51	978.27	979.56
LAUREL RUN 0.004803	UPPER 6.66	179.86	5494.591 81.12	100 YR 0.56	1489.60	970.87	976.40	976.40	977.84
LAUREL RUN 0.002694	UPPER 5.47	371.51	5357.523 146.56	100 YR 0.43	1489.60	969.80	975.90		976.31
LAUREL RUN 0.002570	UPPER 5.42	382.51	5335.512 138.91	100 YR 0.42	1489.60	969.60	975.86		976.25
LAUREL RUN 0.004685	UPPER 7.48	219.82	5187.560 64.20	100 YR 0.58	1489.60	968.06	974.92		975.75
LAUREL RUN 0.005036	UPPER 7.64	220.57	5118.449 66.61	100 YR 0.59	1489.60	967.88	974.57	973.43	975.41
LAUREL RUN 0.014057	UPPER 10.73	145.97	5070.286 47.35	100 YR 0.94	1489.60	967.29	973.17	973.17	974.94
LAUREL RUN 0.006990	UPPER 8.47	195.10	4998.406 55.35	100 YR 0.70	1489.60	967.13	972.45		973.49
LAUREL RUN 0.010968	UPPER 11.27	213.27	4765.350 79.32	100 YR 0.87	1489.60	963.67	969.79	969.79	971.34
LAUREL RUN 0.003286	UPPER 6.69	252.65	4431.983 67.68	100 YR 0.48	1489.60	961.56	968.32		968.93
LAUREL RUN 0.009658	UPPER 9.85	183.06	4266.832 72.19	100 YR 0.80	1489.60	961.56	966.74	966.74	968.06
LAUREL RUN 0.002679	UPPER 5.95	331.69	3949.469 121.64	100 YR 0.42	1489.60	956.78	964.07		964.45
LAUREL RUN 0.003396	UPPER 6.50	327.18	3900.631 133.08	100 YR 0.46	1489.60	956.39	963.85		964.30
LAUREL RUN 0.007652	UPPER 8.69	229.91	3853.996 121.67	100 YR 0.69	1489.60	956.21	963.11	963.11	964.03
LAUREL RUN 0.007758	UPPER 8.41	255.17	3791.489 144.02	100 YR 0.69	1489.60	955.91	962.24	962.24	963.05
LAUREL RUN 0.011096	UPPER 8.78	241.30	3691.713 144.46	100 YR 0.81	1489.60	955.72	959.92	959.86	960.68
LAUREL RUN 0.010759	UPPER 7.72	241.68	3675.796 140.72	100 YR 0.77	1489.60	955.34	959.80		960.47

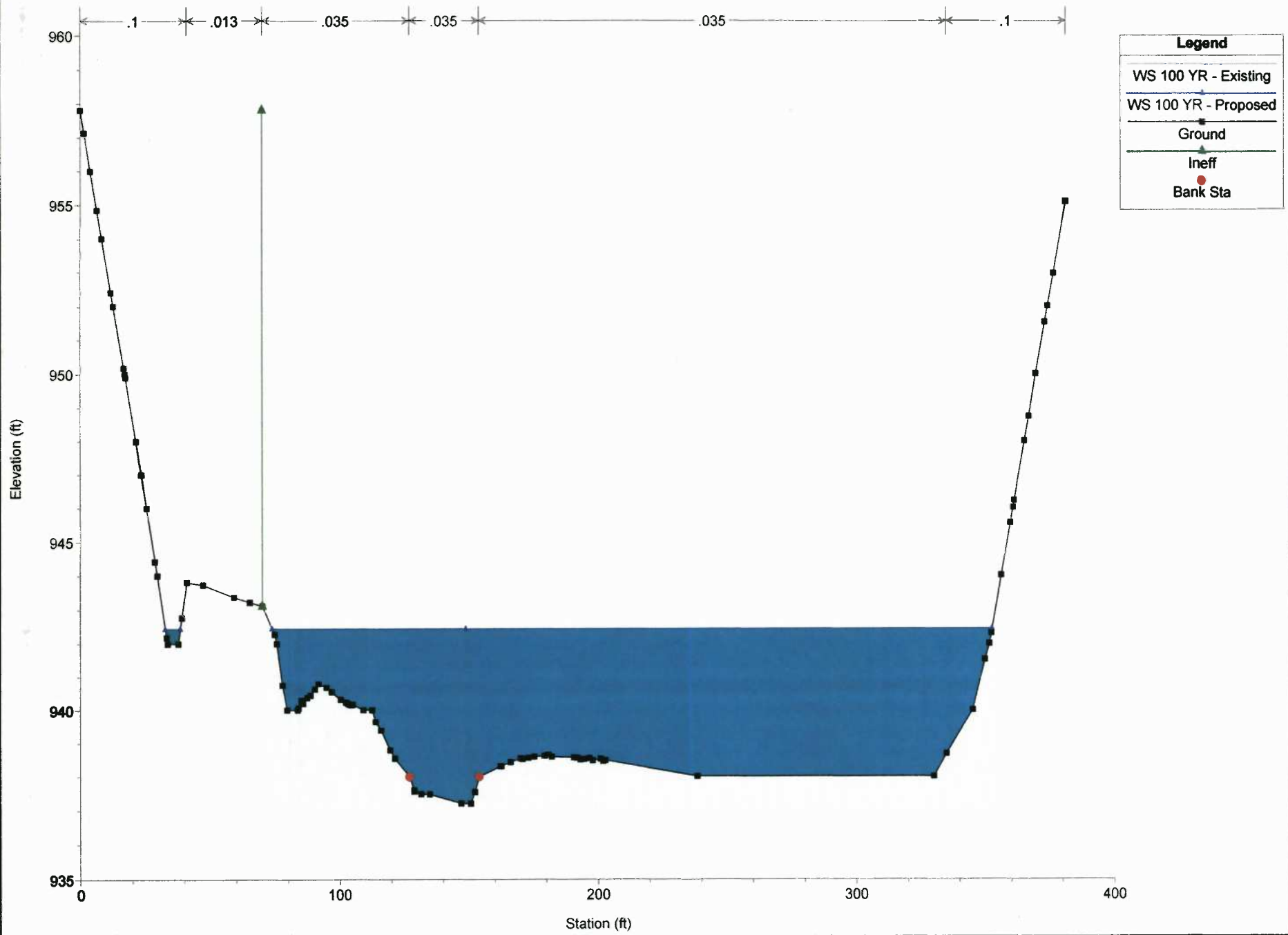
			EntranceStudy.rep						
LAUREL RUN	UPPER		3657.812	100 YR	1489.60	955.24	959.58	959.58	960.28
0.013249	8.19	229.03	146.07		0.81				
LAUREL RUN	UPPER		3632.733	100 YR	1489.60	955.14	959.29	959.29	959.95
0.010998	7.98	249.96	170.34		0.80				
LAUREL RUN	UPPER		3465.882	100 YR	1489.60	952.55	959.03		959.21
0.001091	3.55	466.71	145.69		0.28				
LAUREL RUN	UPPER		3309.640	100 YR	1489.60	951.98	958.77		959.04
0.002686	4.87	365.75	139.97		0.41				
LAUREL RUN	UPPER		3269.177	100 YR	1489.60	951.98	958.72	957.60	958.93
0.001965	4.43	437.25	209.03		0.36				
LAUREL RUN	UPPER		3257.286		Bridge				
LAUREL RUN	UPPER		3243.083	100 YR	1489.60	951.68	956.70	956.68	957.80
0.012037	9.49	183.04	74.59		0.84				
LAUREL RUN	UPPER		3206.856	100 YR	1489.60	950.61	956.31	956.31	957.38
0.011740	9.40	189.61	84.90		0.84				
LAUREL RUN	UPPER		3119.439	100 YR	1659.50	948.78	954.66	954.66	955.26
0.005723	7.62	344.40	262.15		0.61				
LAUREL RUN	UPPER		2947.900	100 YR	1659.50	946.15	953.07	953.07	953.75
0.007266	8.14	302.14	194.25		0.67				
LAUREL RUN	UPPER		2616.159	100 YR	1659.50	944.25	949.35	949.35	950.04
0.007812	7.91	298.06	205.94		0.71				
LAUREL RUN	UPPER		2447.349	100 YR	1659.50	944.09	947.93	947.93	948.46
0.009764	8.02	326.26	267.17		0.77				
LAUREL RUN	UPPER		2242.734	100 YR	1659.50	941.45	945.67	945.67	946.29
0.011893	8.44	287.10	213.18		0.81				
LAUREL RUN	UPPER		1937.711	100 YR	1659.50	939.81	943.93		944.19
0.003717	4.85	414.52	211.95		0.47				
LAUREL RUN	UPPER		1633.916	100 YR	1659.50	938.24	942.62		942.97
0.005339	6.42	367.80	212.57		0.57				
LAUREL RUN	UPPER		1559.375	100 YR	1659.50	937.98	942.38		942.63
0.002568	4.50	409.89	189.56		0.40				
LAUREL RUN	UPPER		1517.572	100 YR	1659.50	937.65	942.39		942.54
0.001236	3.26	535.44	212.59		0.28				
LAUREL RUN	UPPER		1393.455	100 YR	1659.50	936.90	942.41		942.48
0.000874	3.22	904.97	311.90		0.25				
LAUREL RUN	UPPER		1327.528	100 YR	1659.50	936.34	942.40		942.45
0.000571	2.79	1083.24	351.41		0.21				
LAUREL RUN	UPPER		1246.668	100 YR	1659.50	935.97	942.40		942.43
0.000245	1.90	1386.02	398.29		0.14				
LAUREL RUN	UPPER		1158.443	100 YR	1659.50	935.97	942.40		942.42
0.000138	1.37	1764.76	496.44		0.10				
LAUREL RUN	UPPER		1055.088	100 YR	1659.50	934.80	942.40		942.41
0.000089	1.22	2442.60	508.62		0.08				
LAUREL RUN	UPPER		1000.000	100 YR	1659.50	933.57	942.29		942.35
0.000309	2.44	1259.92	230.83		0.16				
BIG ISAAC	LOWER		2531.399	100 YR	1390.00	943.72	946.74	946.74	947.37
0.009899	6.78	239.79	188.09		0.84				
BIG ISAAC	LOWER		2364.929	100 YR	1390.00	941.66	944.77		945.12
0.004632	5.42	312.16	176.73		0.60				
BIG ISAAC	LOWER		2037.082	100 YR	1390.00	938.88	942.85	942.85	943.42
0.008831	7.78	273.10	215.92		0.82				

				EntranceStudy.rep					
BIG ISAAC	LOWER	1730.807		100 YR	1390.00	937.28	942.44		942.47
0.000260	1.70 896.70	273.84			0.15				
BIG ISAAC	LOWER	1669.175		100 YR	1390.00	937.20	942.44		942.47
0.000150	1.52 1075.55	284.47			0.12				
BIG ISAAC	LOWER	1539.840		100 YR	1390.00	935.94	942.40		942.45
0.000267	2.25 1016.18	292.48			0.16				
BIG ISAAC	LOWER	1419.259		100 YR	1390.00	935.32	942.40		942.44
0.000142	1.42 978.15	320.50			0.10				
BIG ISAAC	LOWER	1318.016		100 YR	1390.00	934.72	942.41	938.62	942.43
0.000067	1.07 1222.16	372.16			0.07				
BIG ISAAC	LOWER	1291.256			Culvert				
BIG ISAAC	LOWER	1266.884		100 YR	1390.00	934.65	942.36		942.38
0.000116	1.19 1276.62	372.91			0.09				
BIG ISAAC	LOWER	1172.189		100 YR	1390.00	934.19	942.36		942.37
0.000061	1.25 2052.06	461.69			0.08				
BIG ISAAC	LOWER	1096.461		100 YR	1390.00	933.69	942.36		942.37
0.000021	0.76 2785.15	560.56			0.05				
BIG ISAAC	LOWER	1000.000		100 YR	1390.00	933.57	942.31		942.35
0.000220	2.11 1264.11	230.89			0.13				

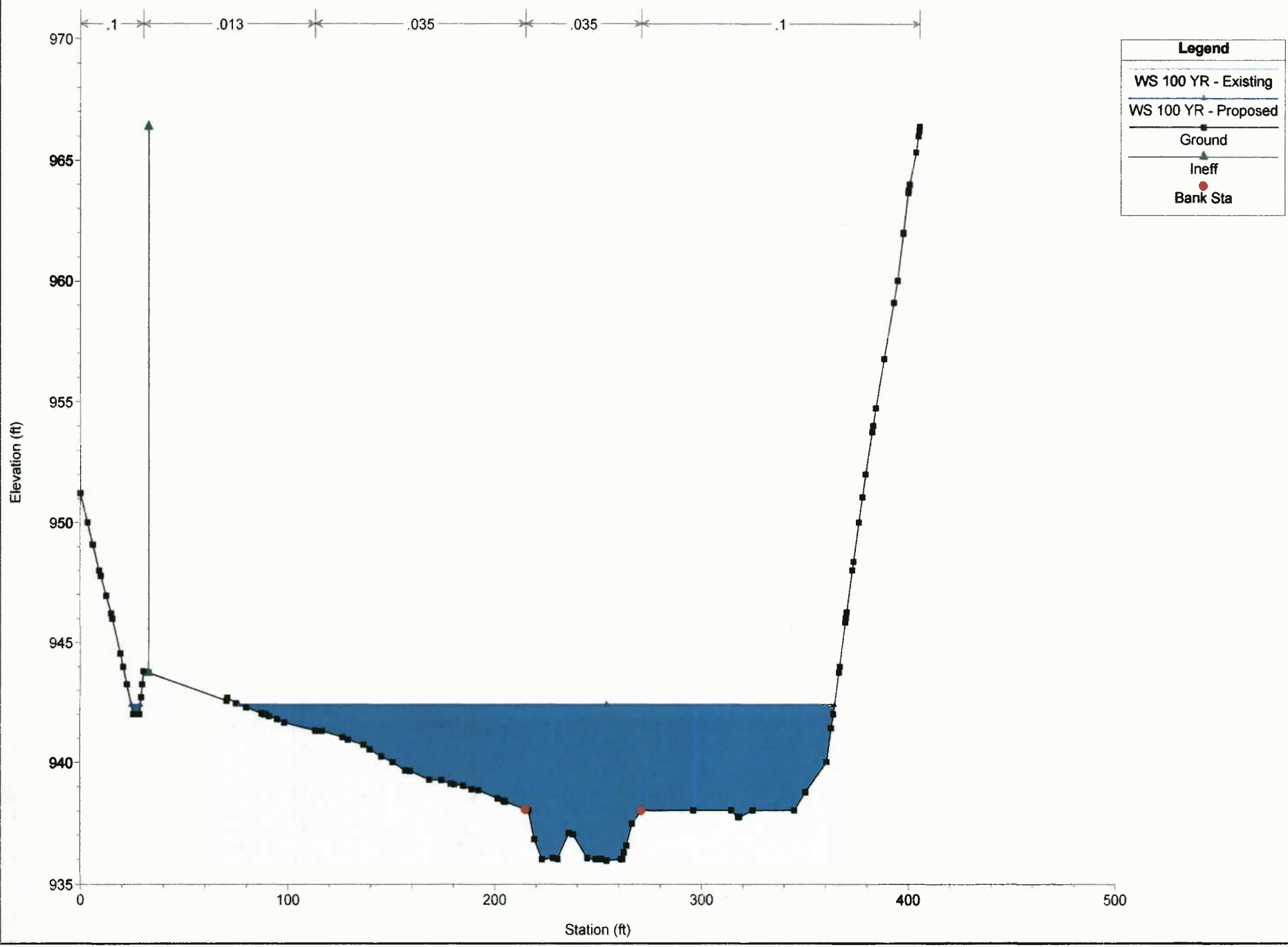
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



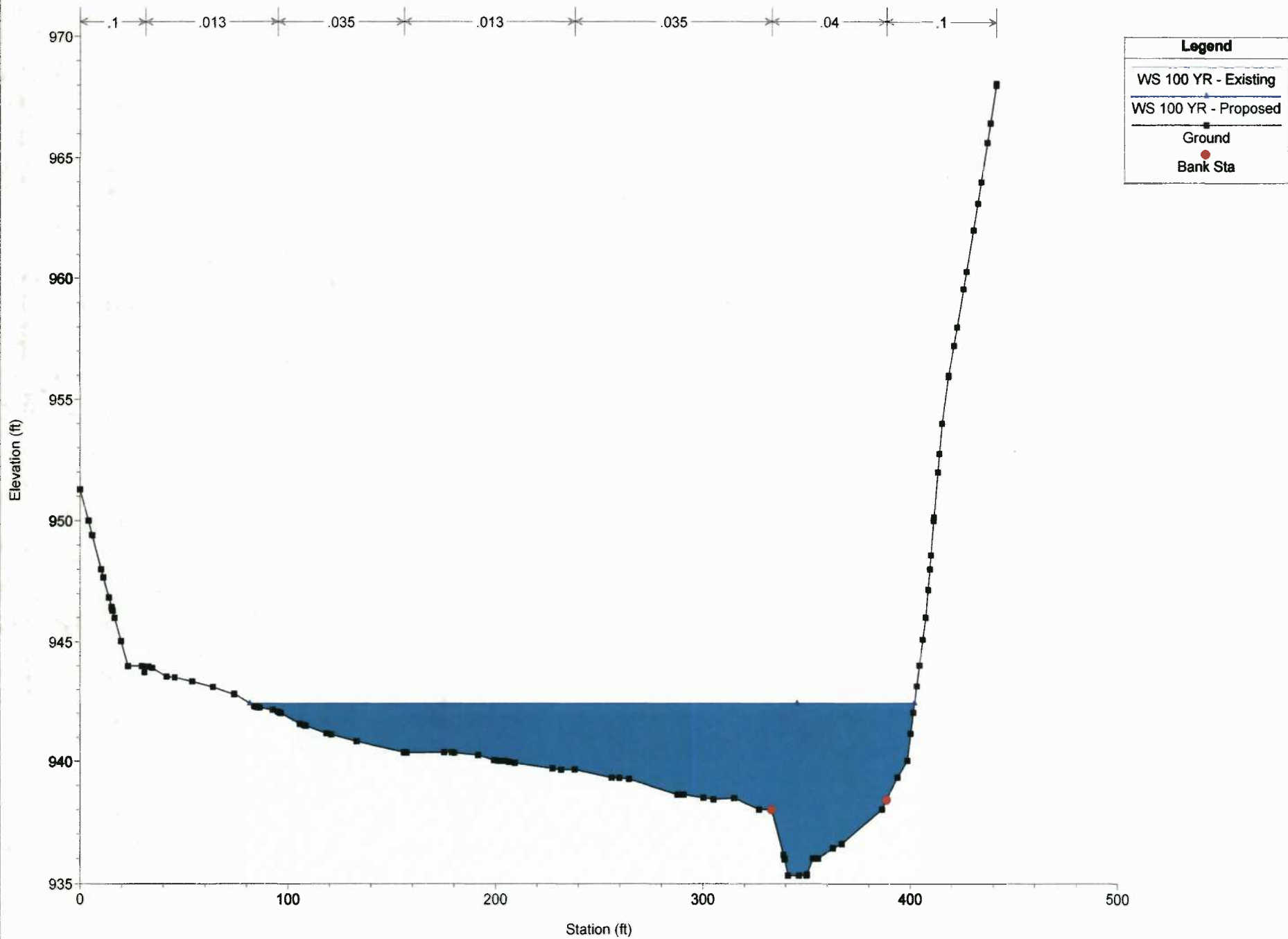
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



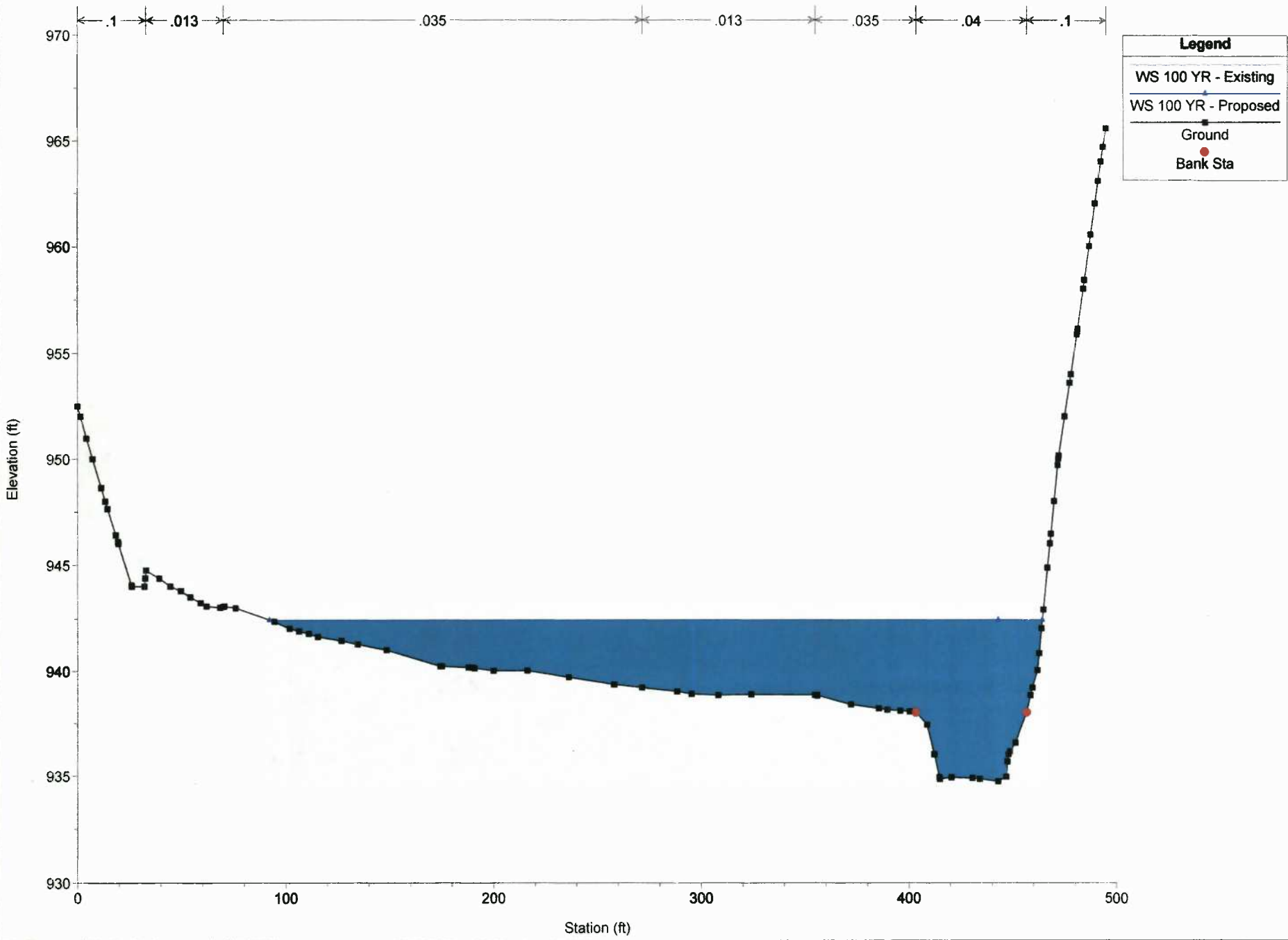
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



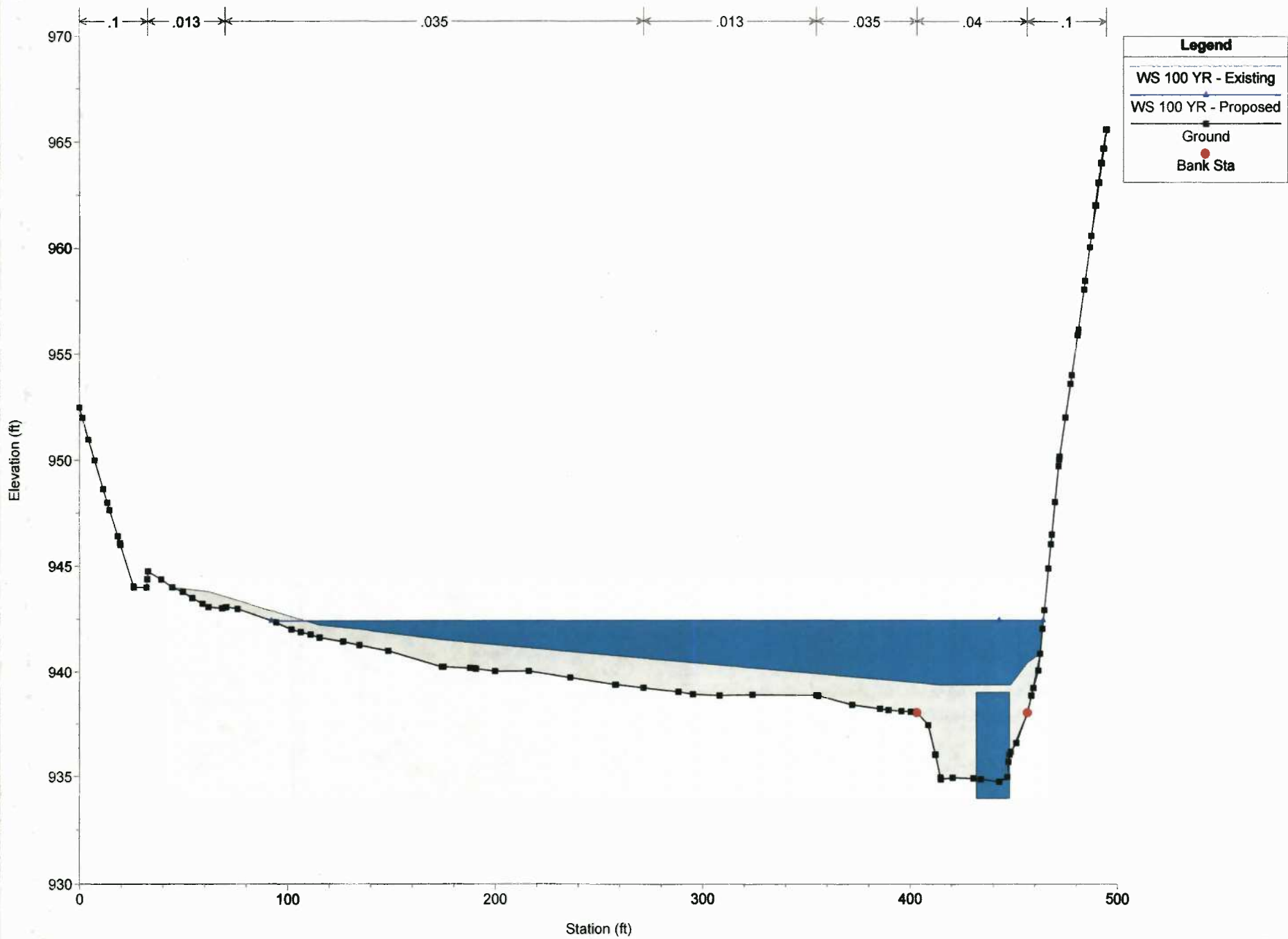
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



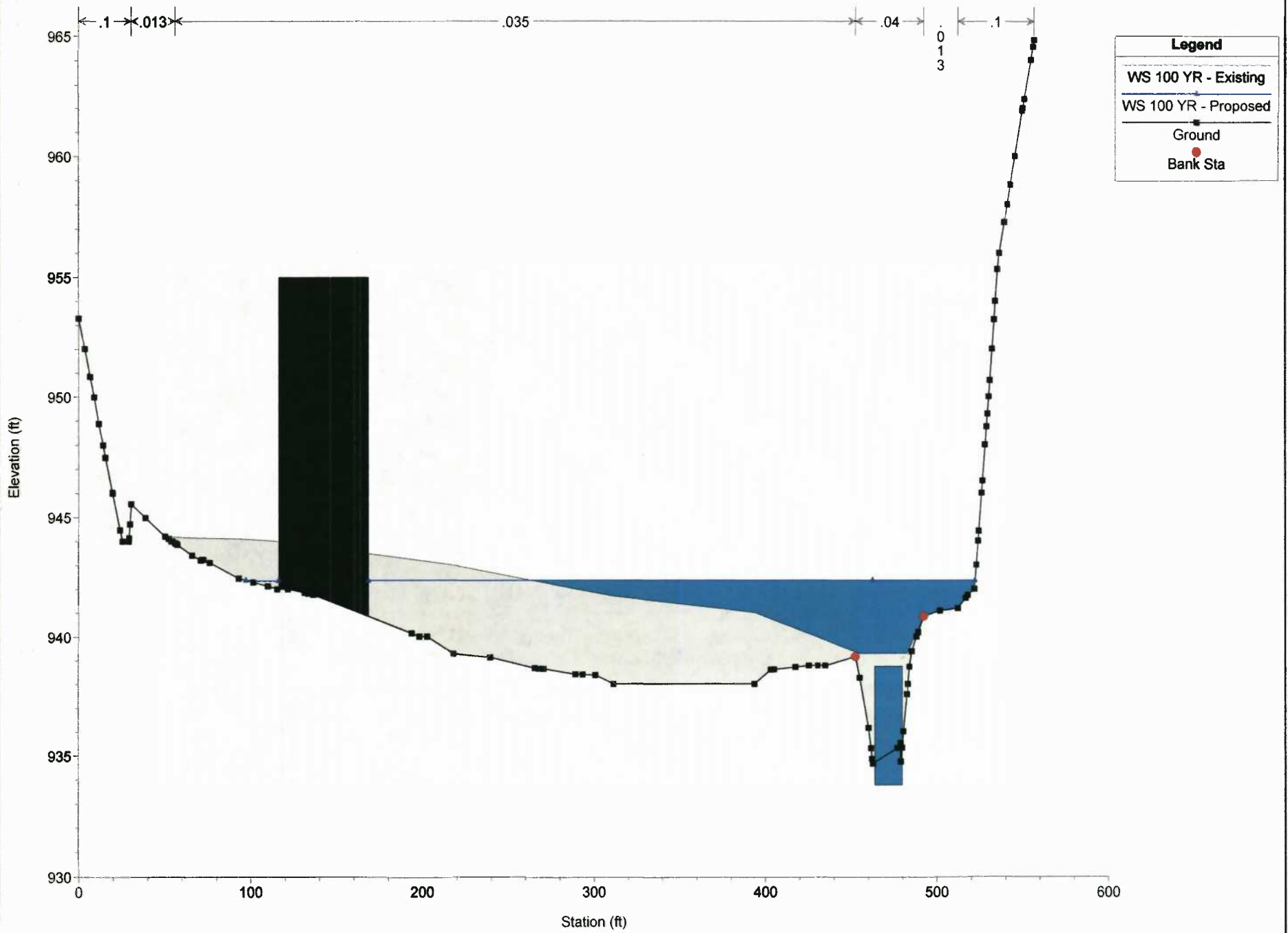
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



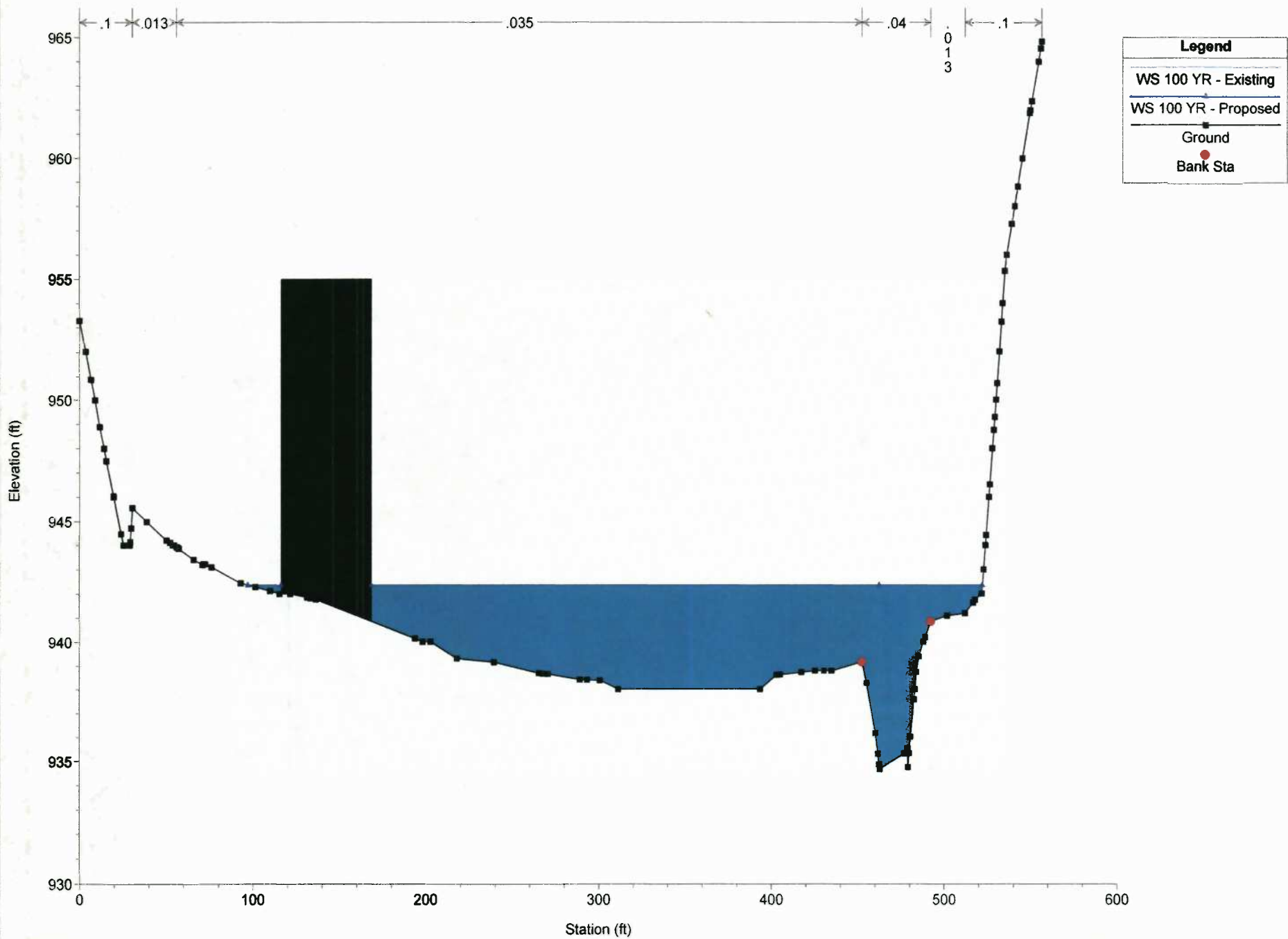
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



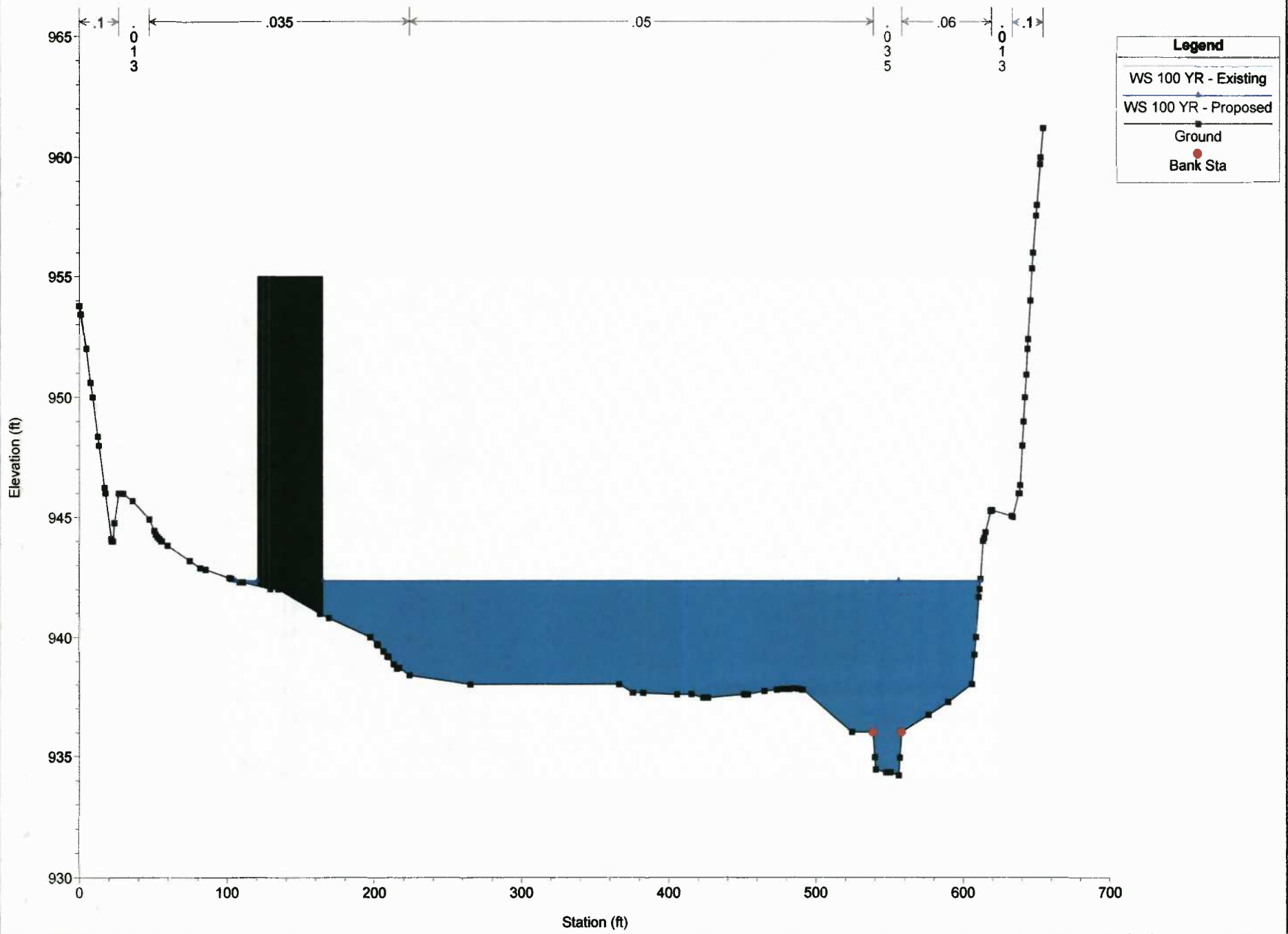
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



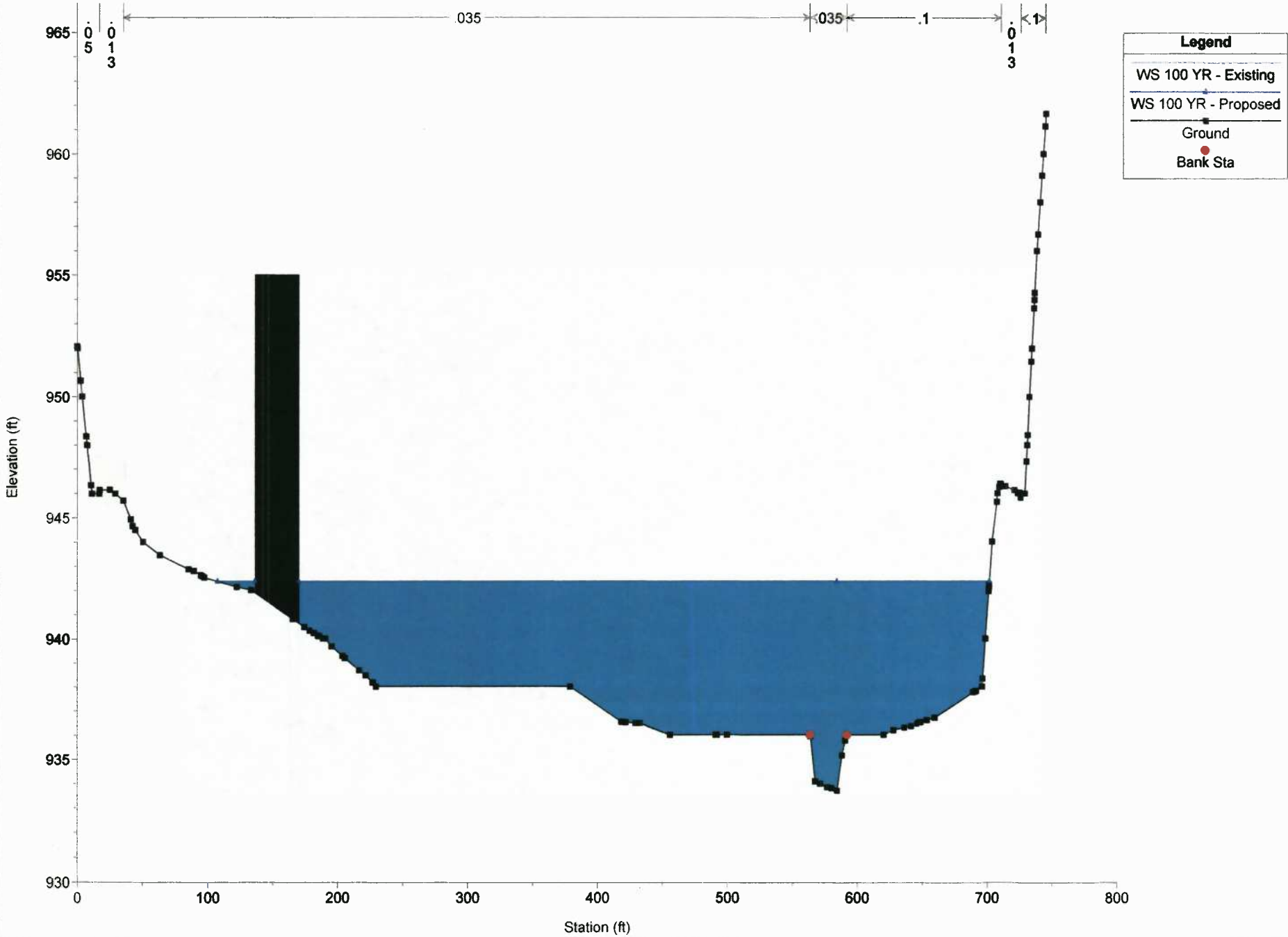
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



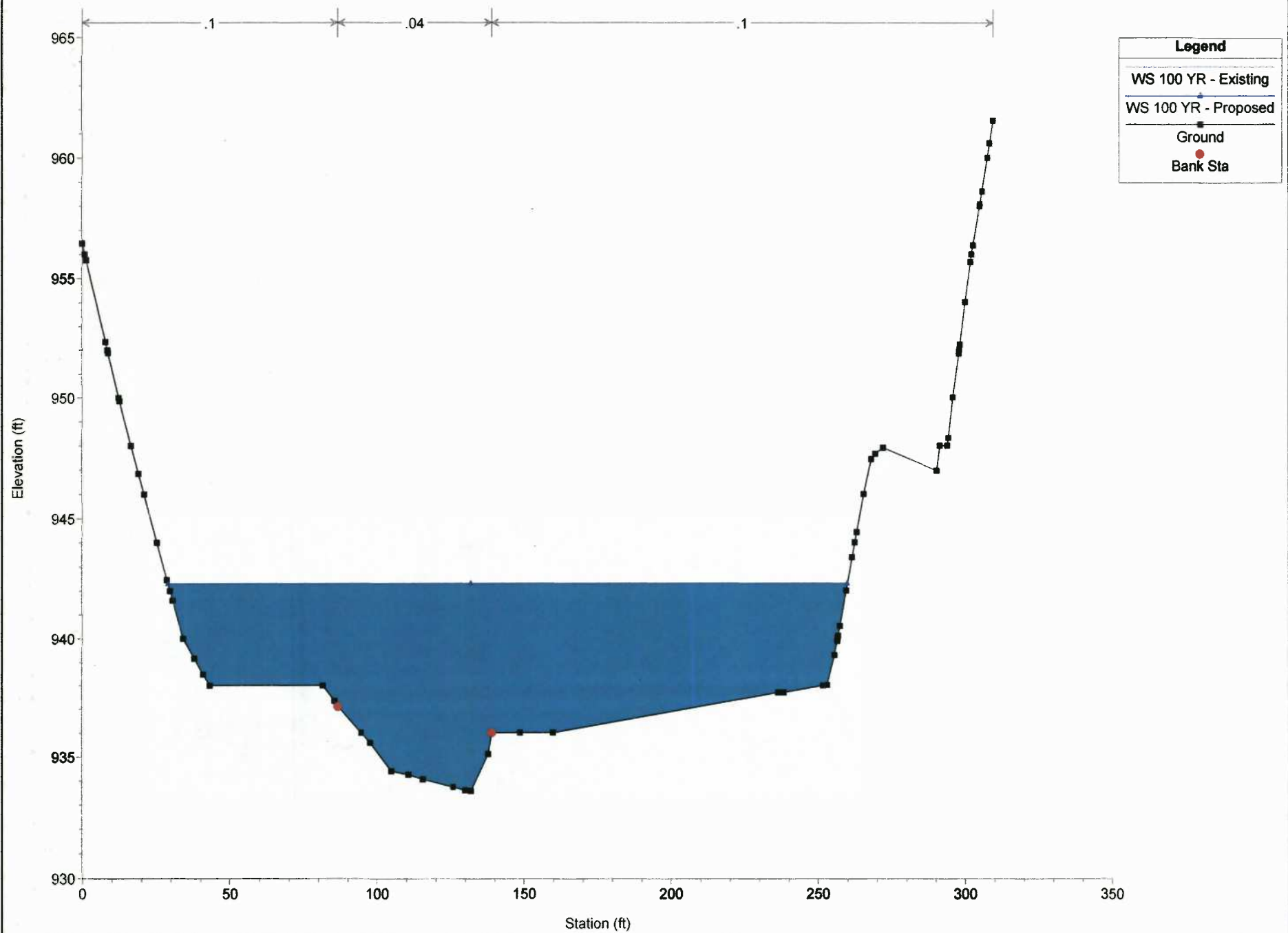
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



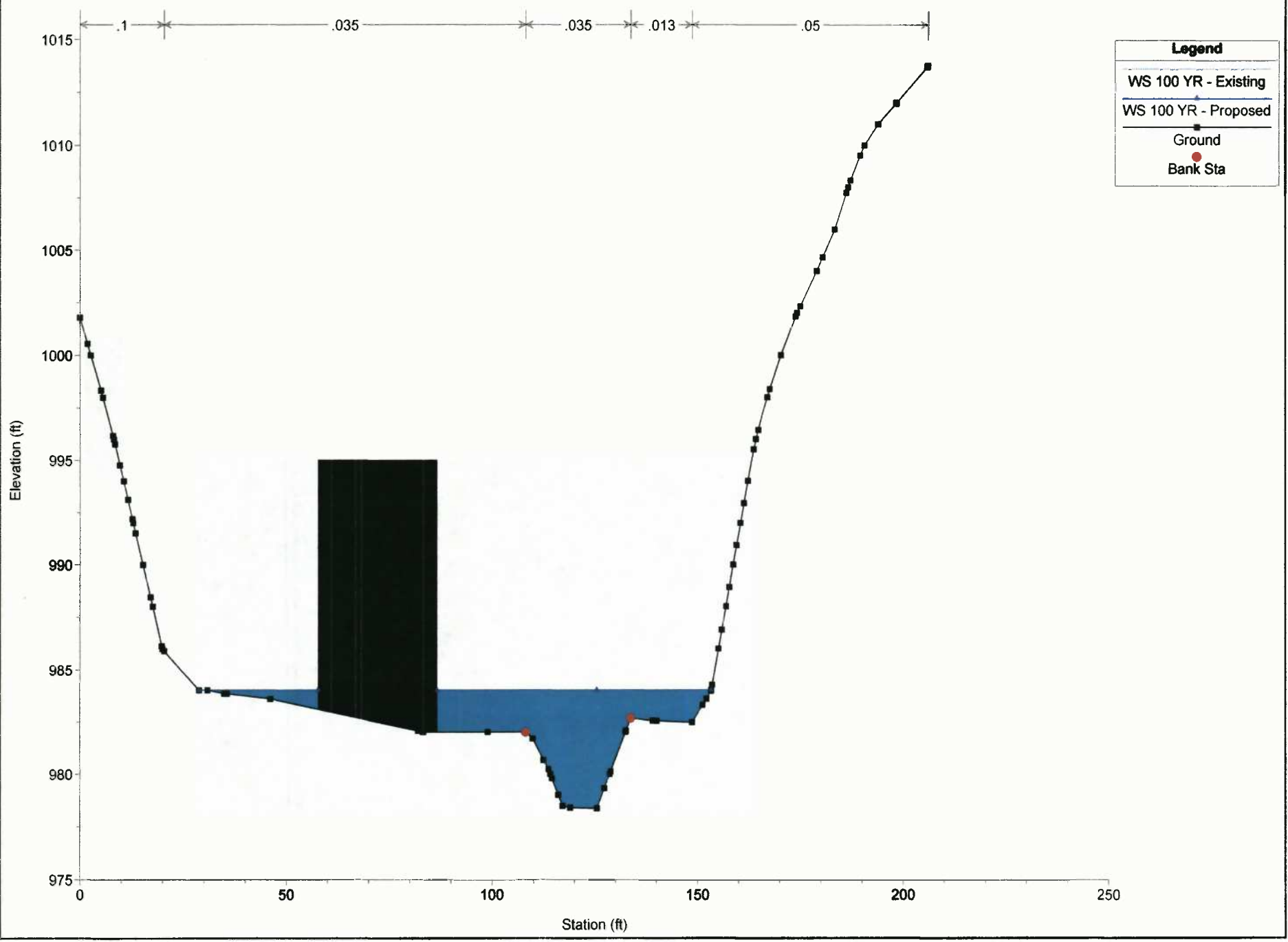
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



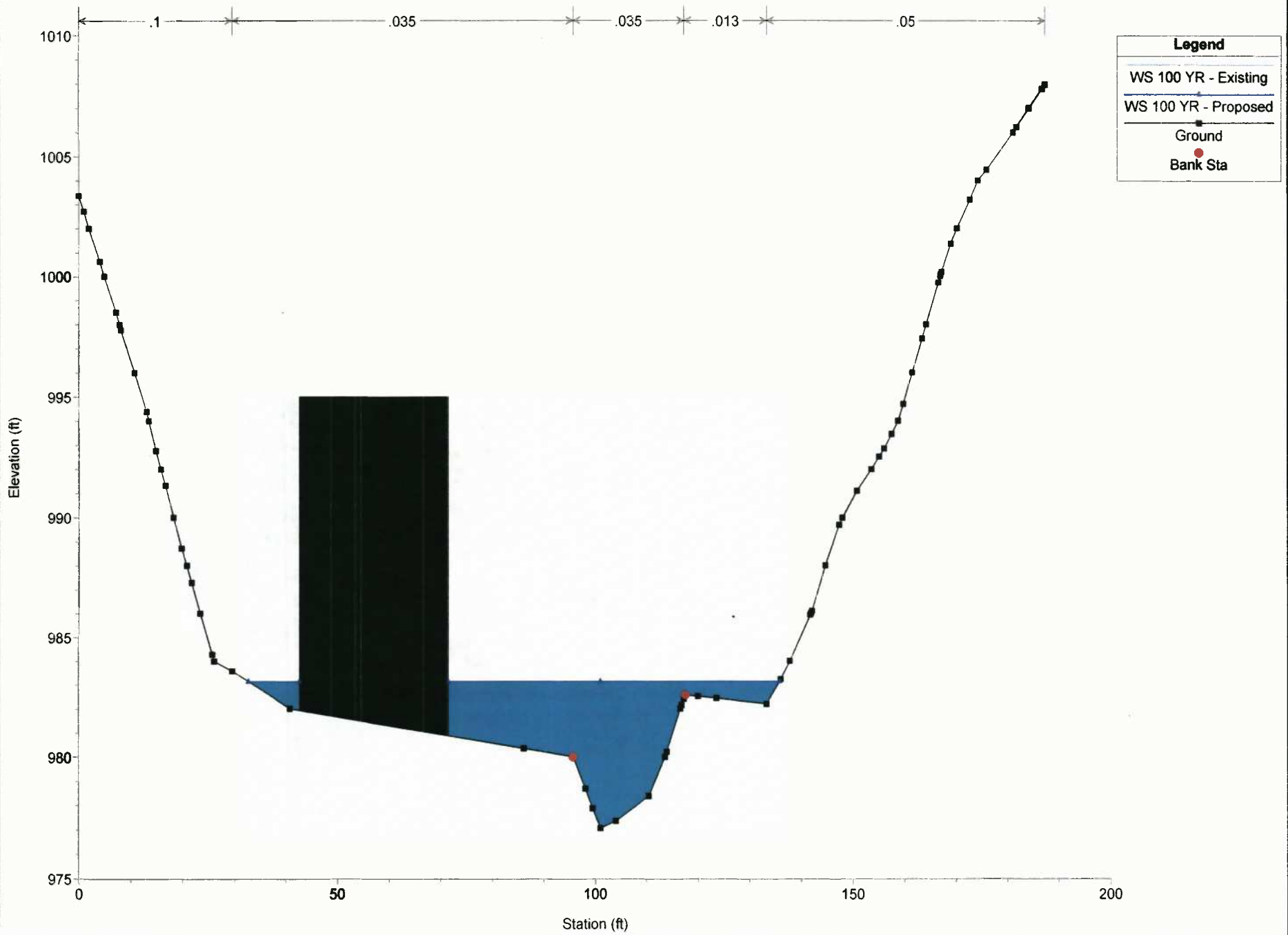
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



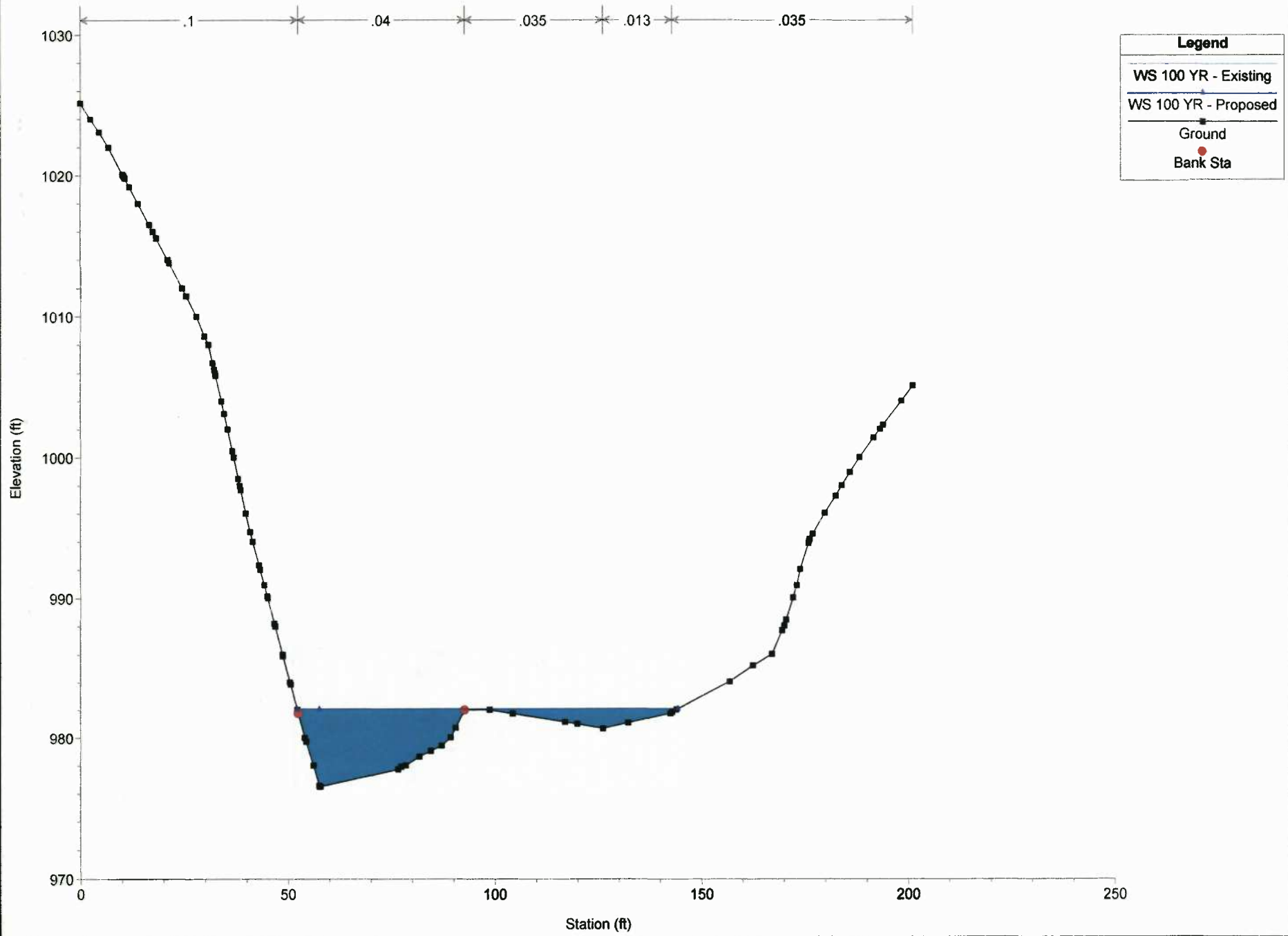
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



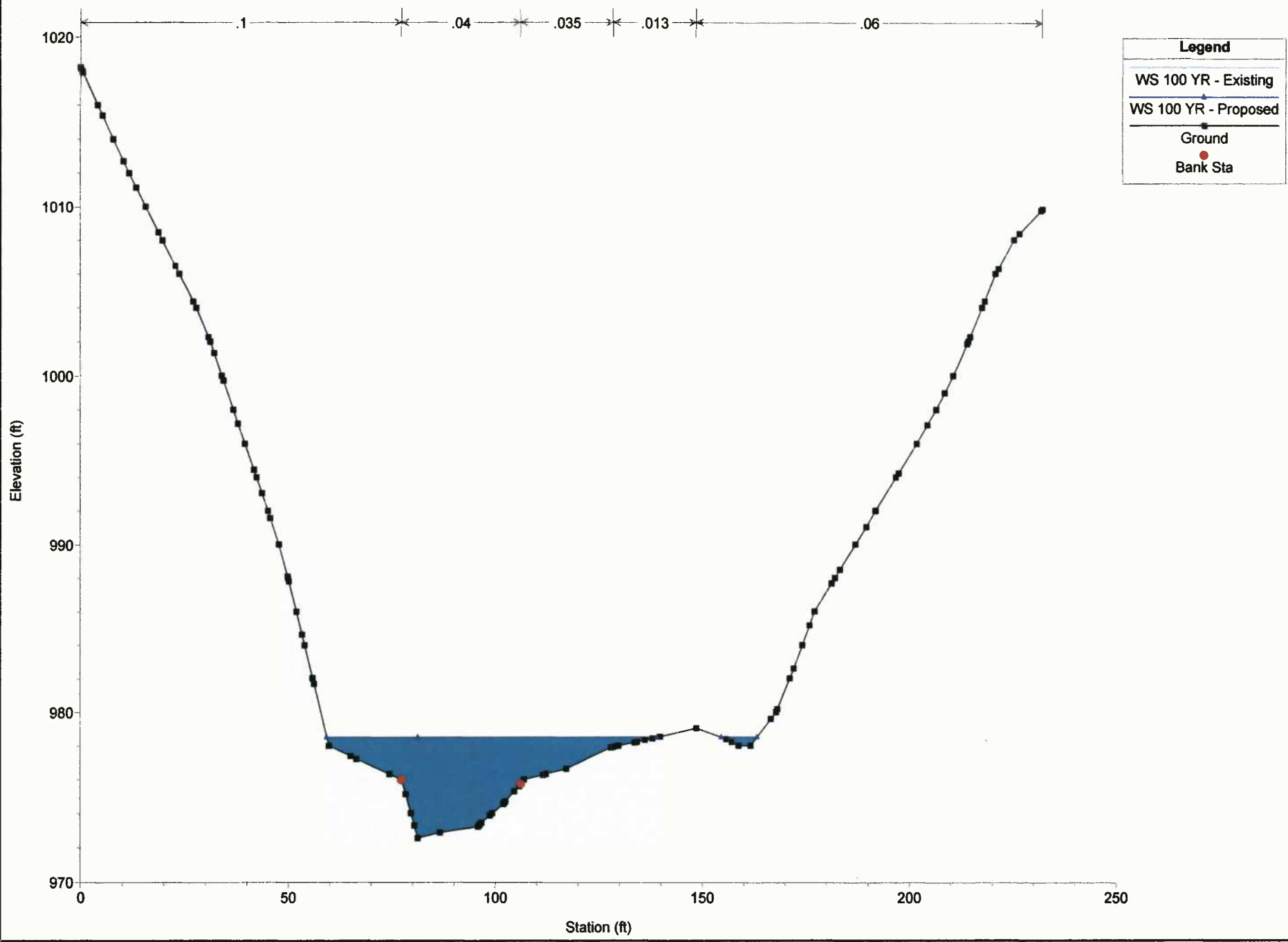
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



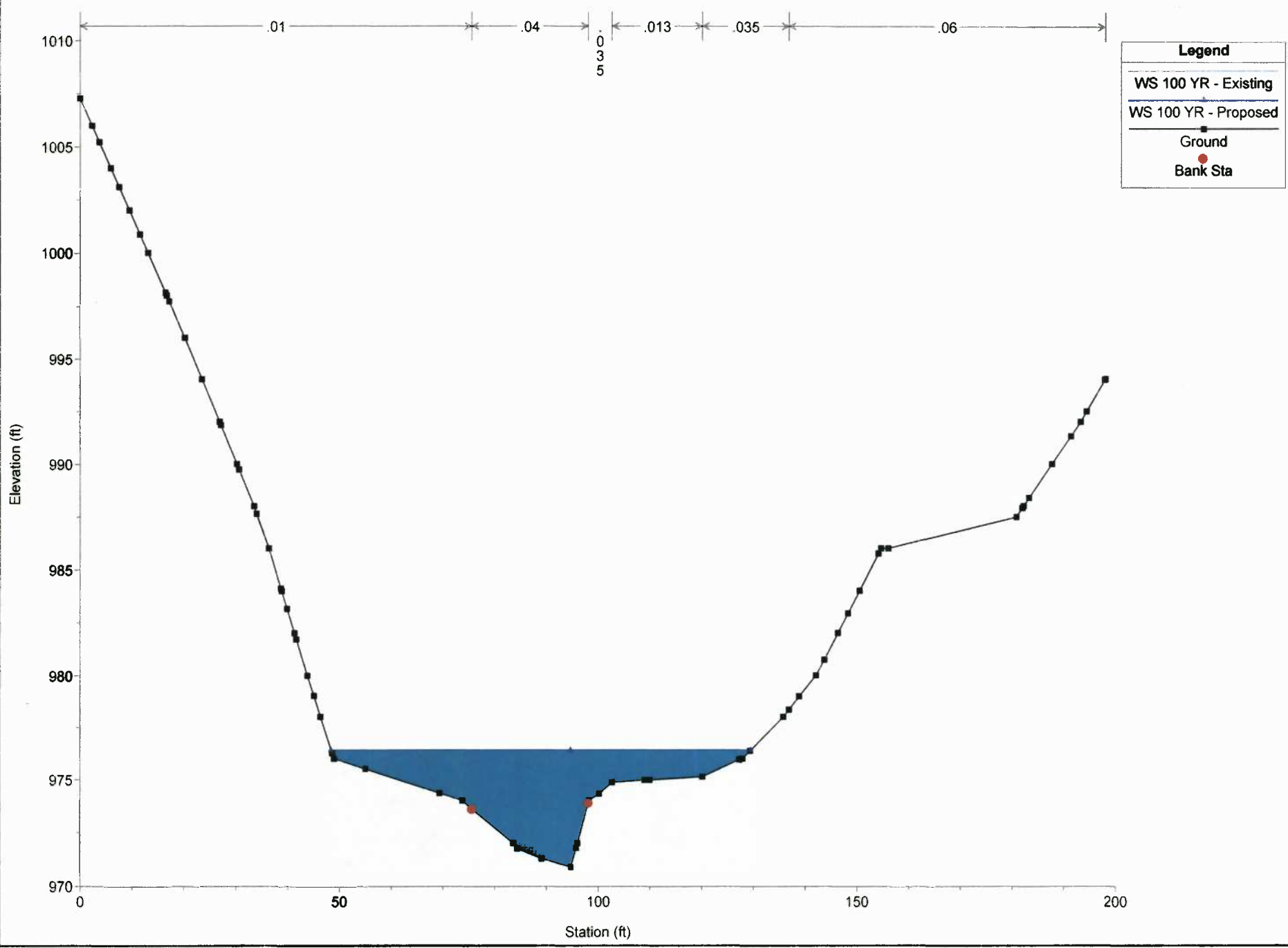
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



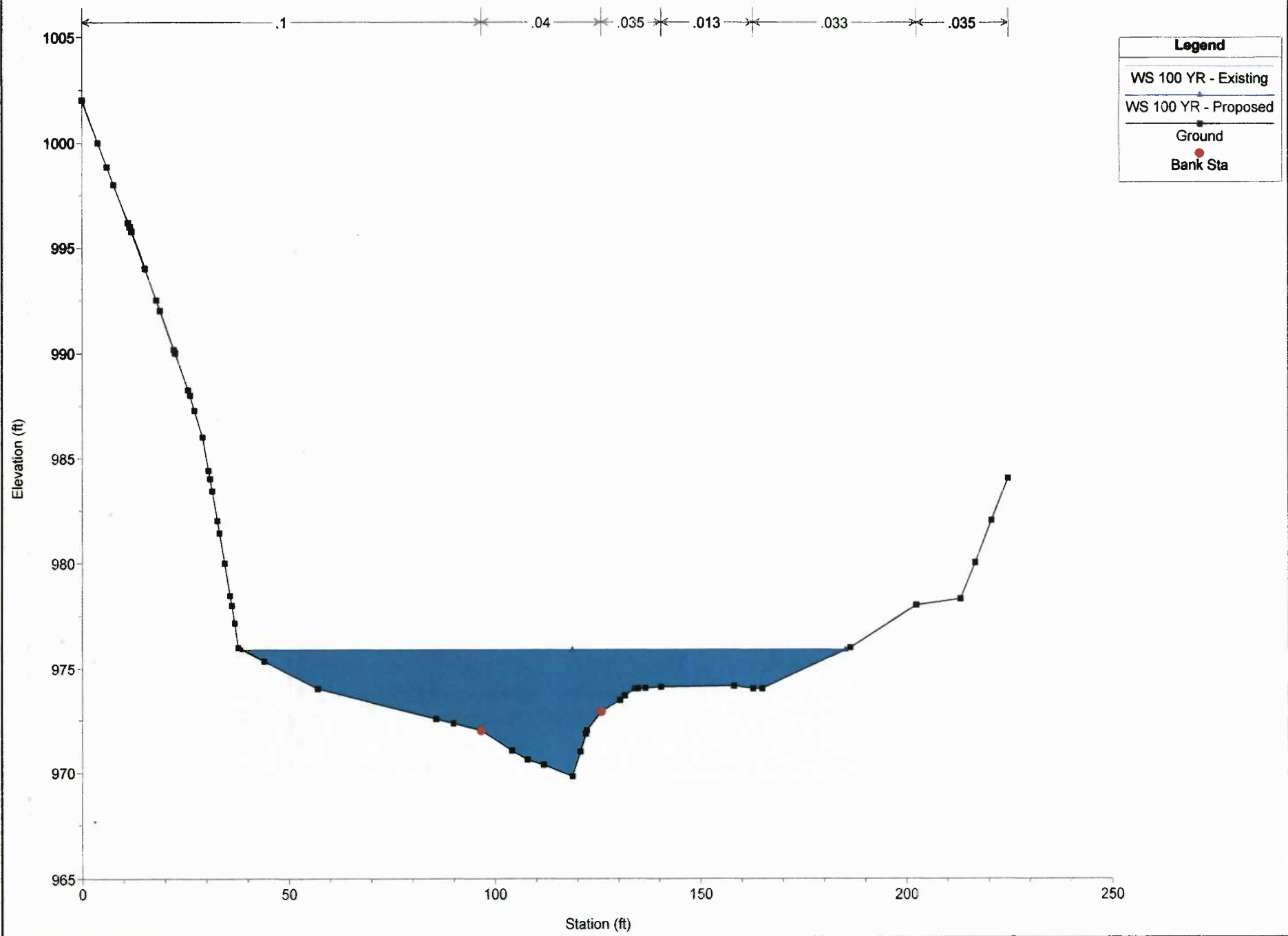
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



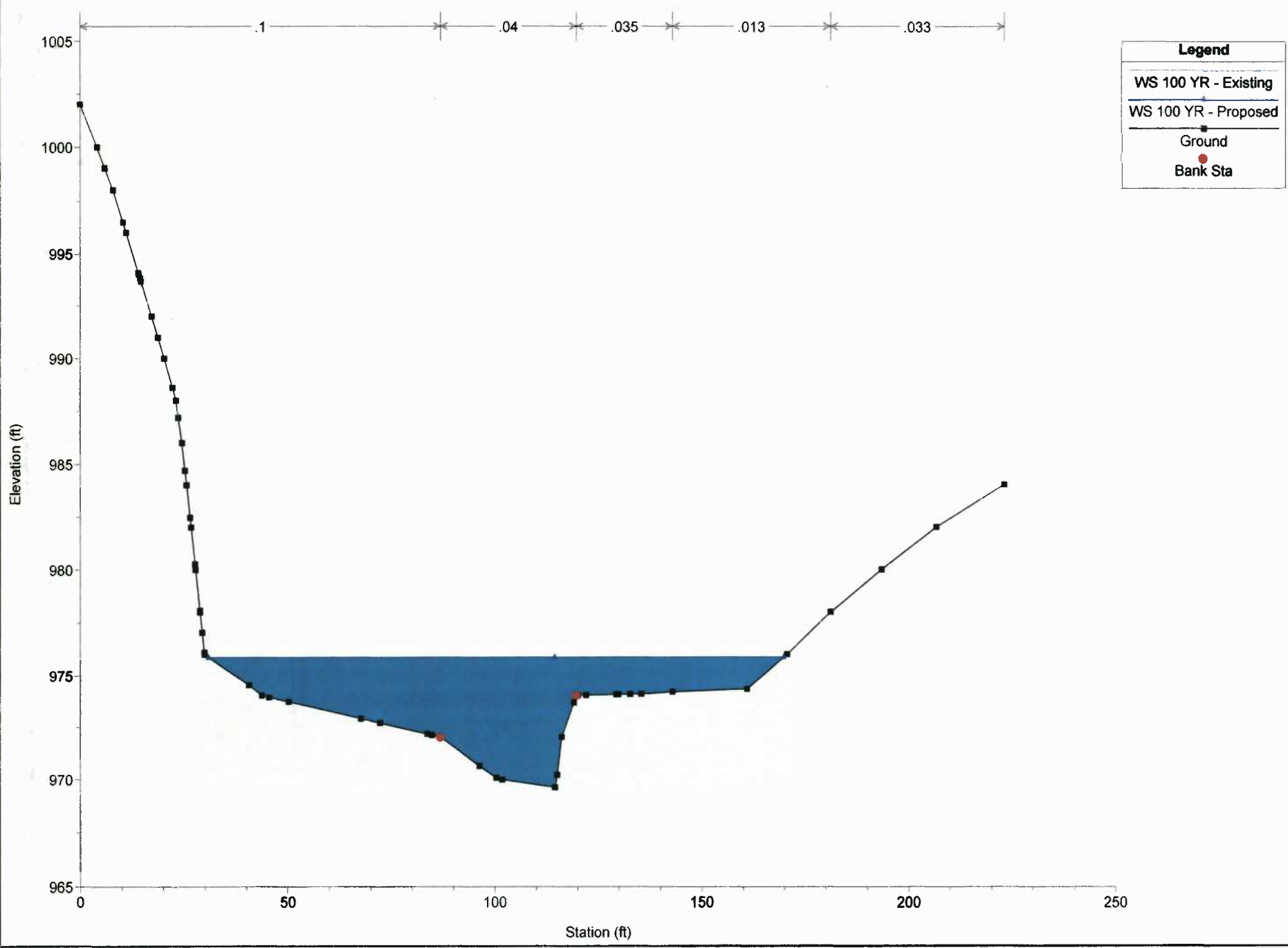
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



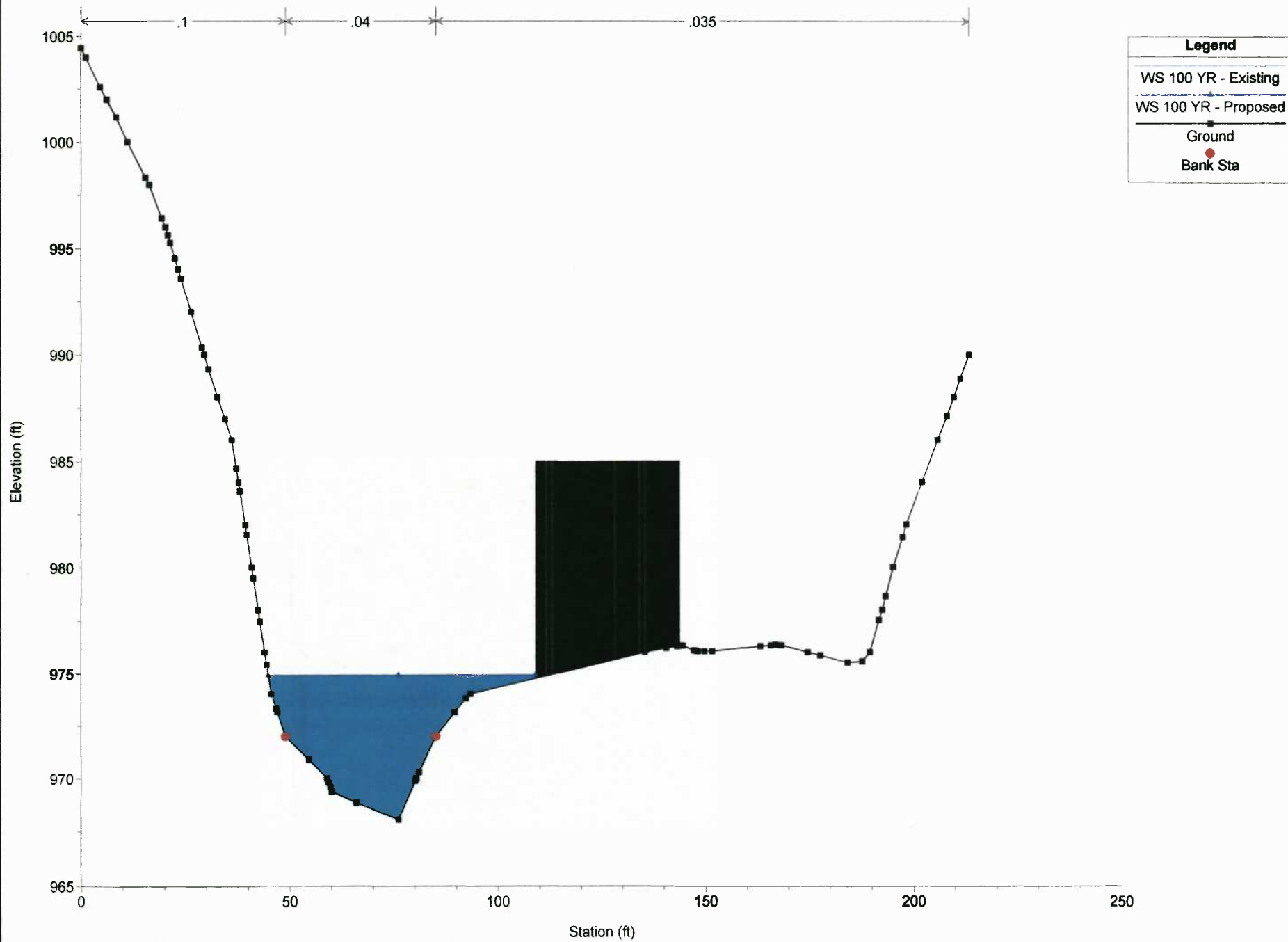
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



Legend

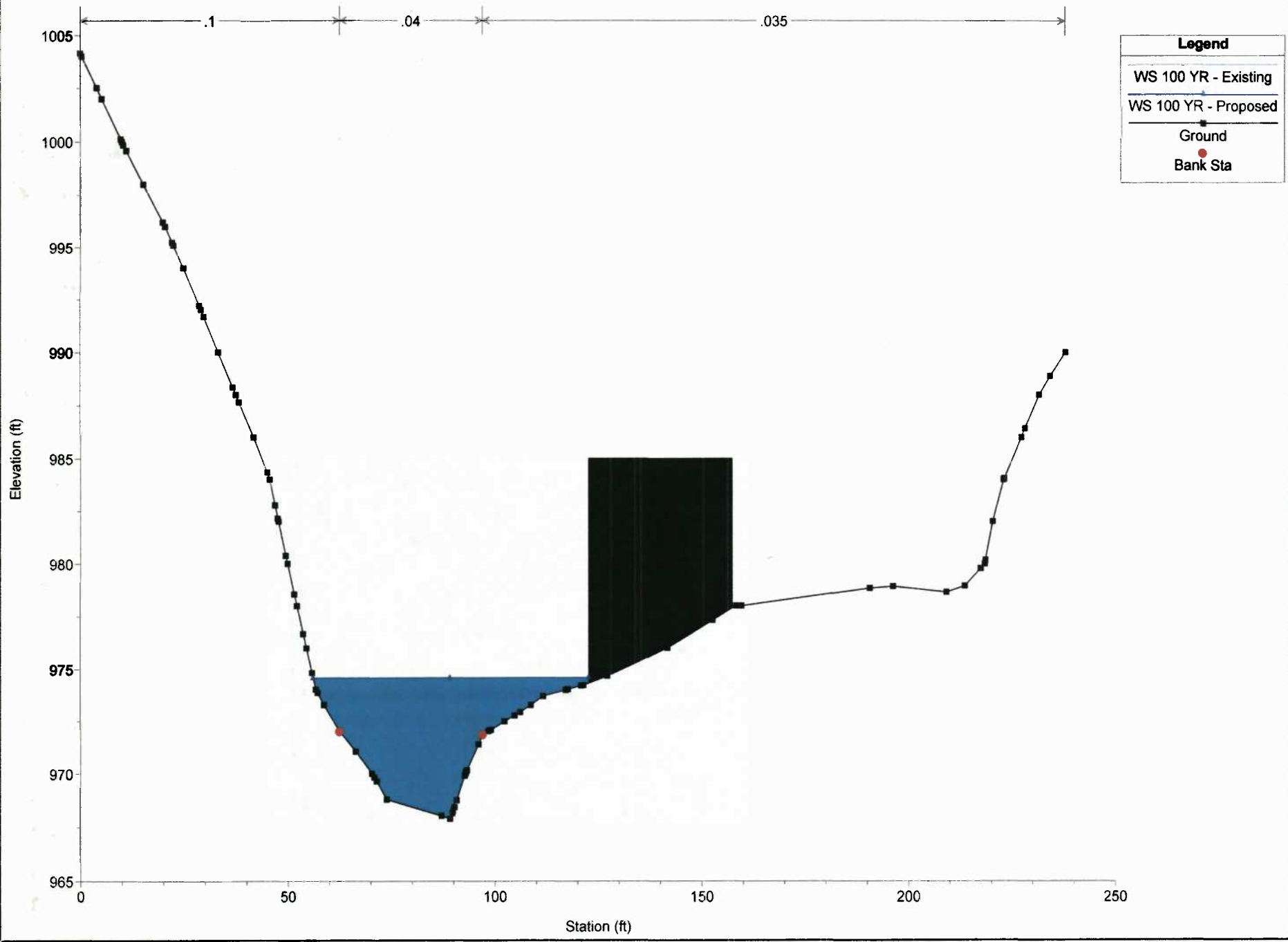
- WS 100 YR - Existing
- WS 100 YR - Proposed
- Ground
- Bank Sta

MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

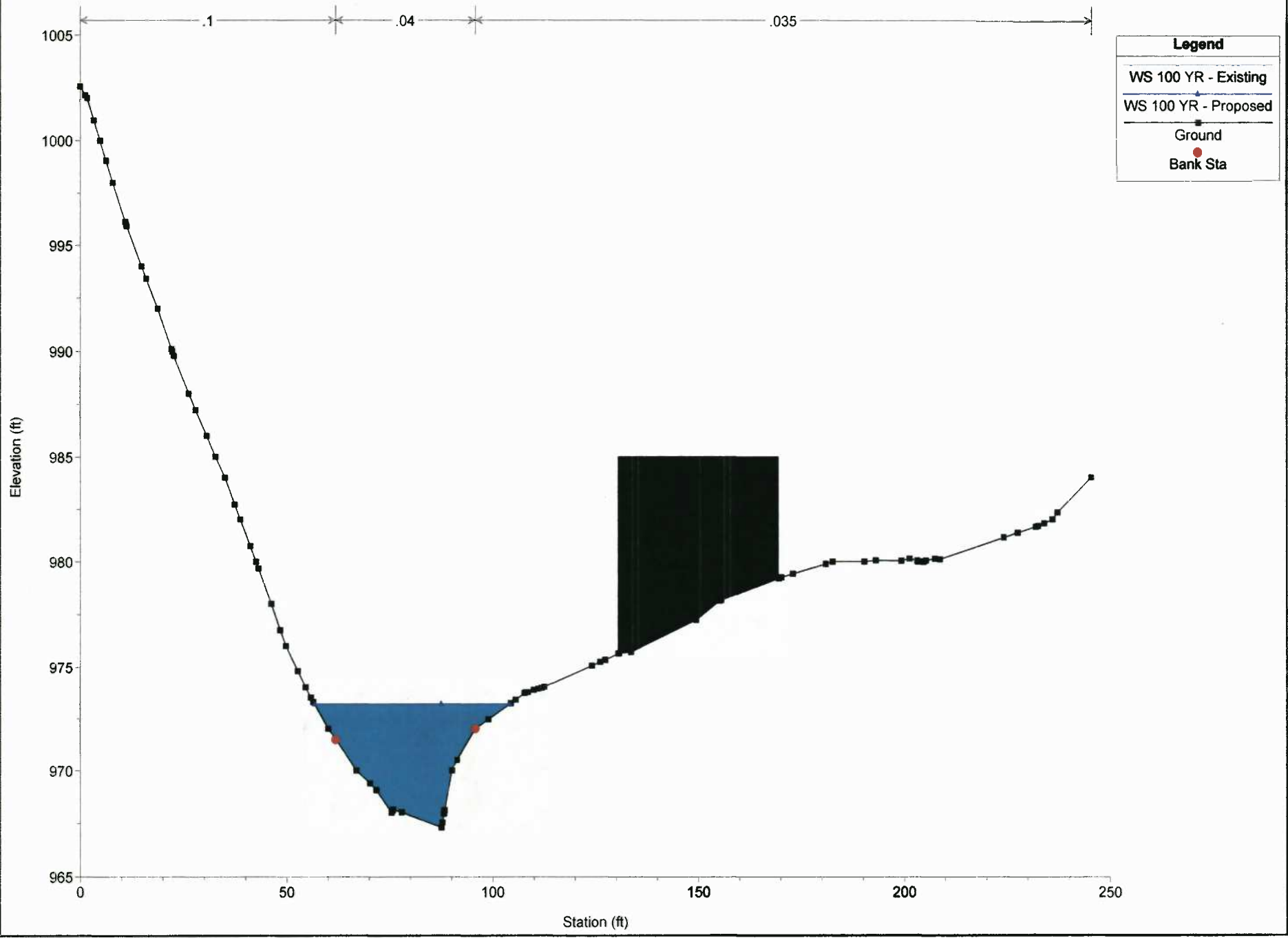


Legend	
WS 100 YR - Existing	(Blue shaded area)
WS 100 YR - Proposed	(Dashed line with square markers)
Ground	(Solid black line with square markers)
Bank Sta	(Red dot)

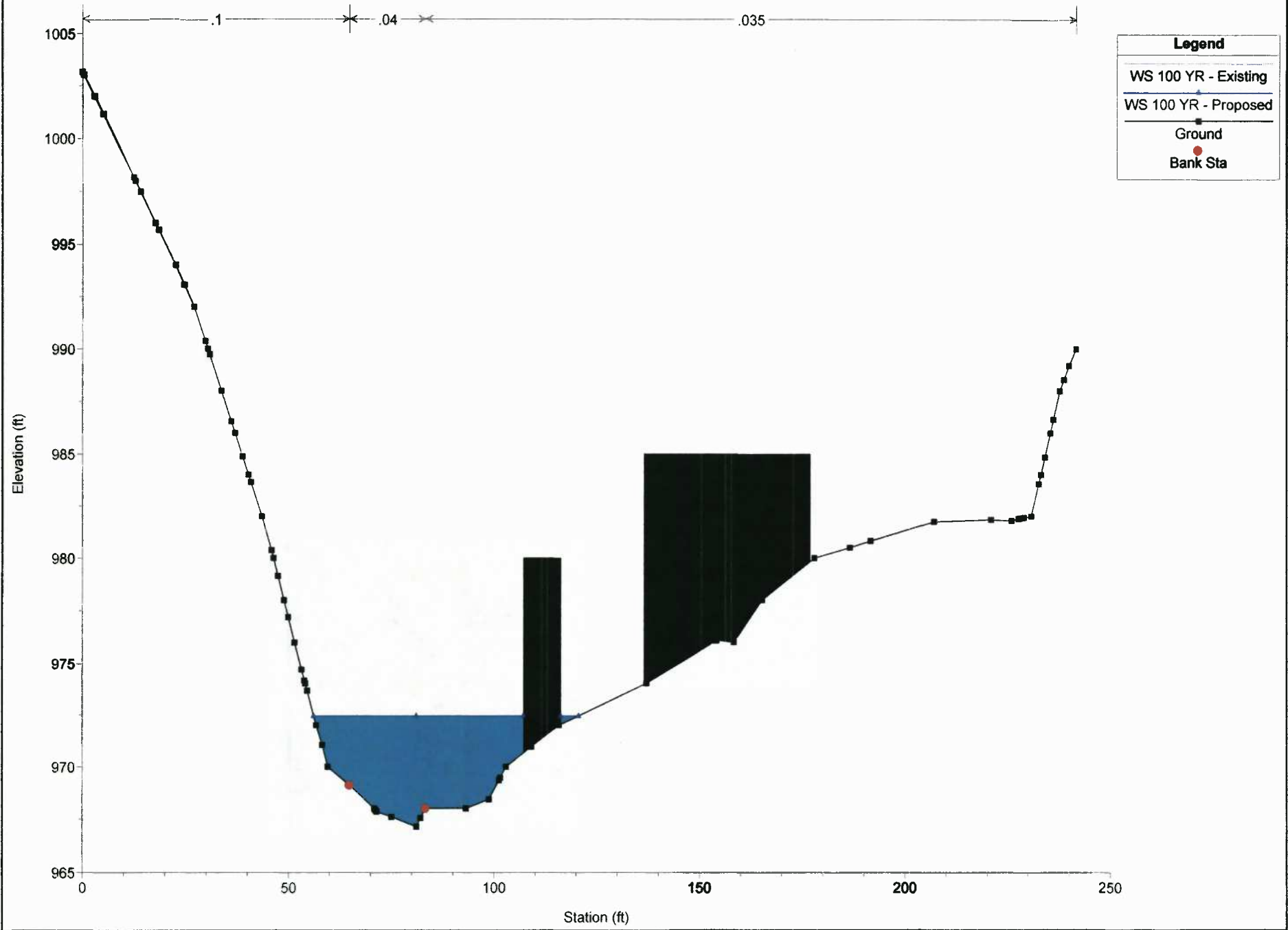
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



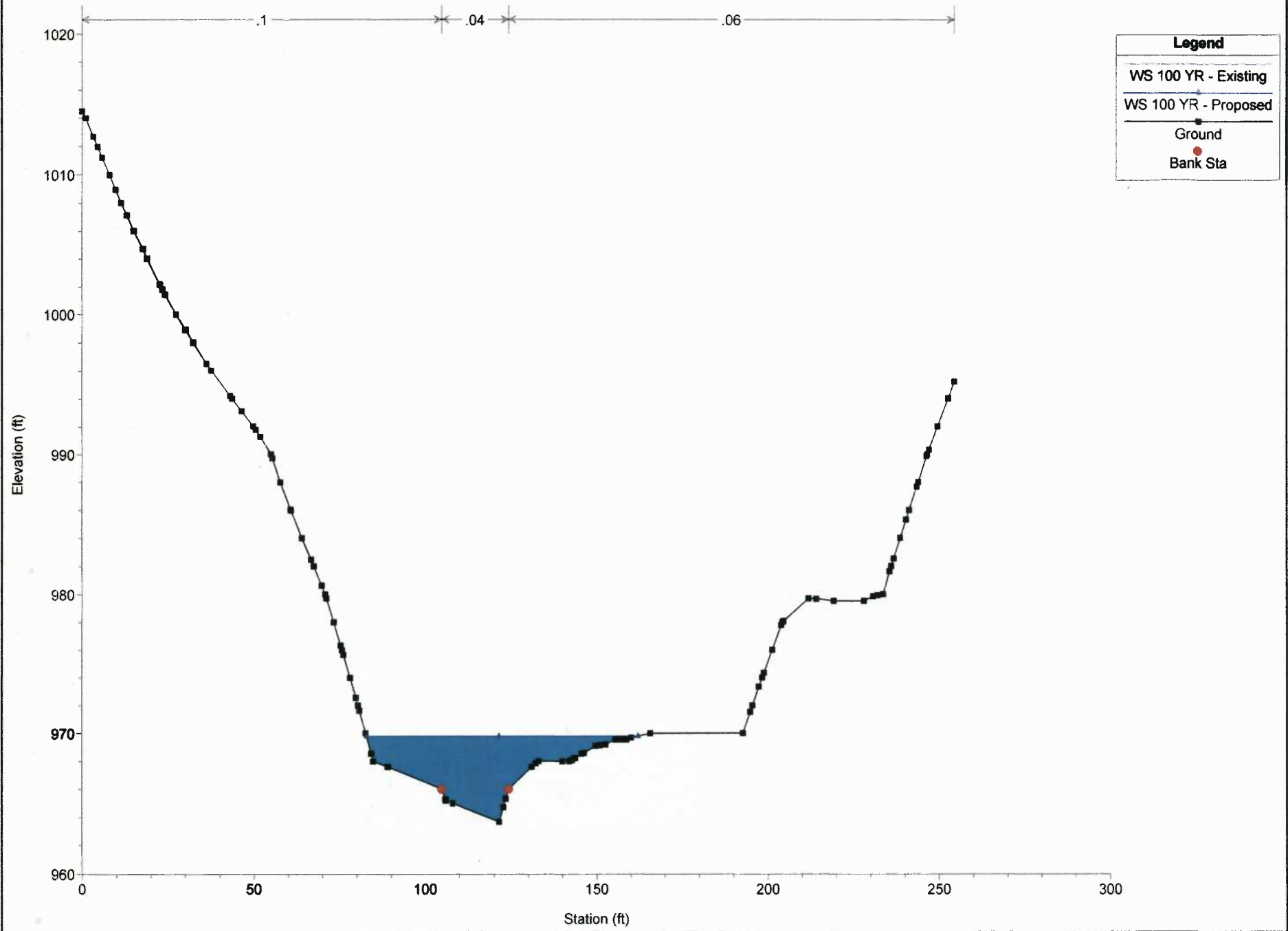
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



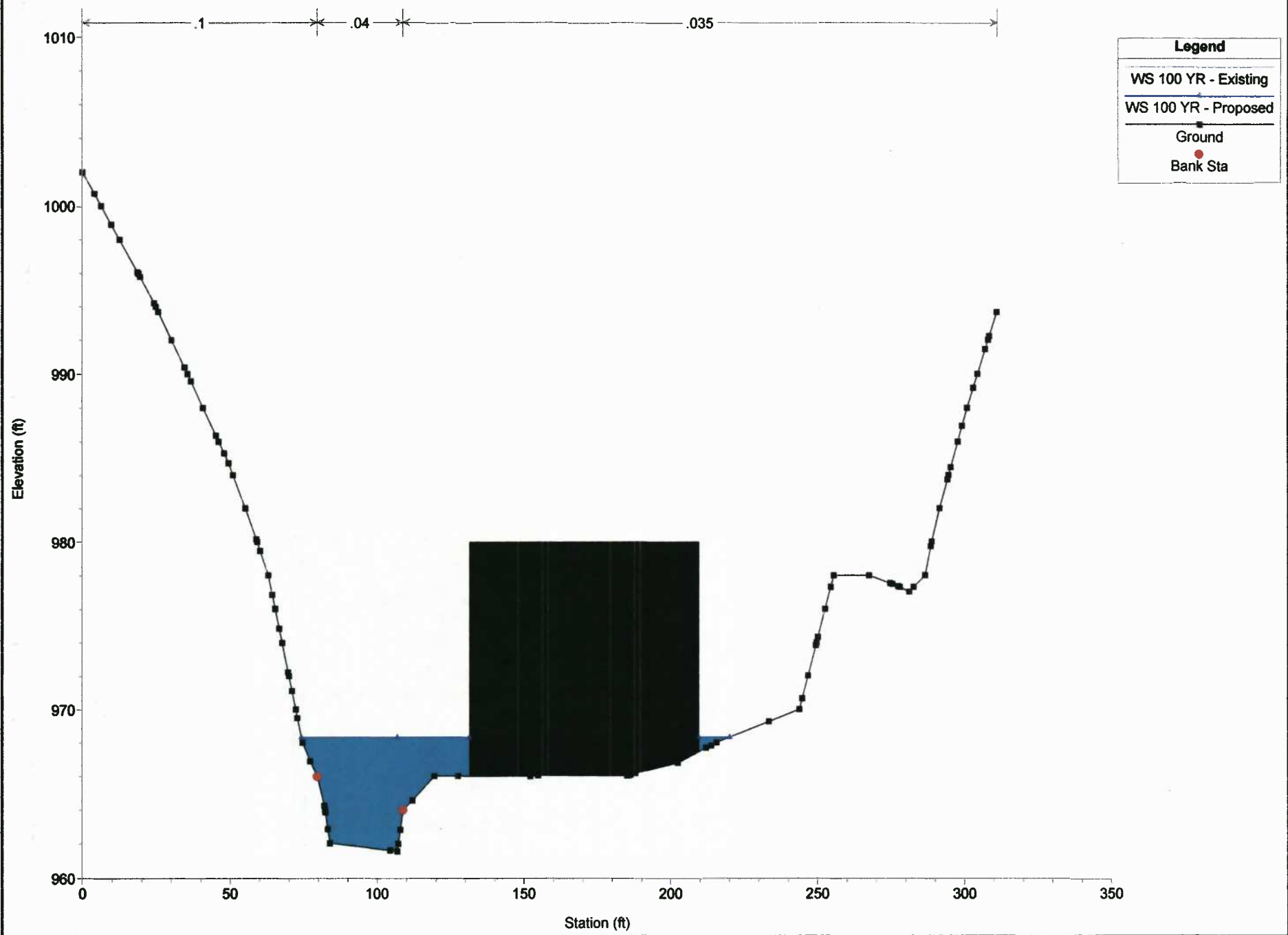
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



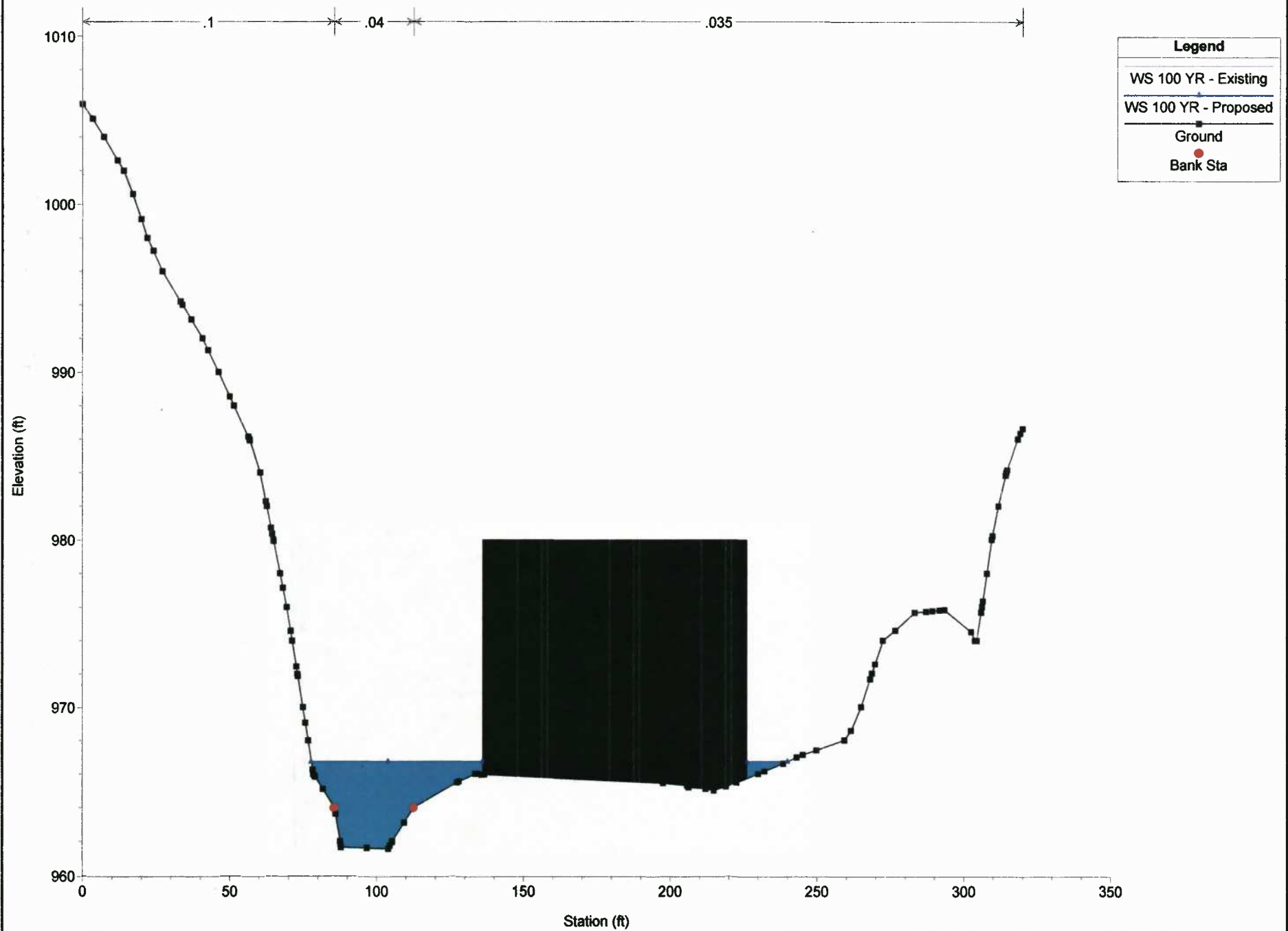
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

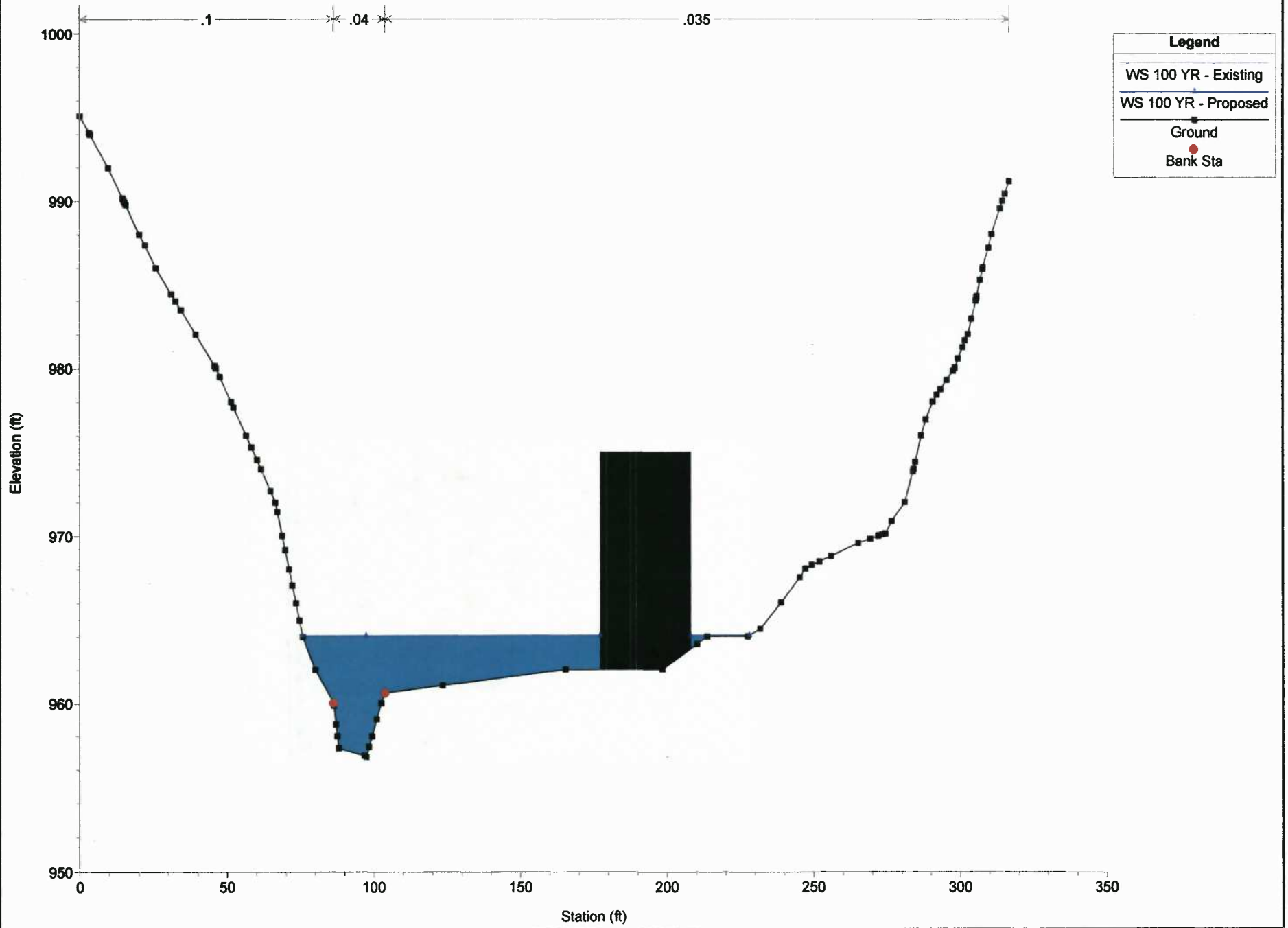


MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

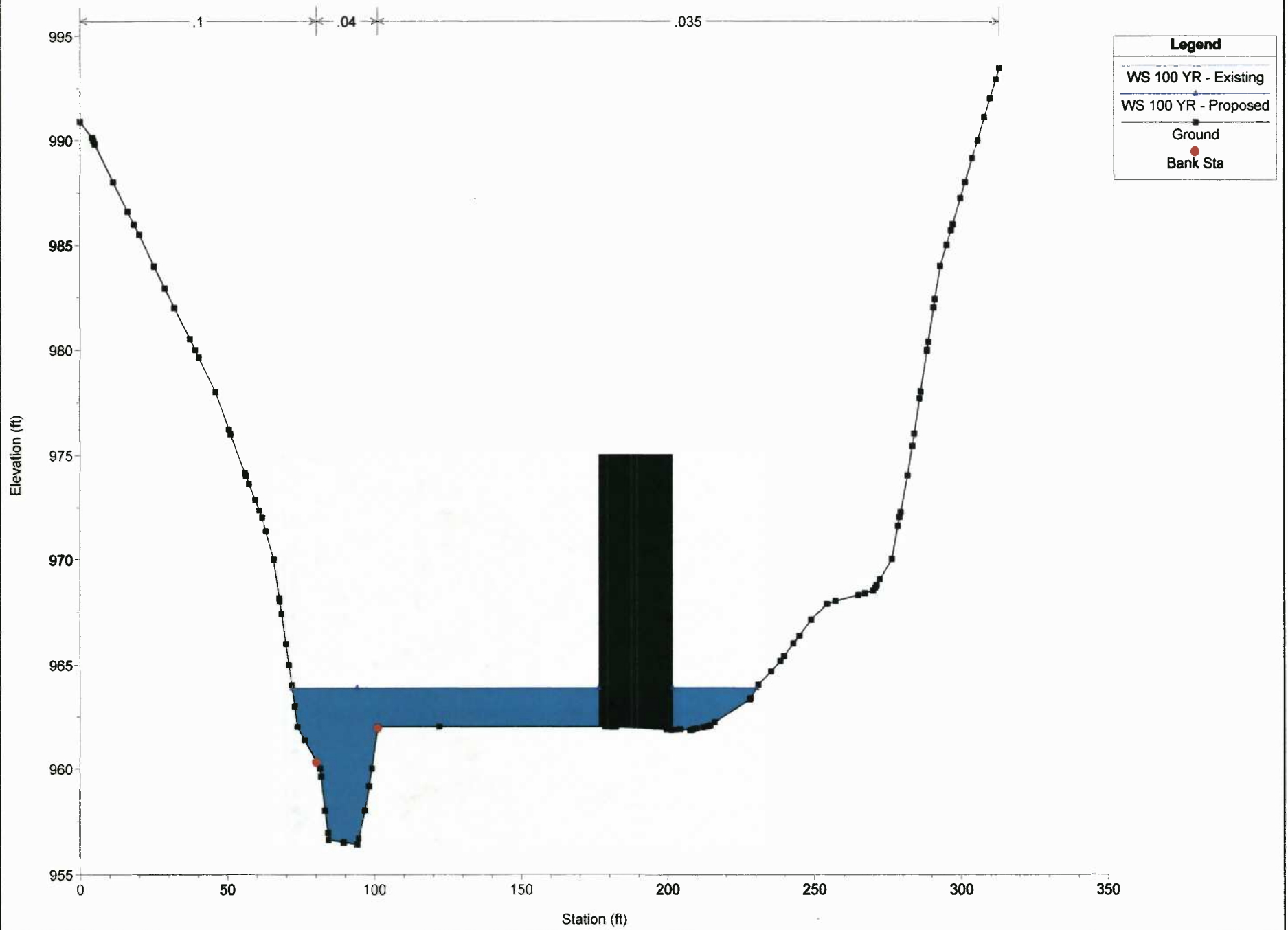


Legend	
WS 100 YR - Existing	—
WS 100 YR - Proposed	—
Ground	■
Bank Sta	●

MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

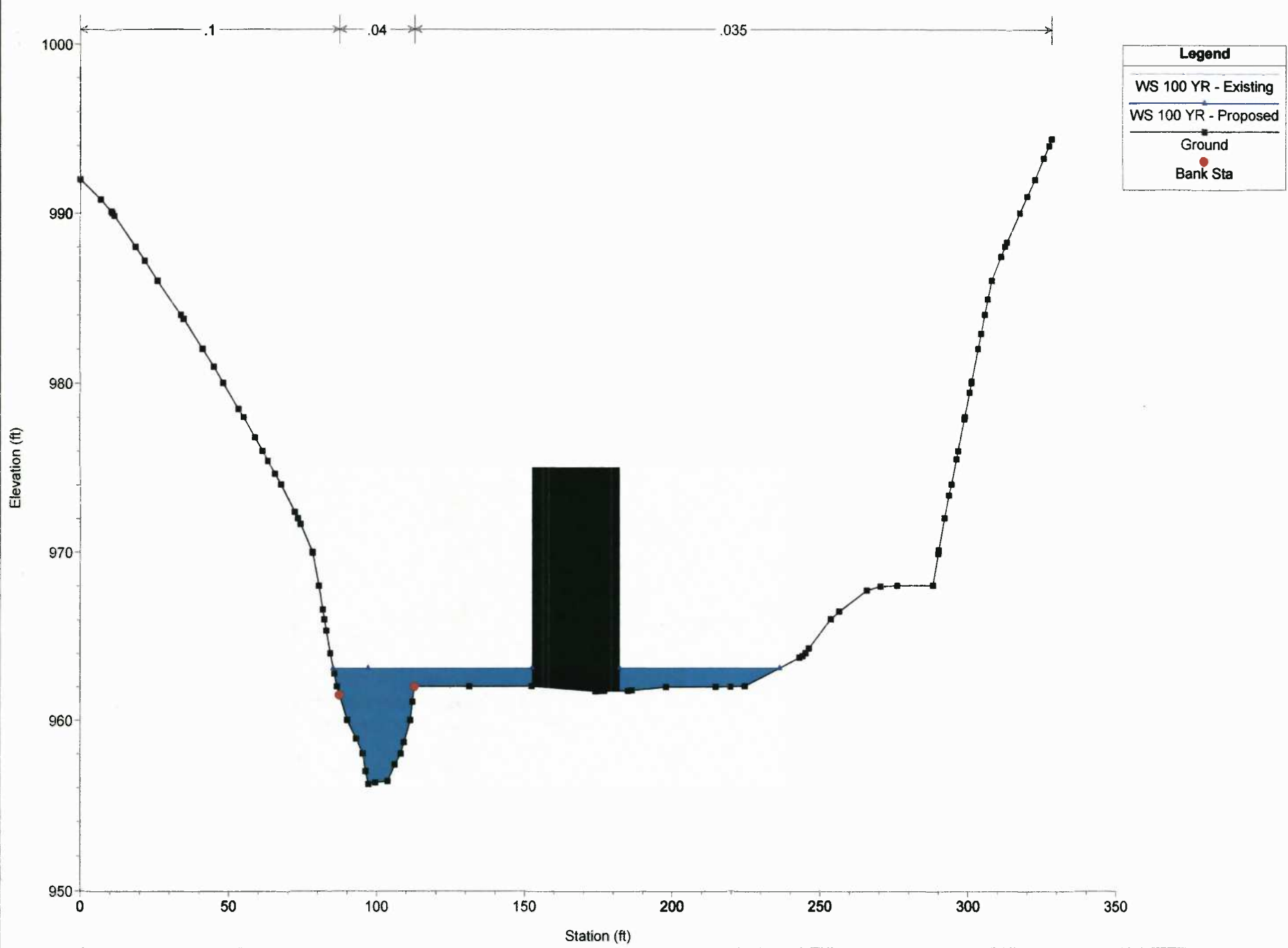


MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

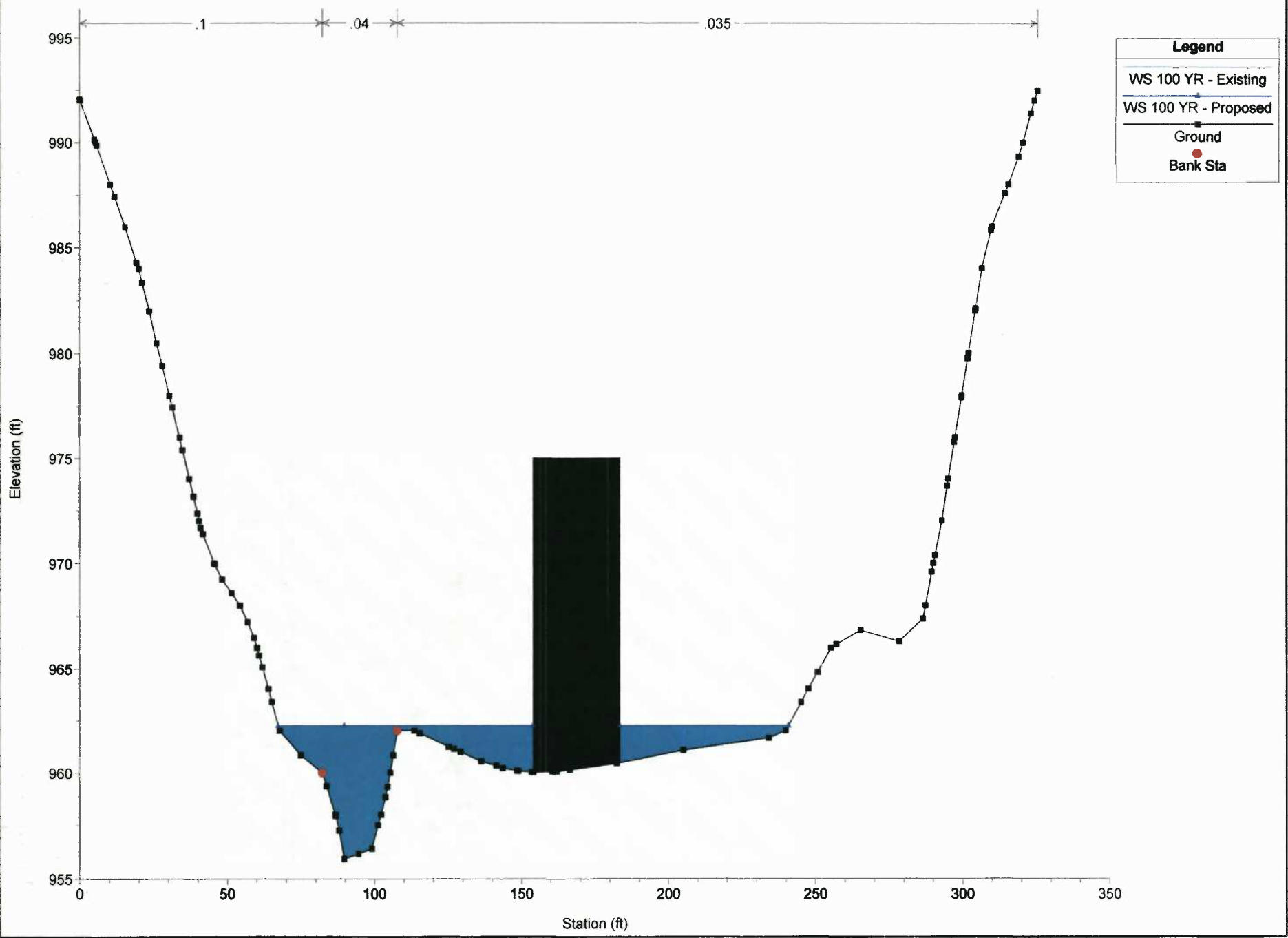


Legend	
WS 100 YR - Existing	(dashed line with diamond markers)
WS 100 YR - Proposed	(solid line with square markers)
Ground	(solid black line with square markers)
Bank Sta	(red dot)

MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

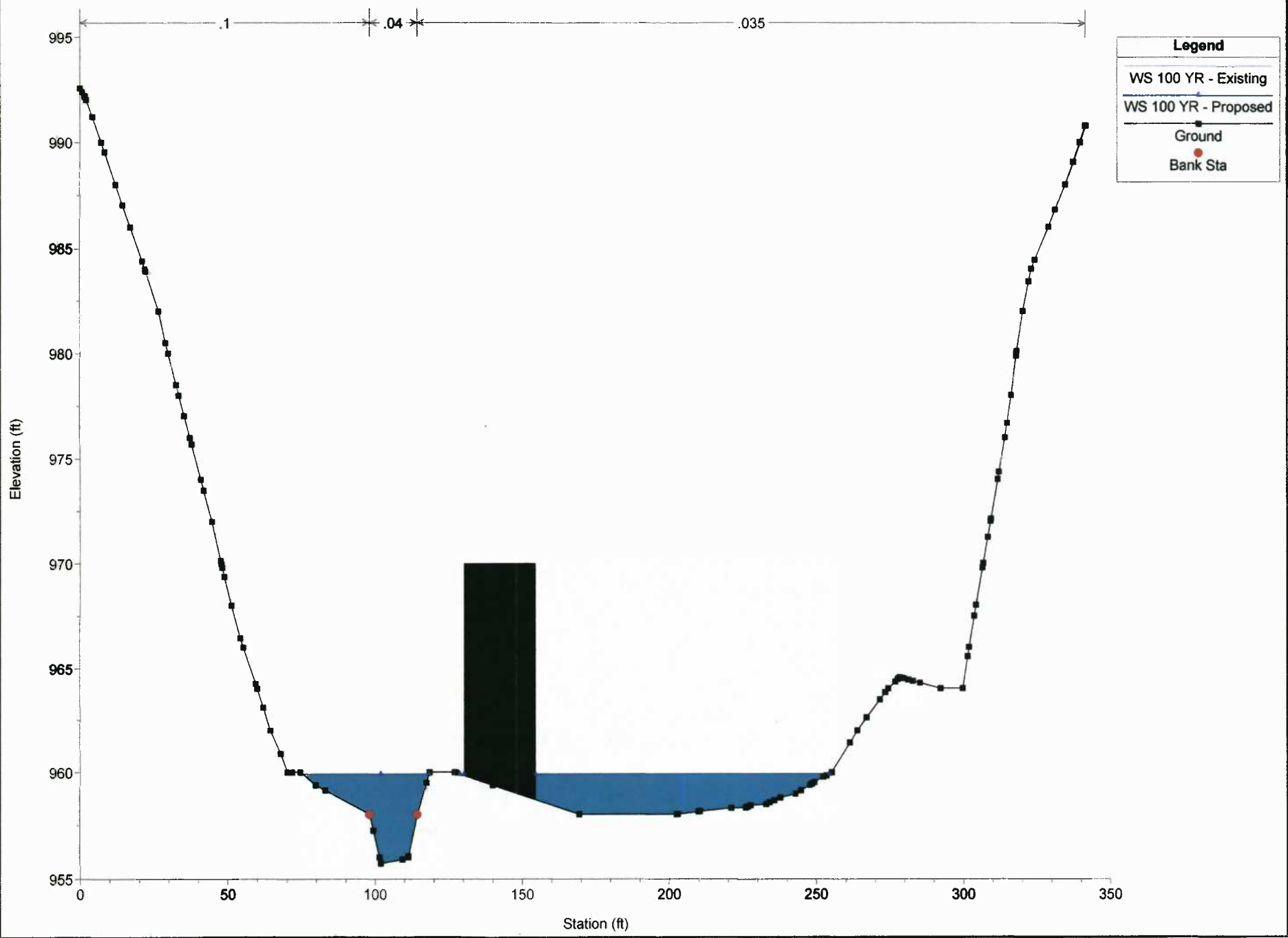


MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

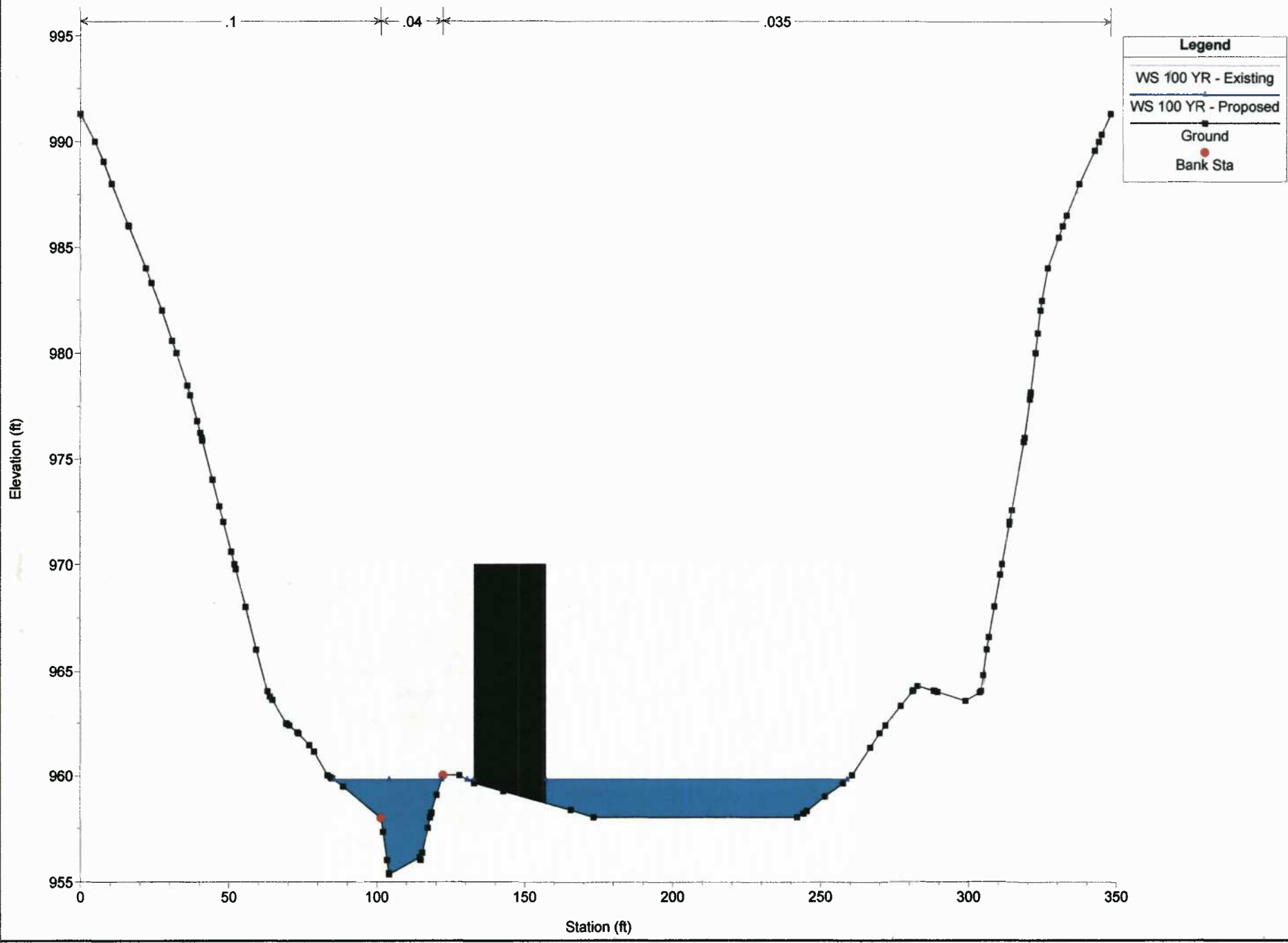


Legend	
WS 100 YR - Existing	Blue shaded area
WS 100 YR - Proposed	Blue shaded area
Ground	Black line with square markers
Bank Sta	Red dot

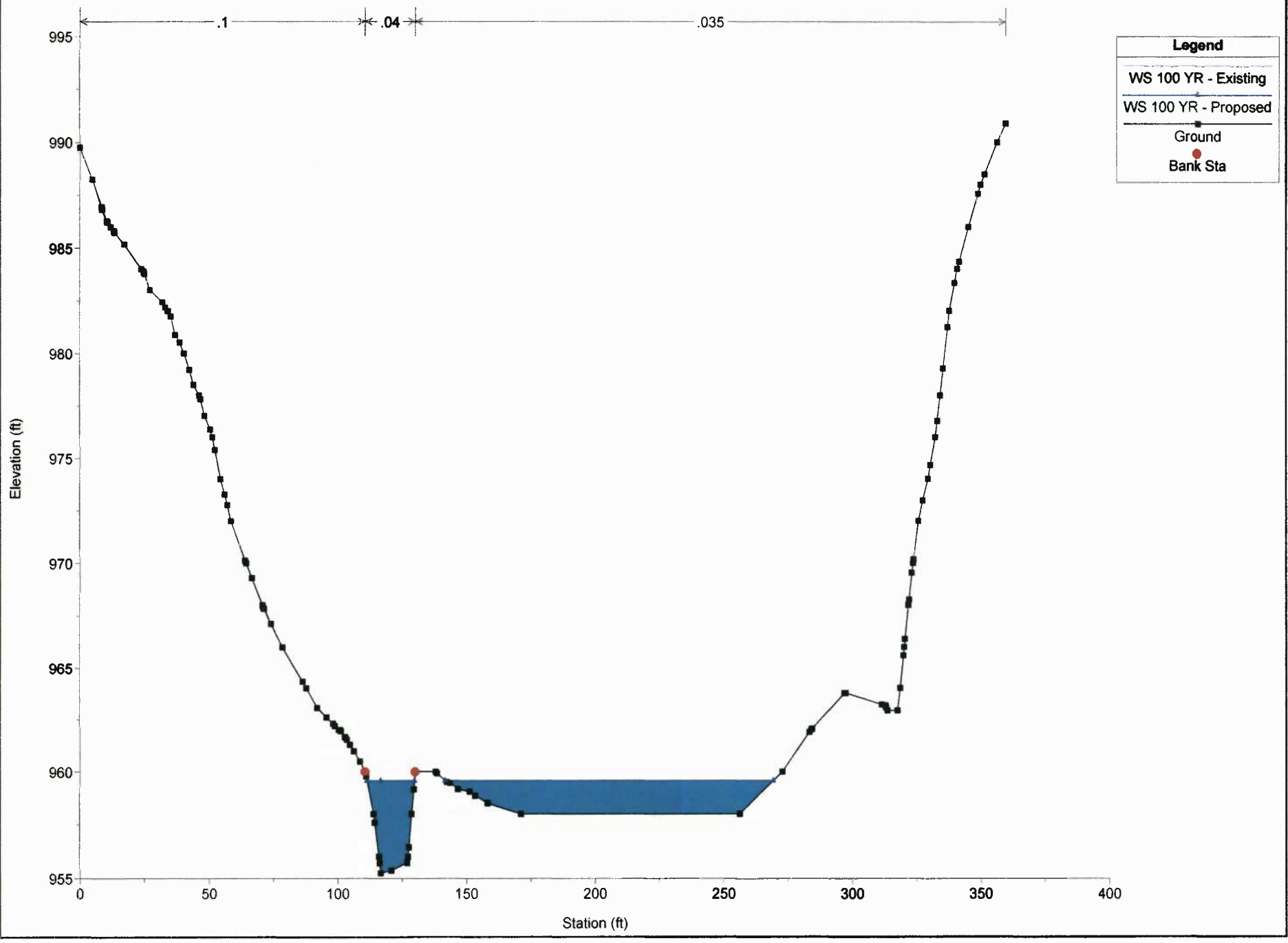
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

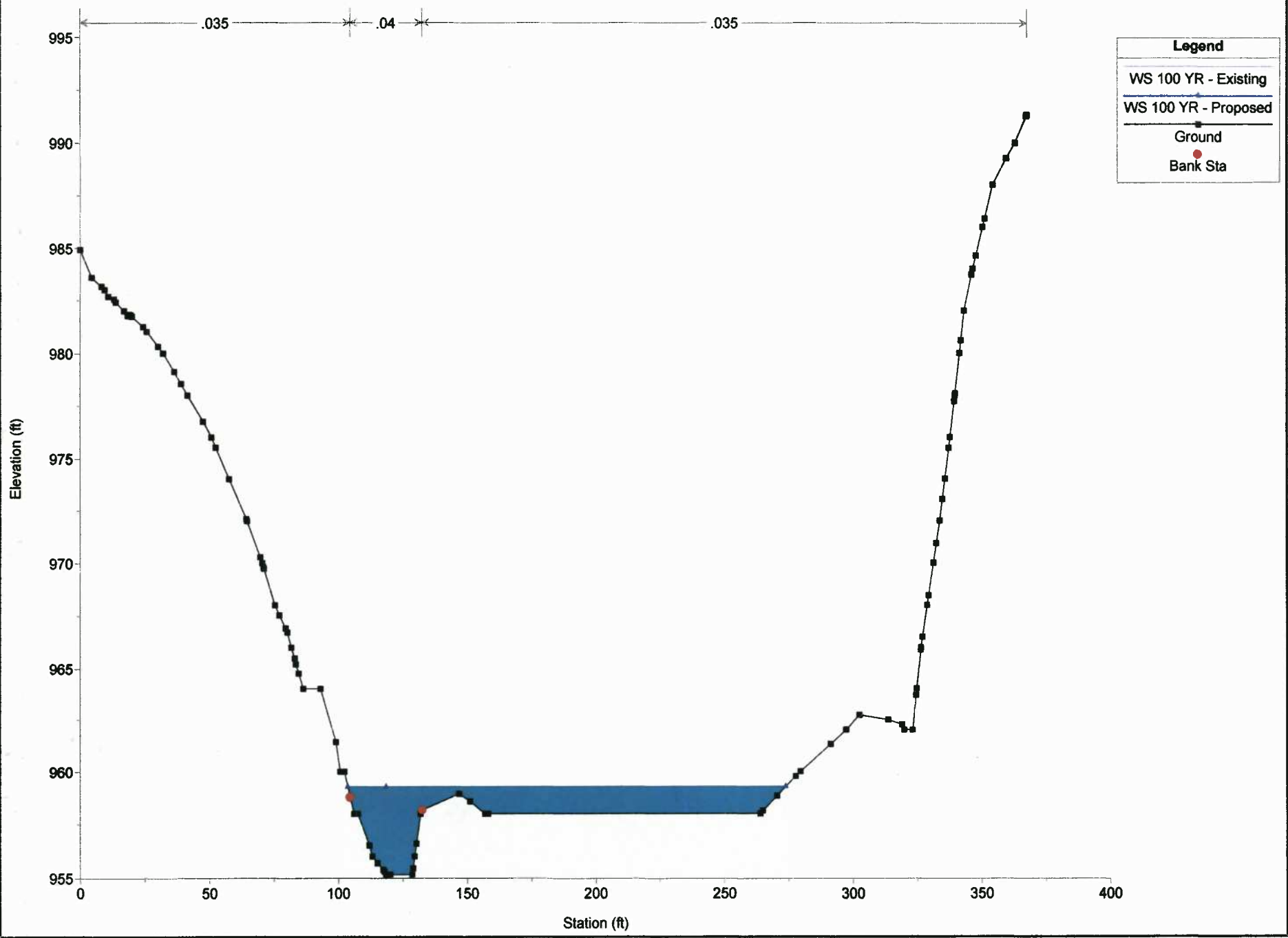


MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

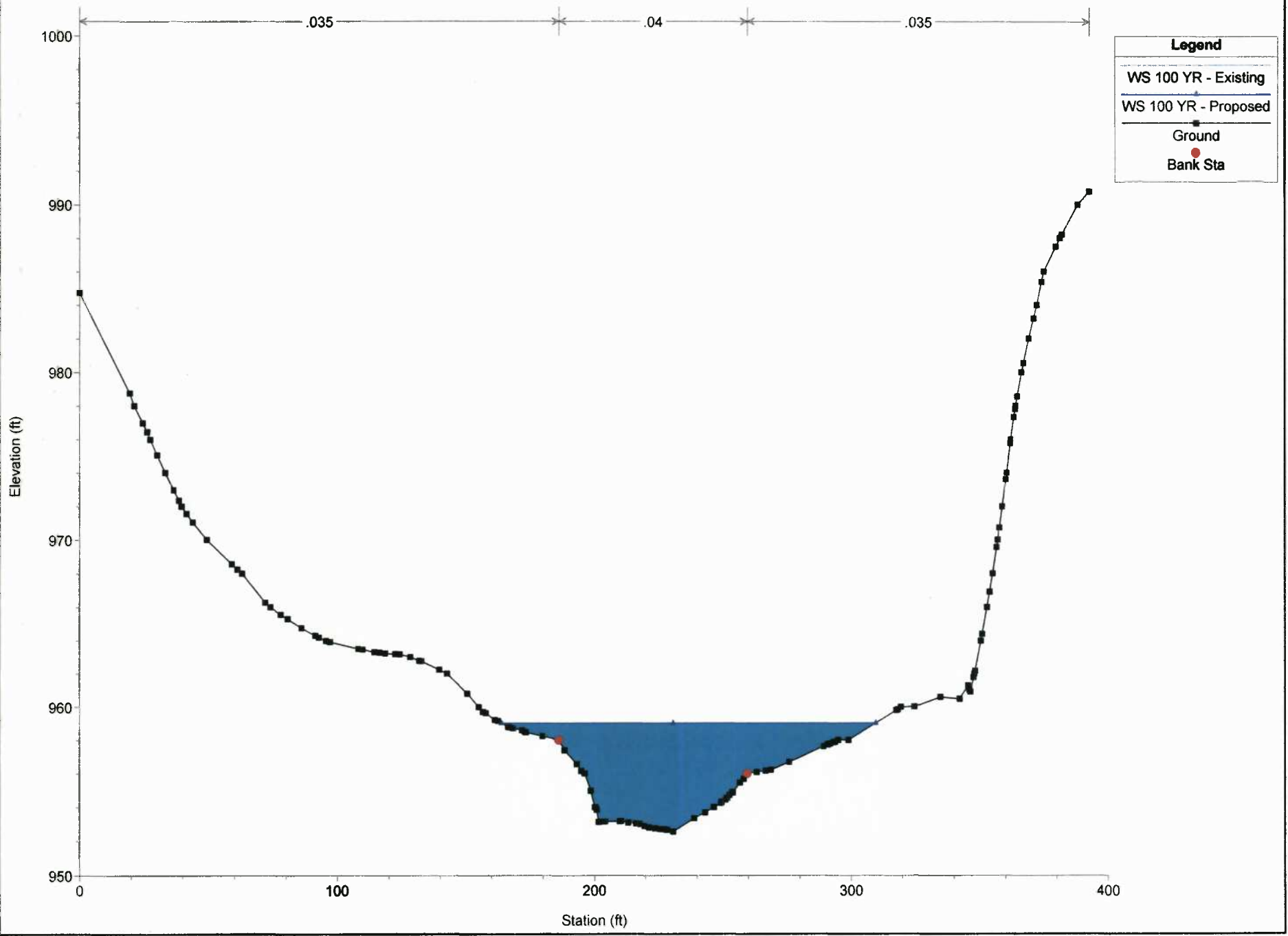


Legend	
WS 100 YR - Existing	—
WS 100 YR - Proposed	—
Ground	■
Bank Sta	●

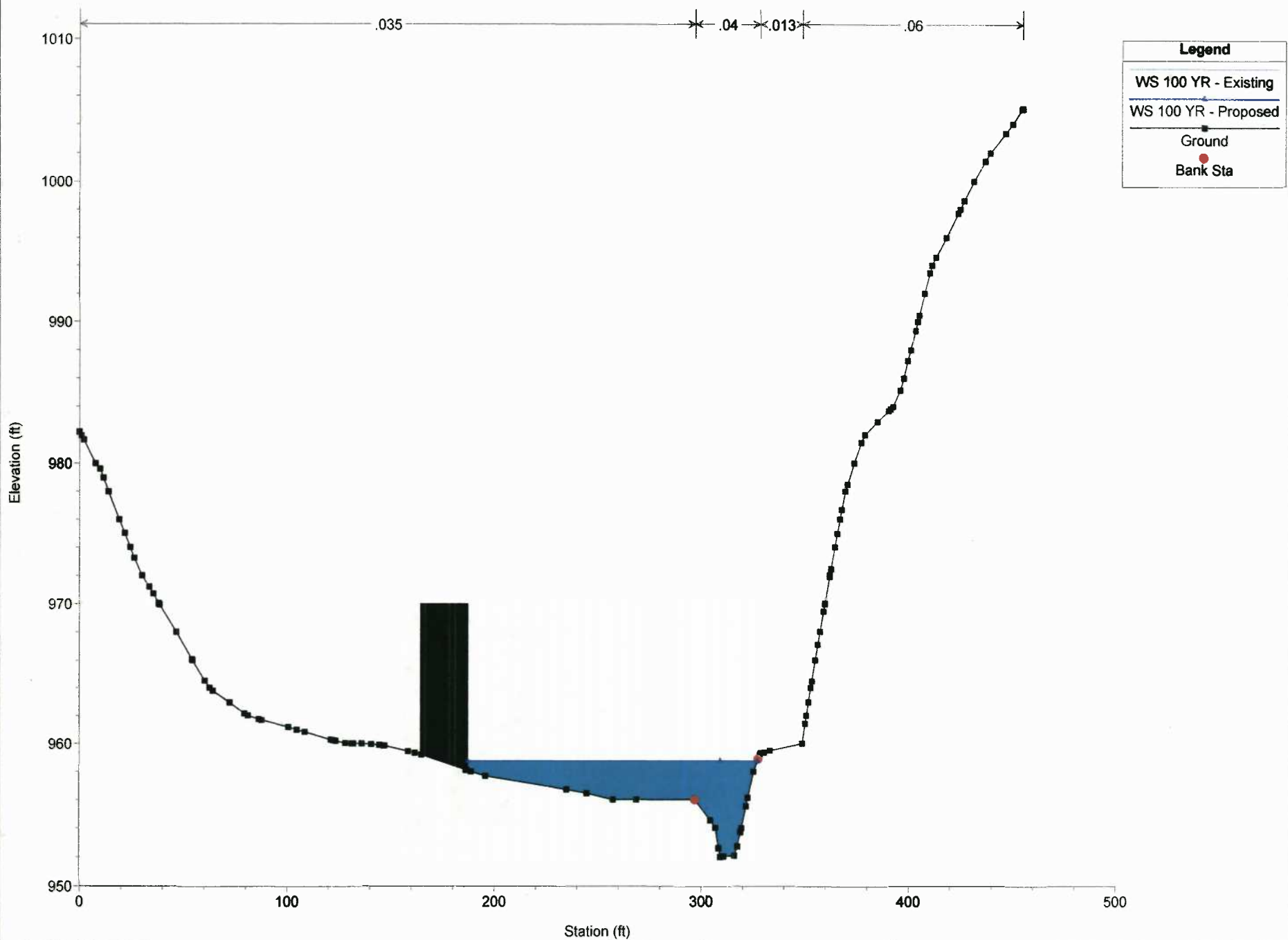
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



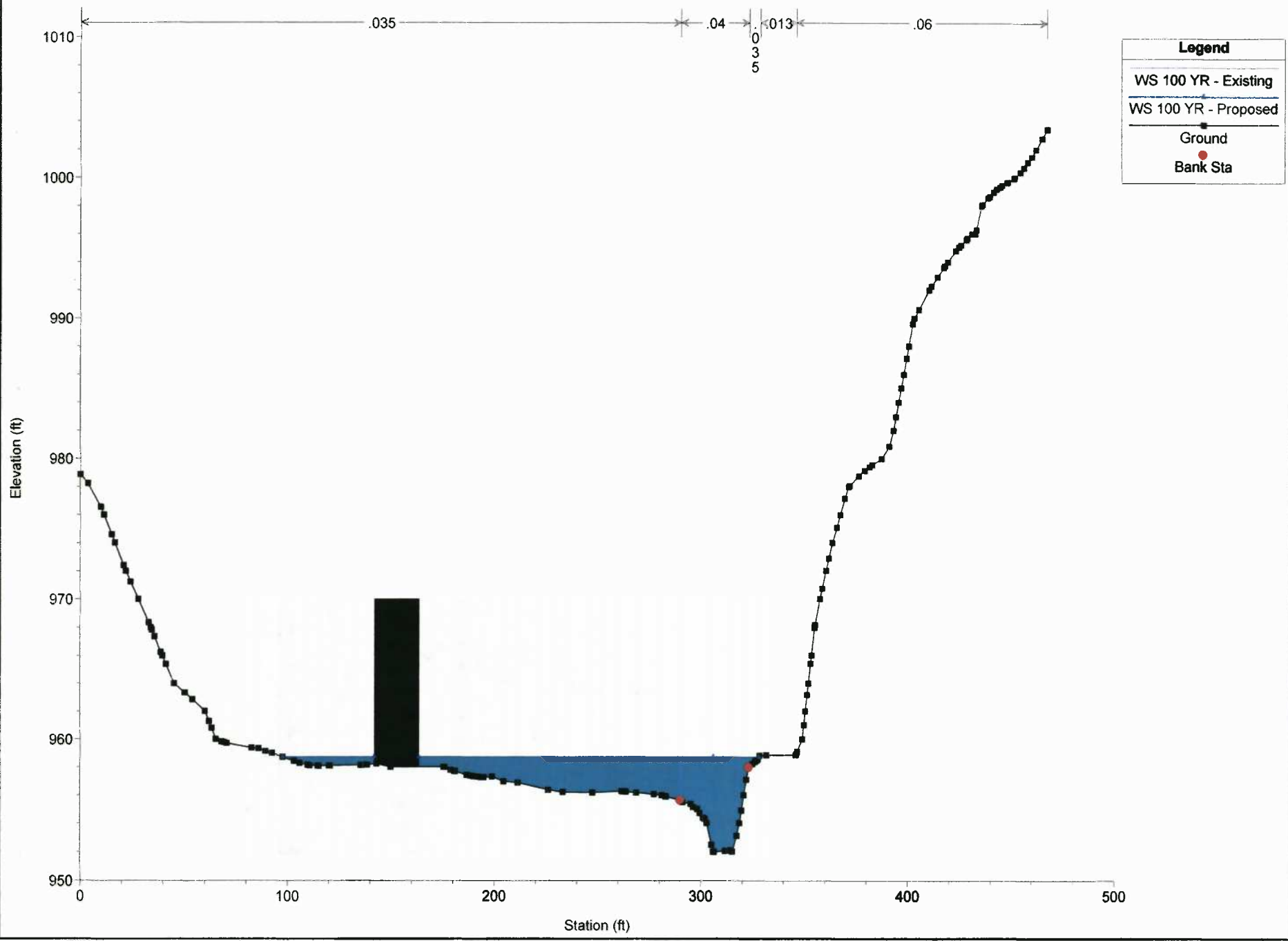
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

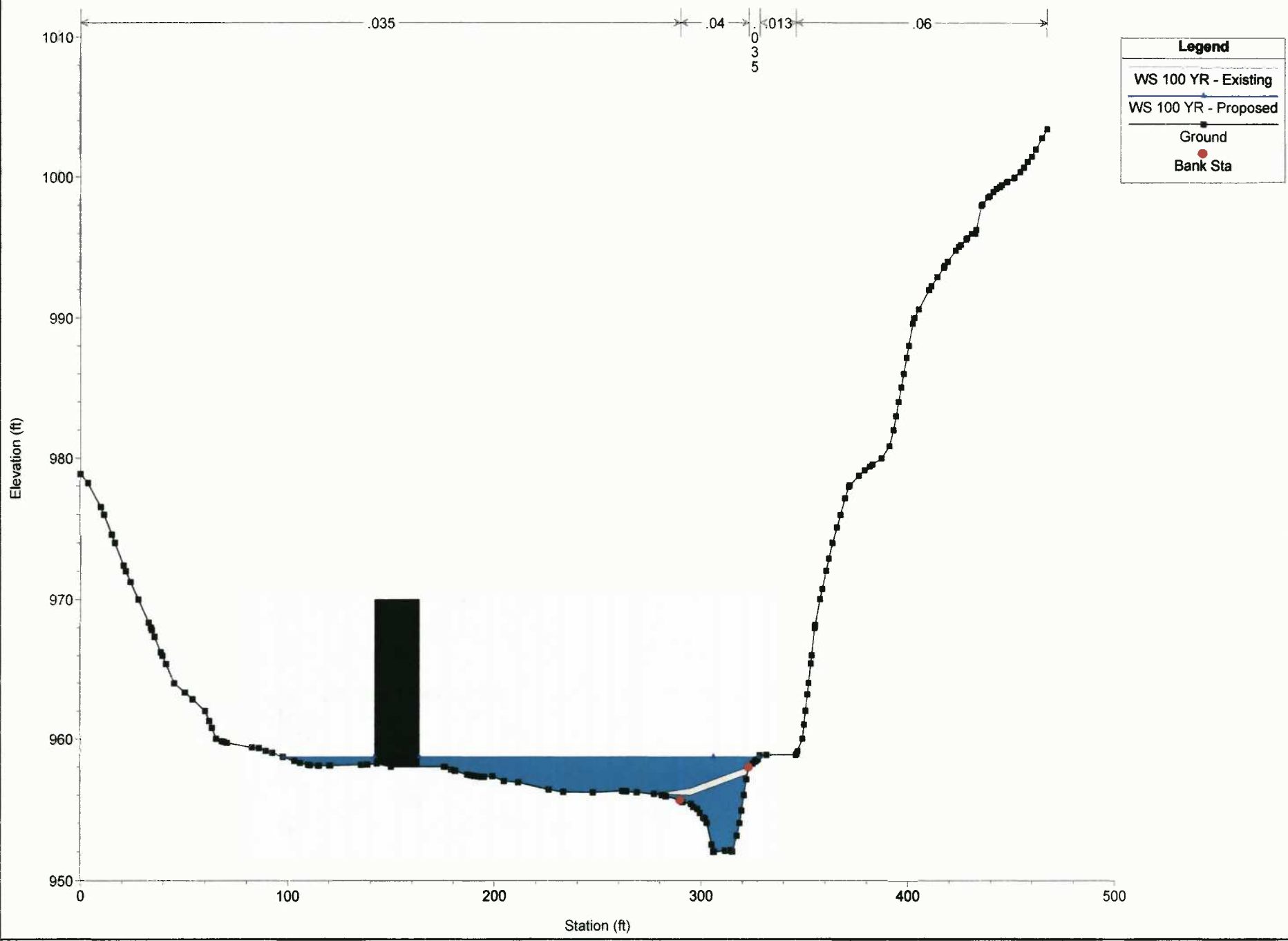


MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

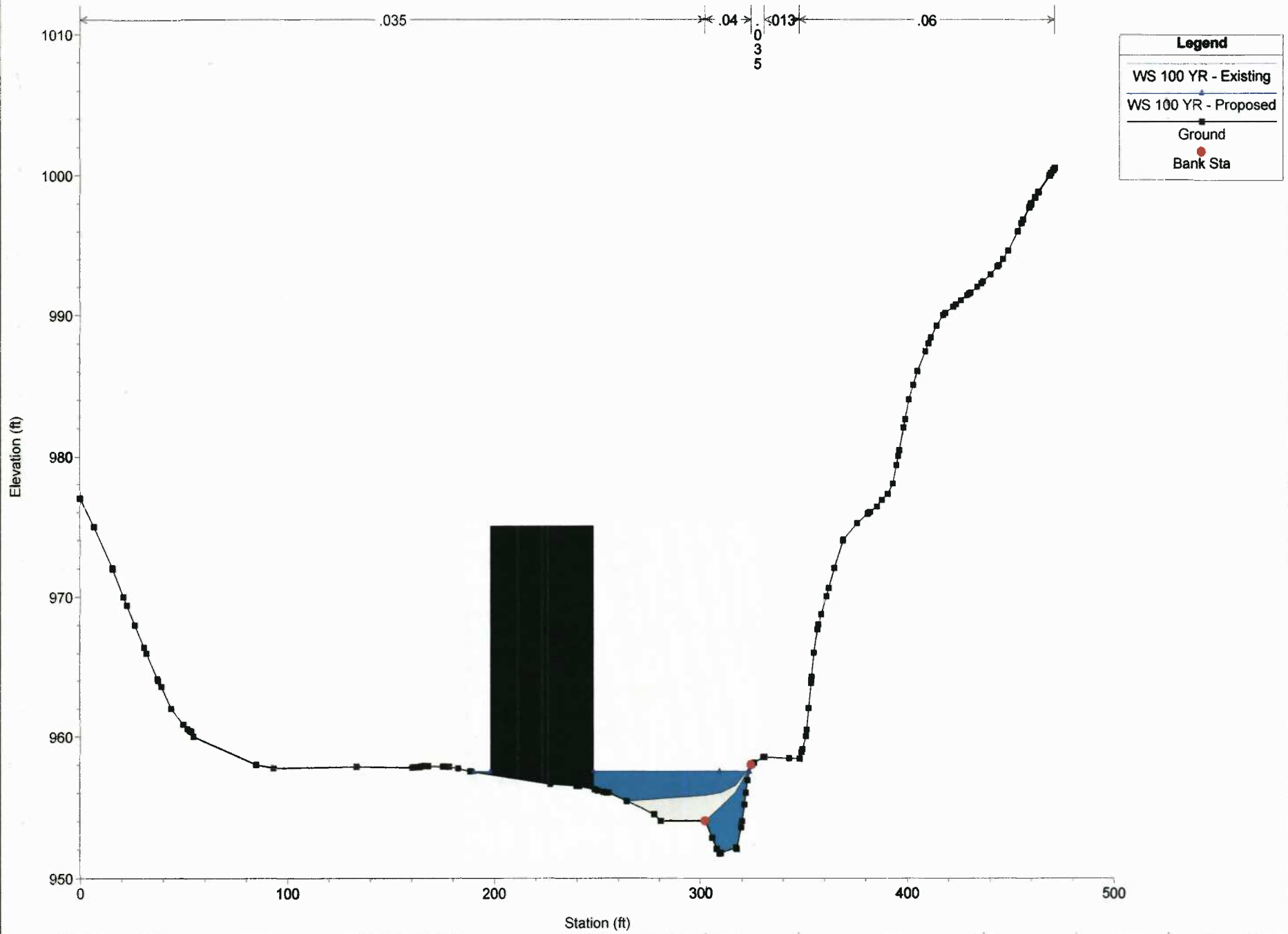


Legend	
WS 100 YR - Existing	(dashed line)
WS 100 YR - Proposed	(solid line)
Ground	(black line with square markers)
Bank Sta	(red dot)

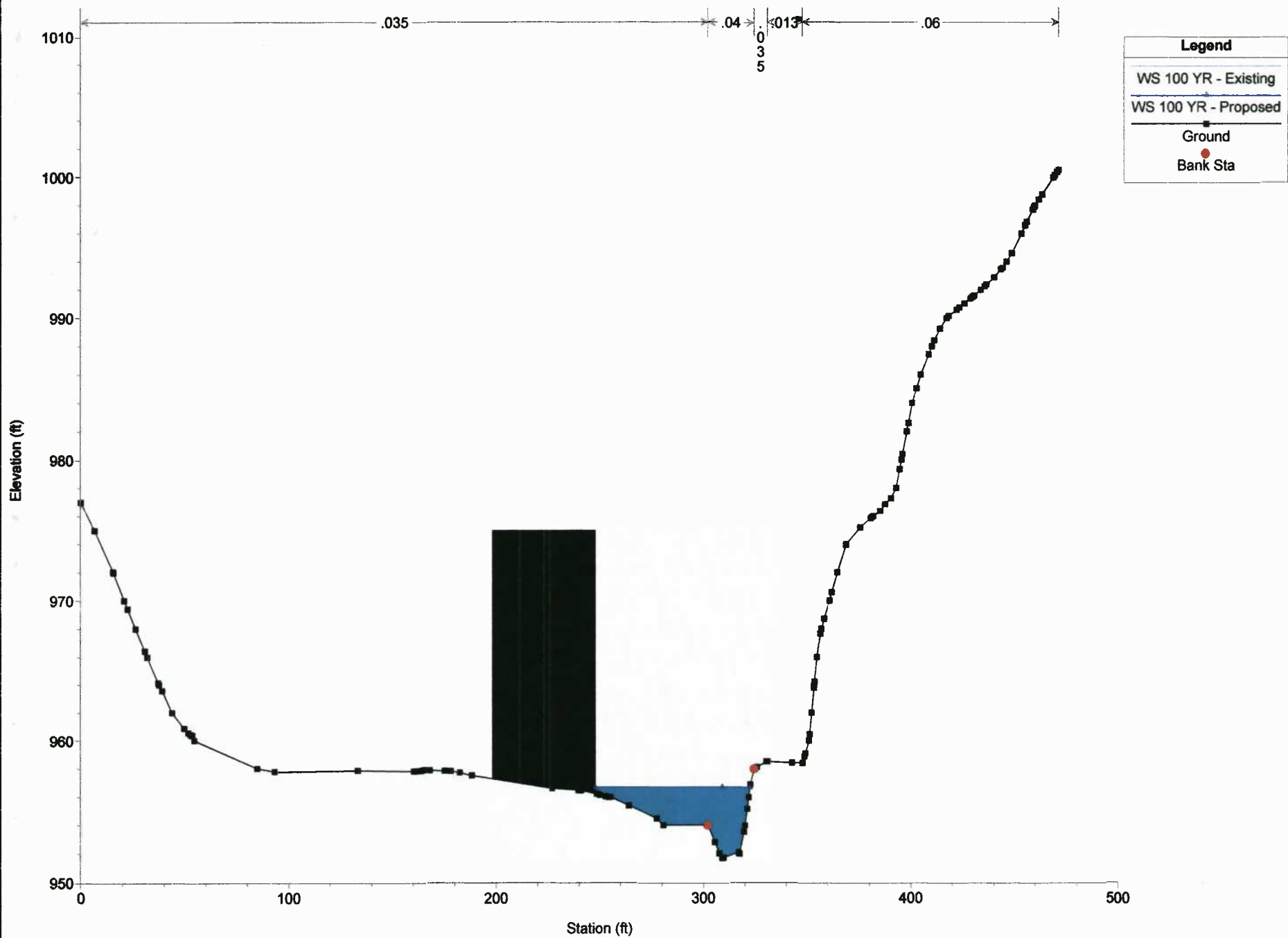
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

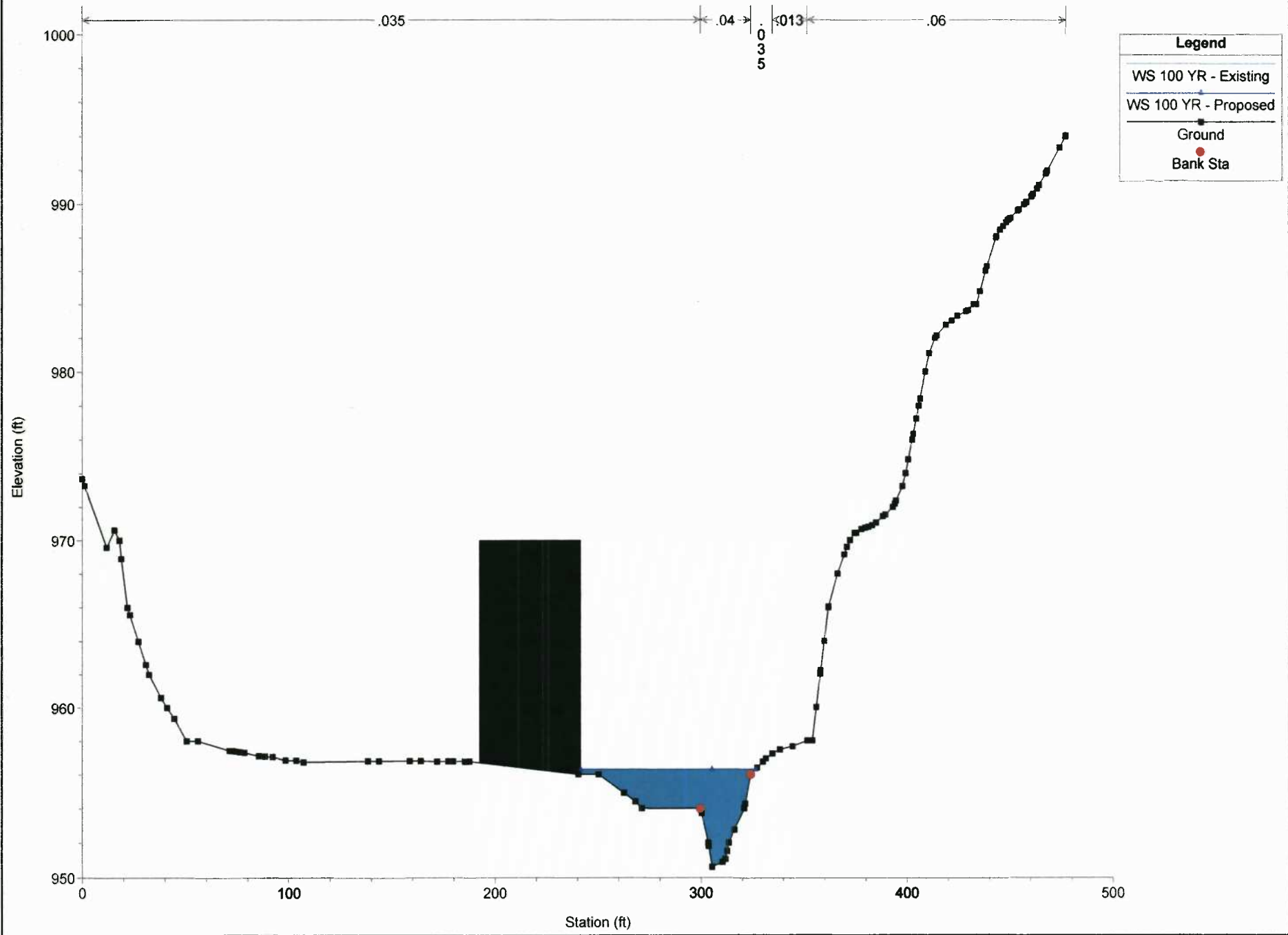


MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

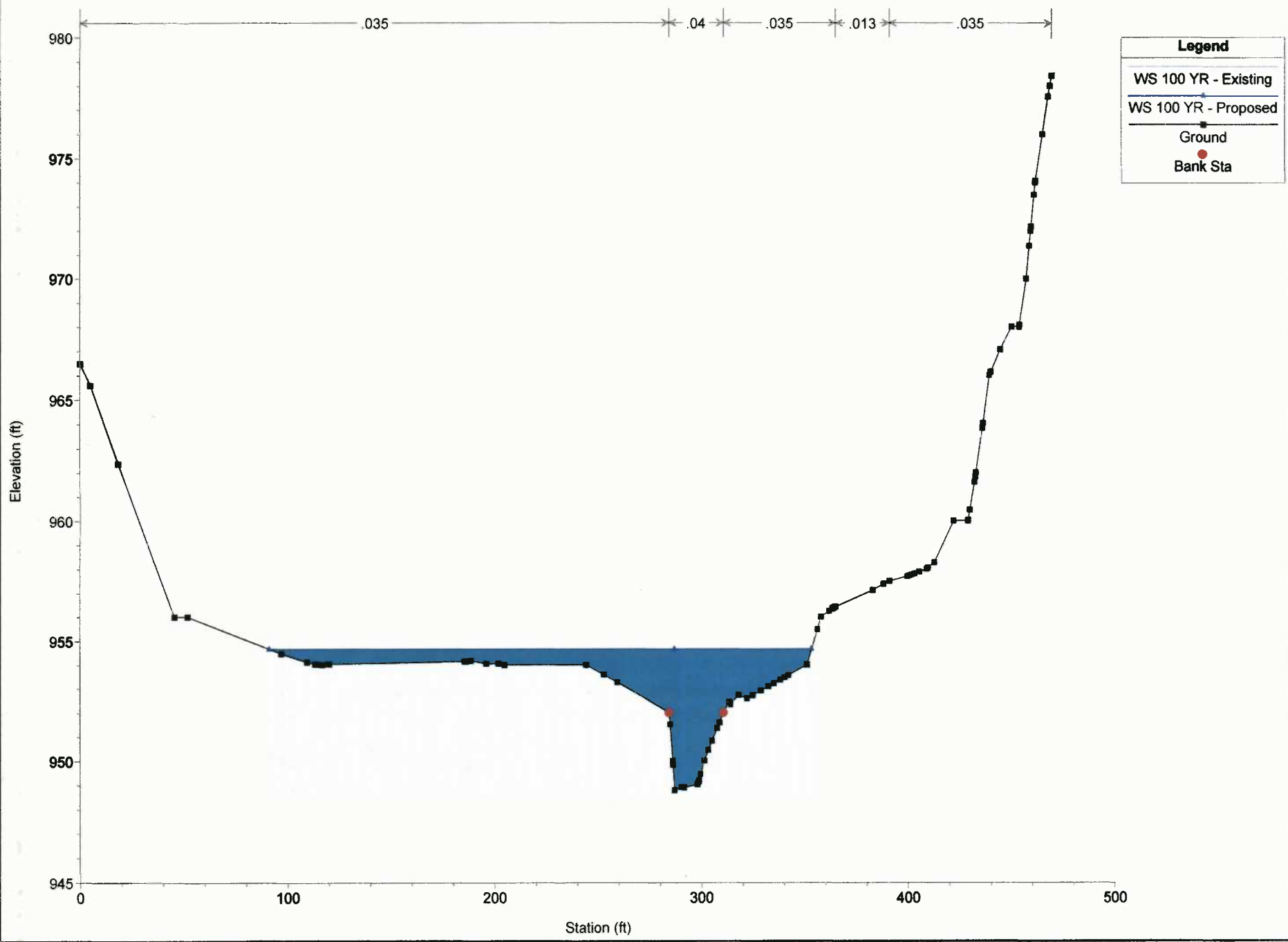


Legend	
WS 100 YR - Existing	(Dashed line)
WS 100 YR - Proposed	(Solid blue line)
Ground	(Black line with square markers)
Bank Sta	(Red dot)

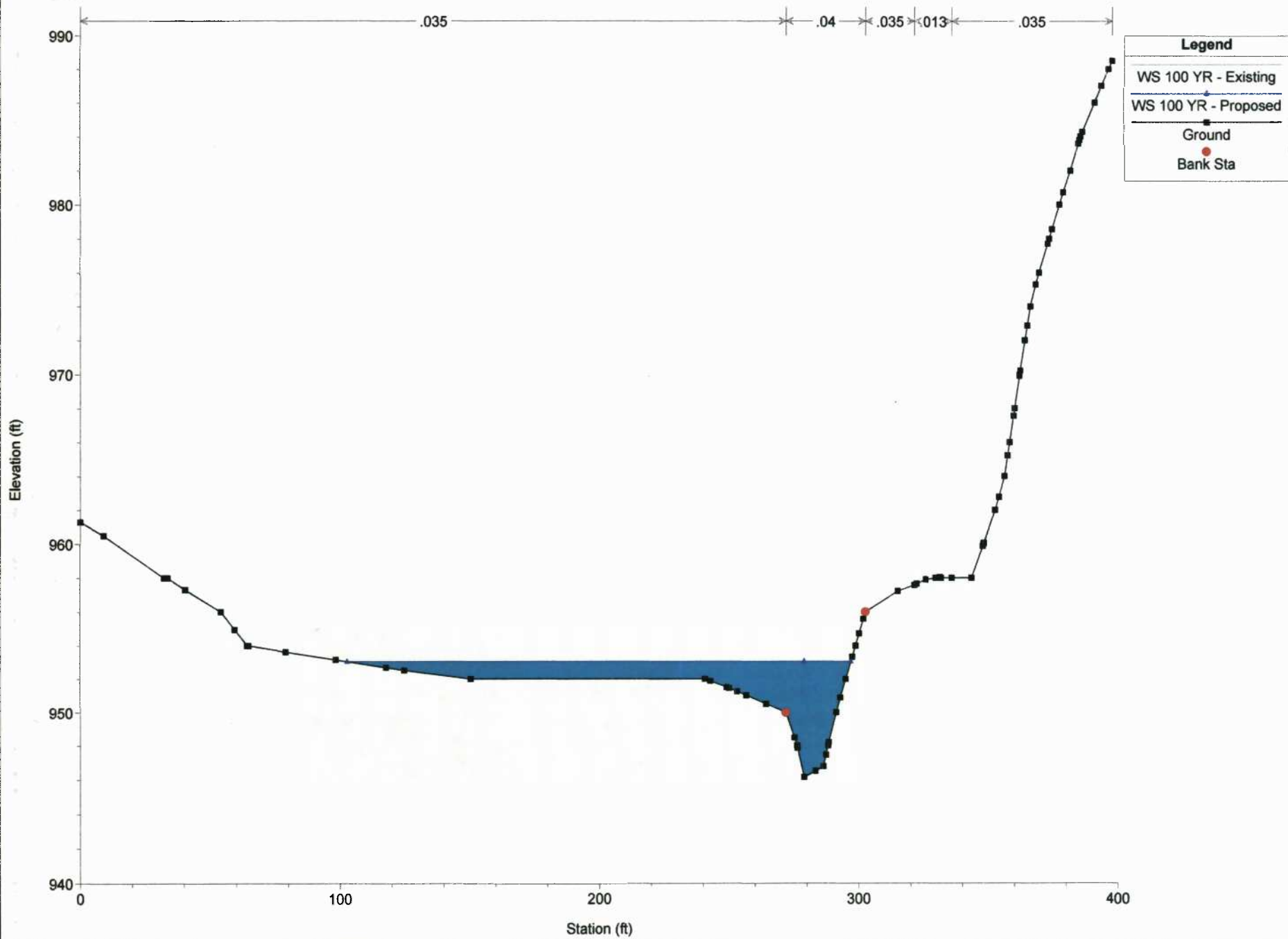
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



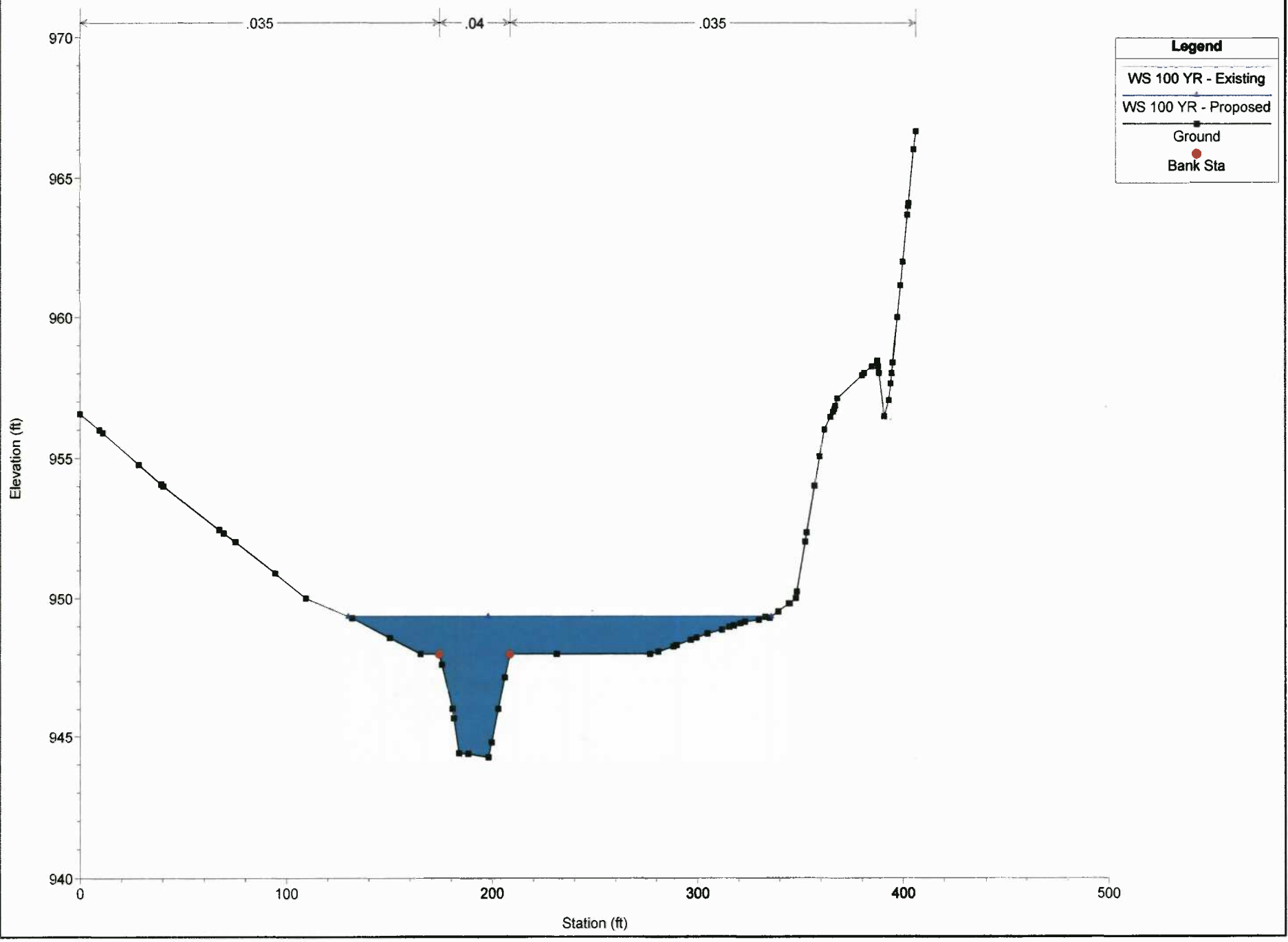
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



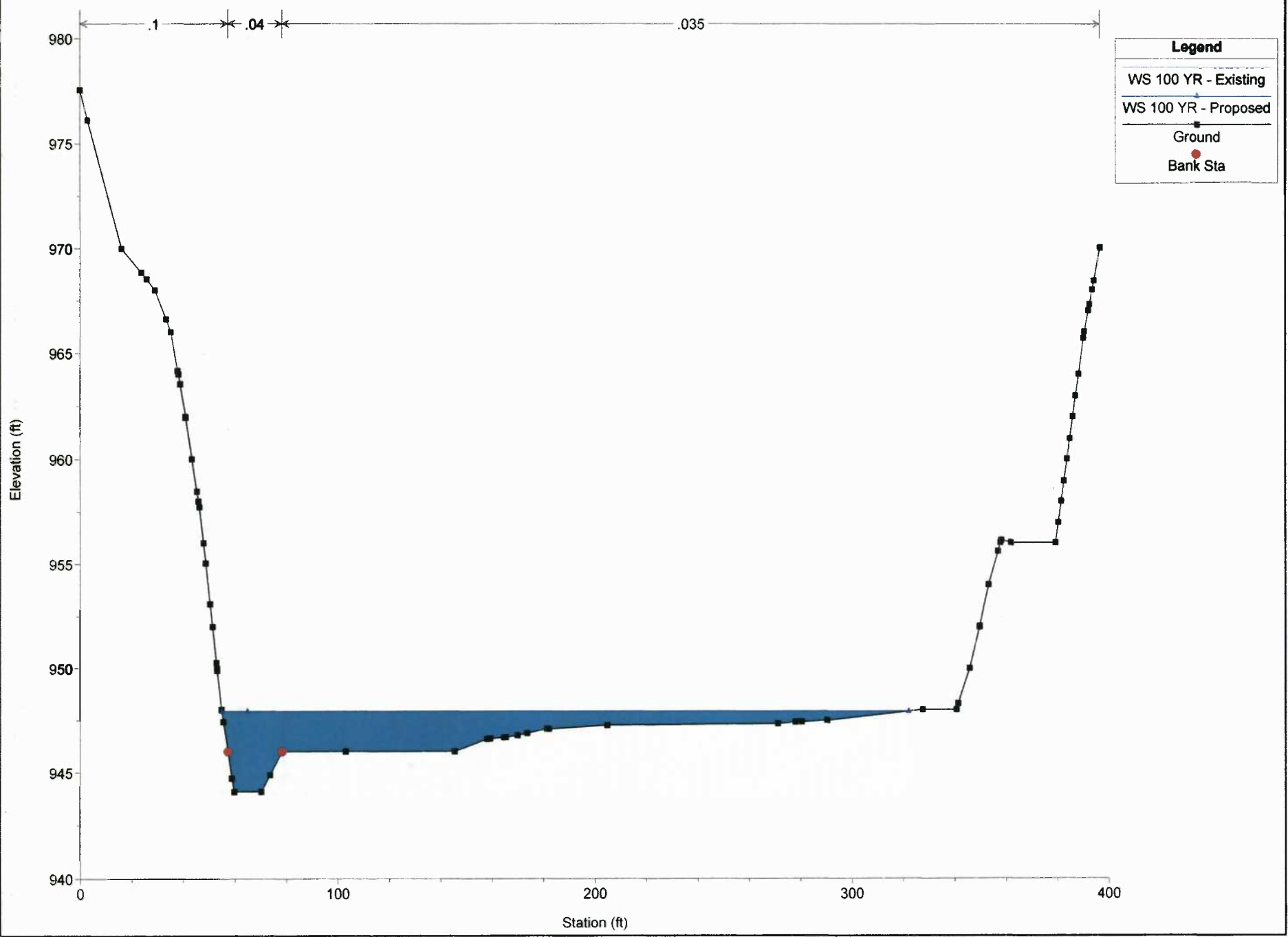
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

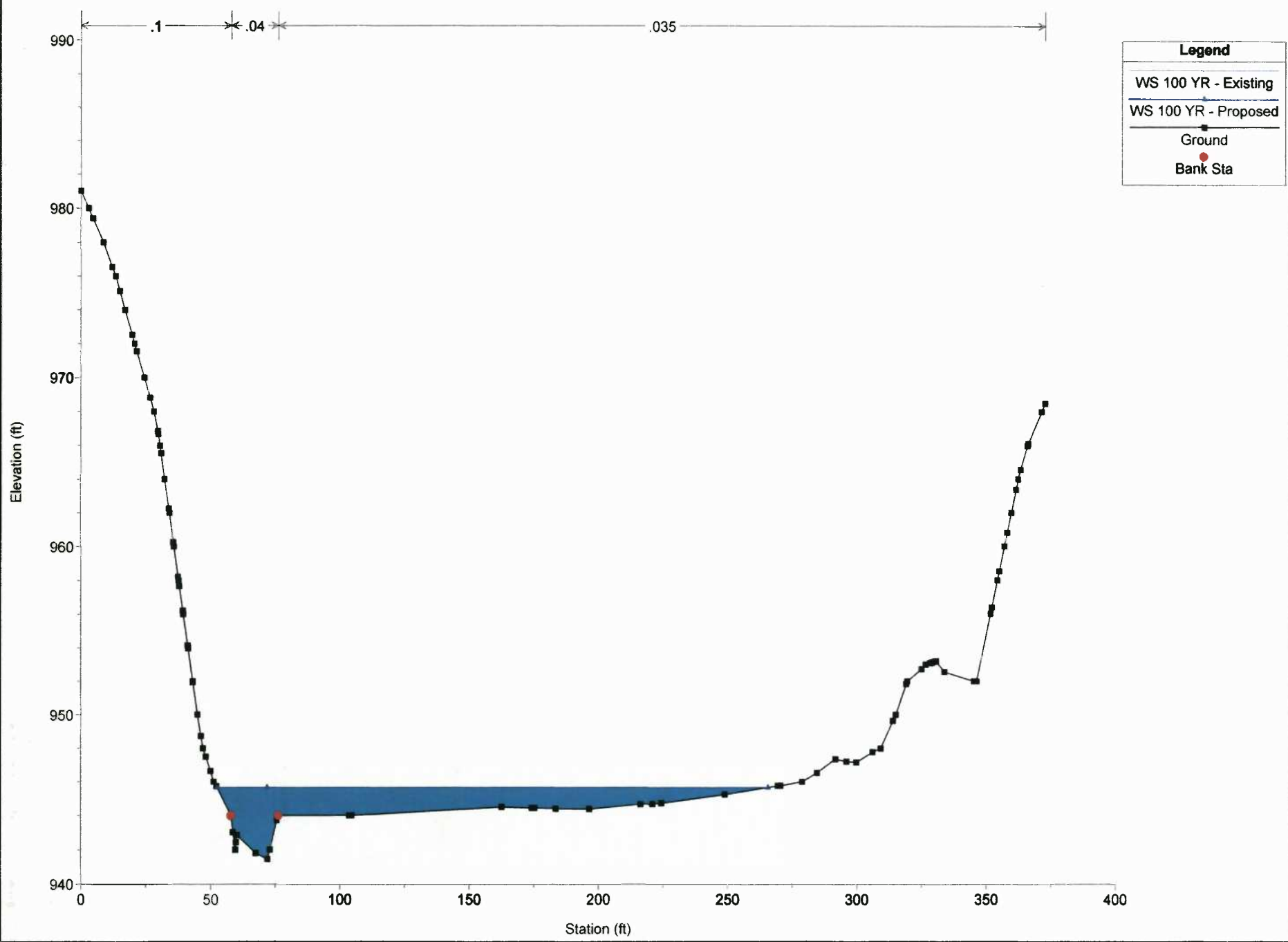


MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

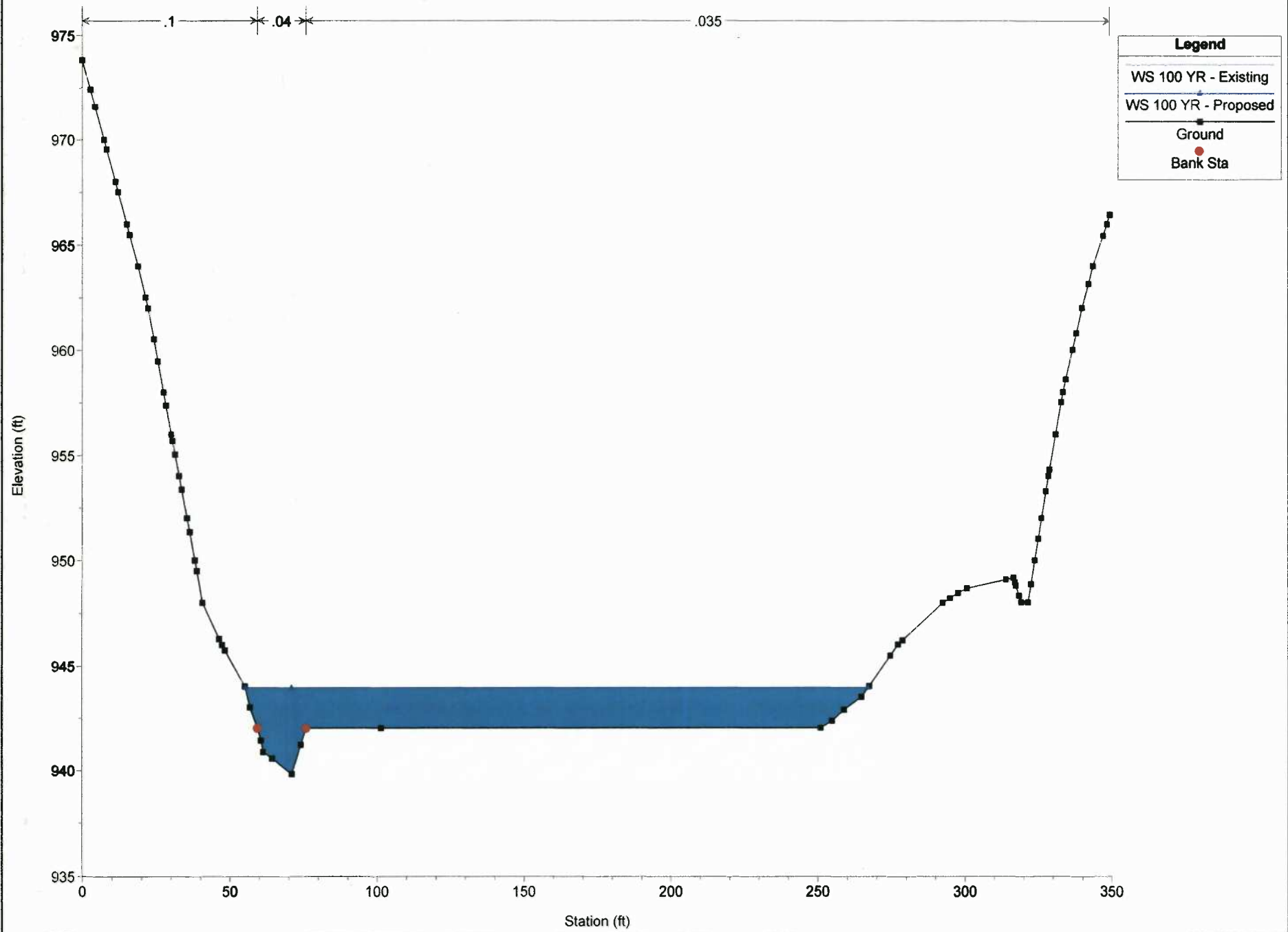


Legend	
WS 100 YR - Existing	—
WS 100 YR - Proposed	—
Ground	■
Bank Sta	●

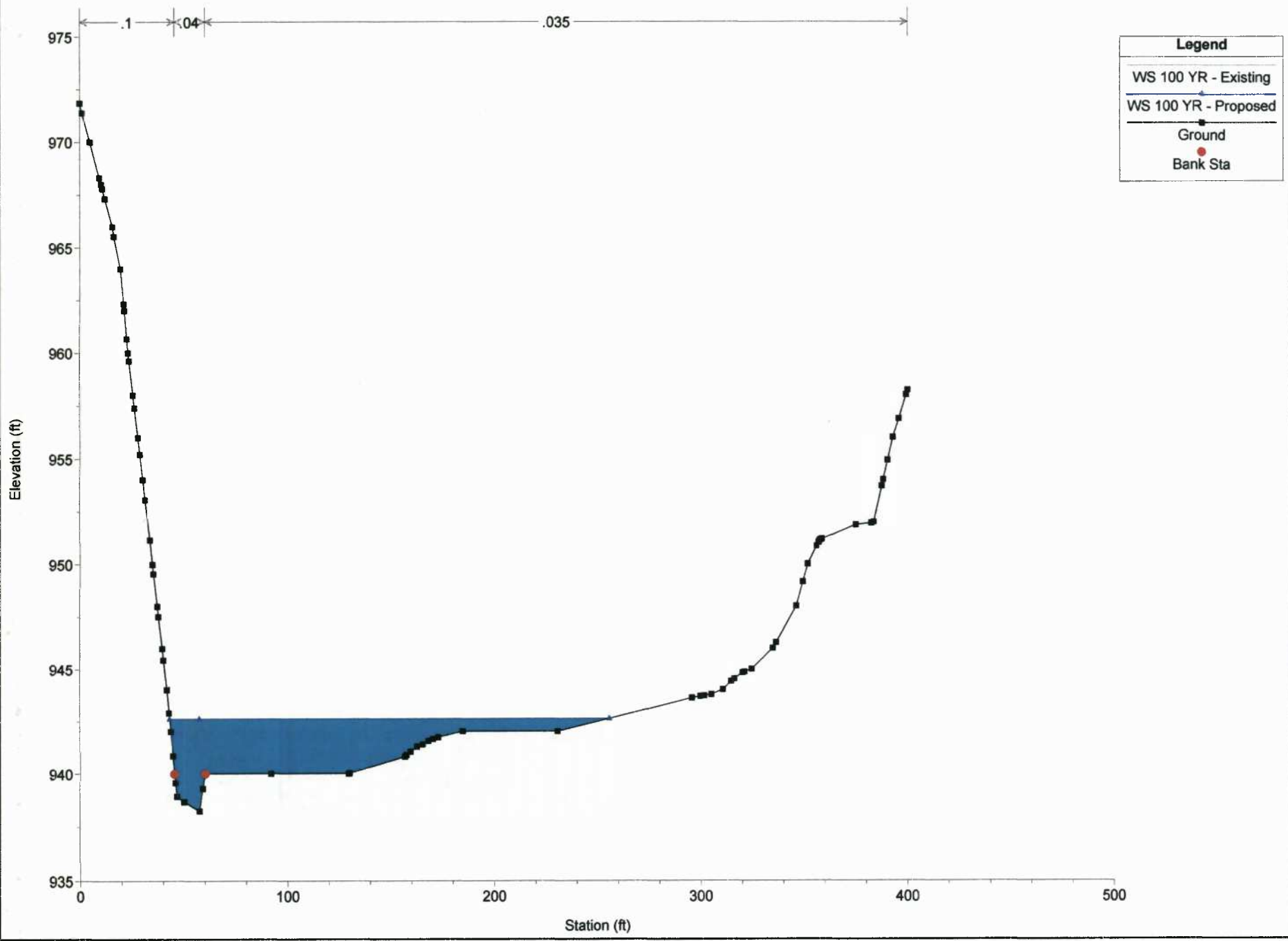
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



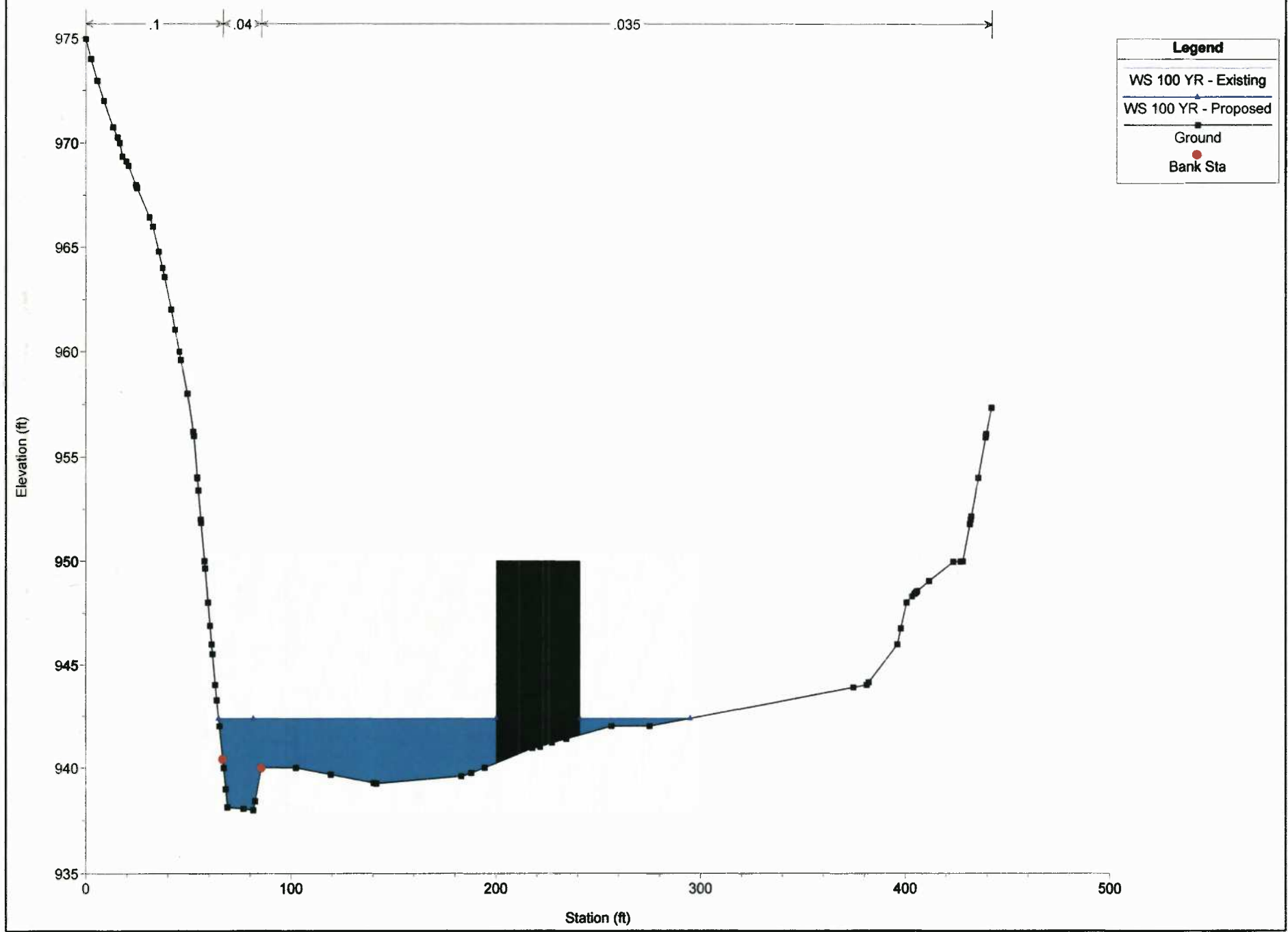
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



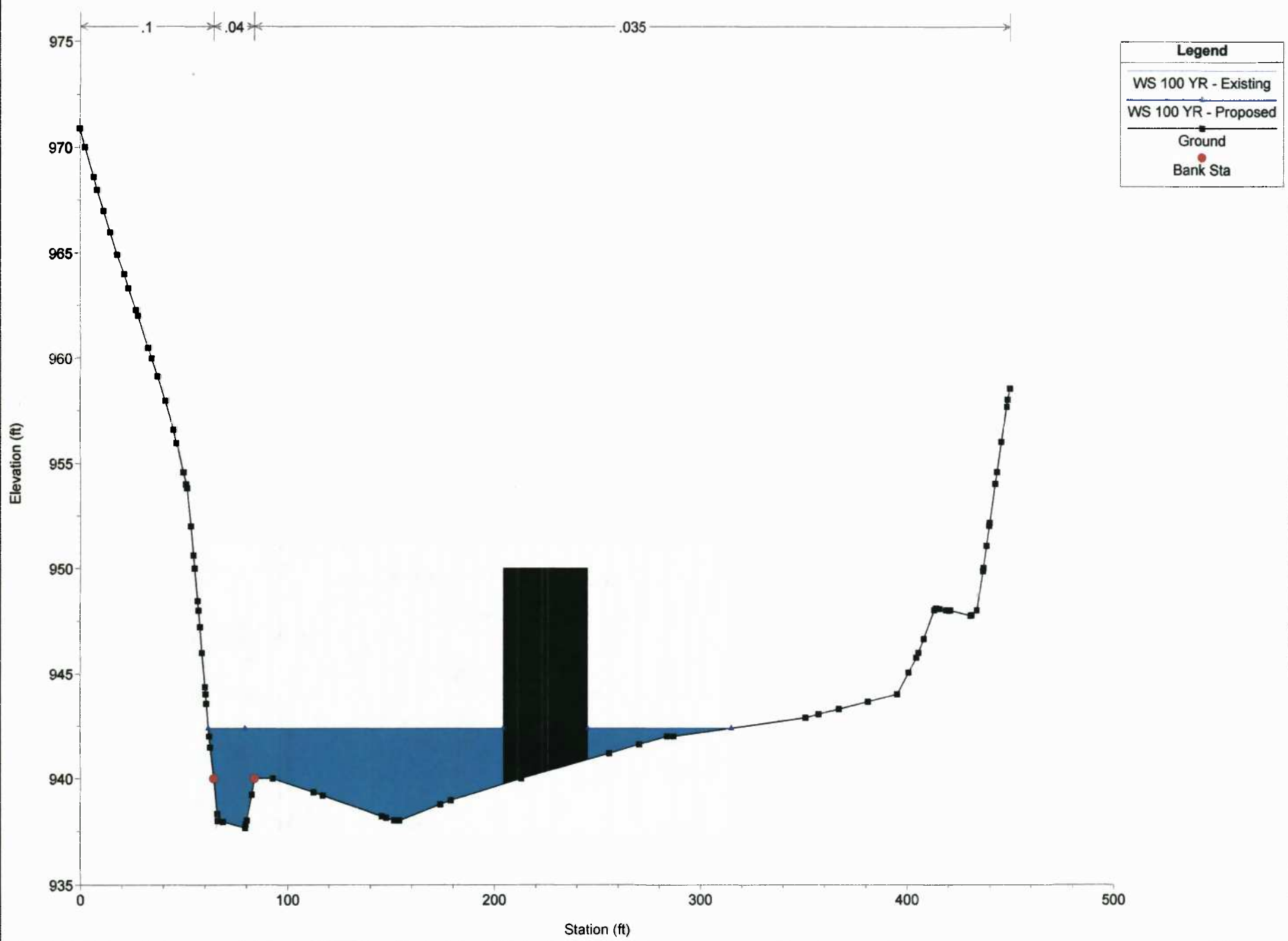
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



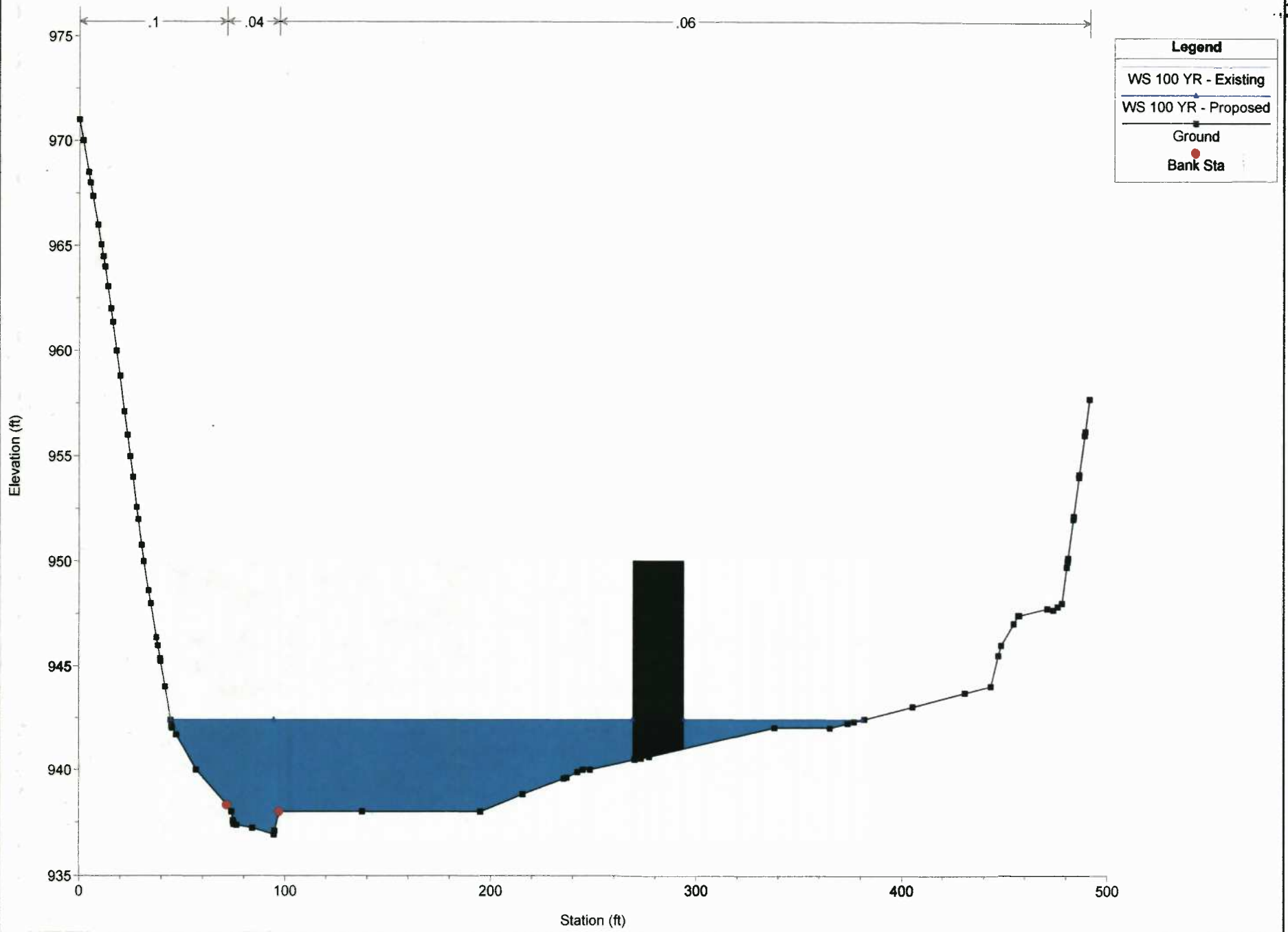
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



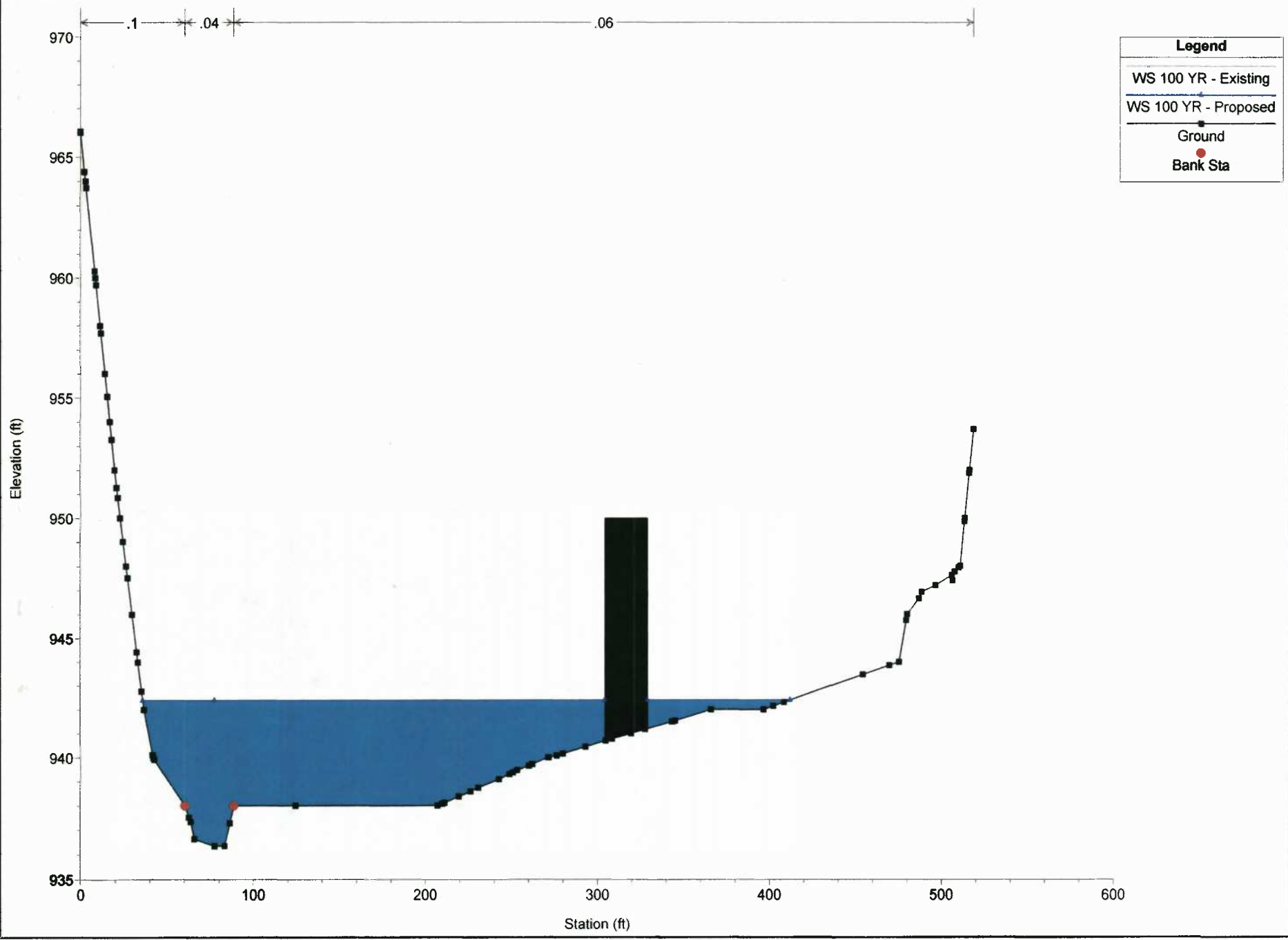
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

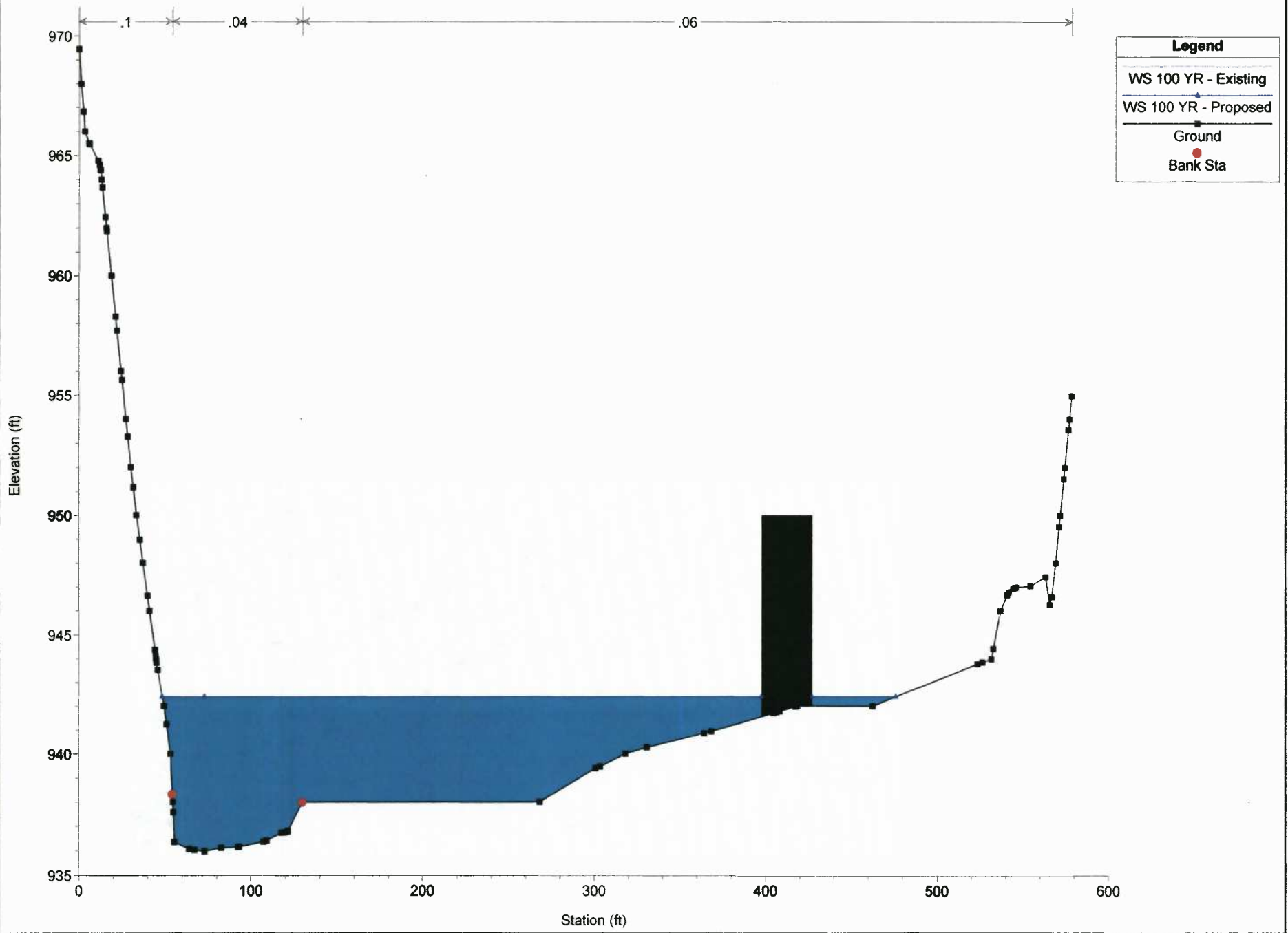


MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

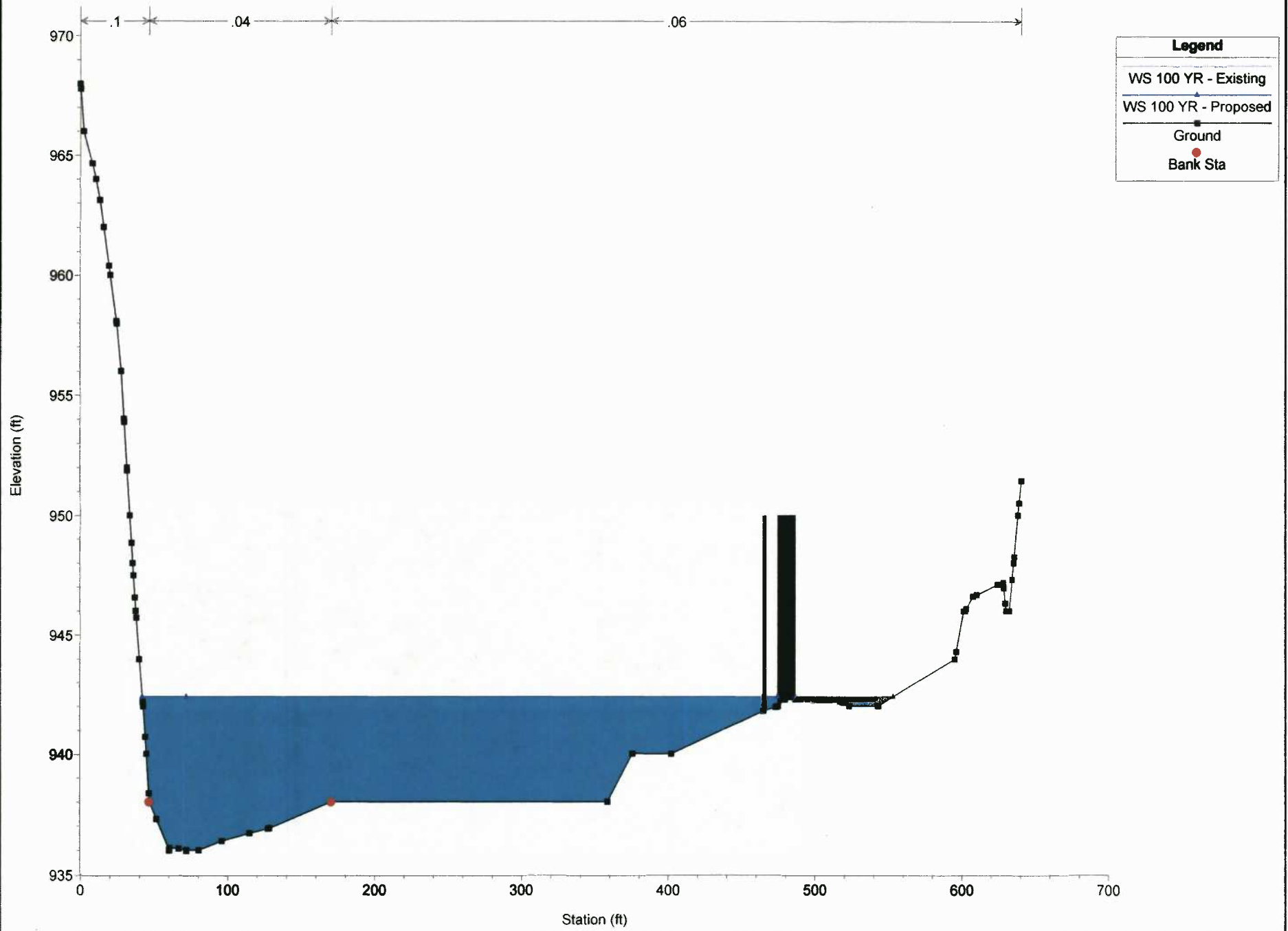


Legend	
—	WS 100 YR - Existing
- - -	WS 100 YR - Proposed
■	Ground
●	Bank Sta

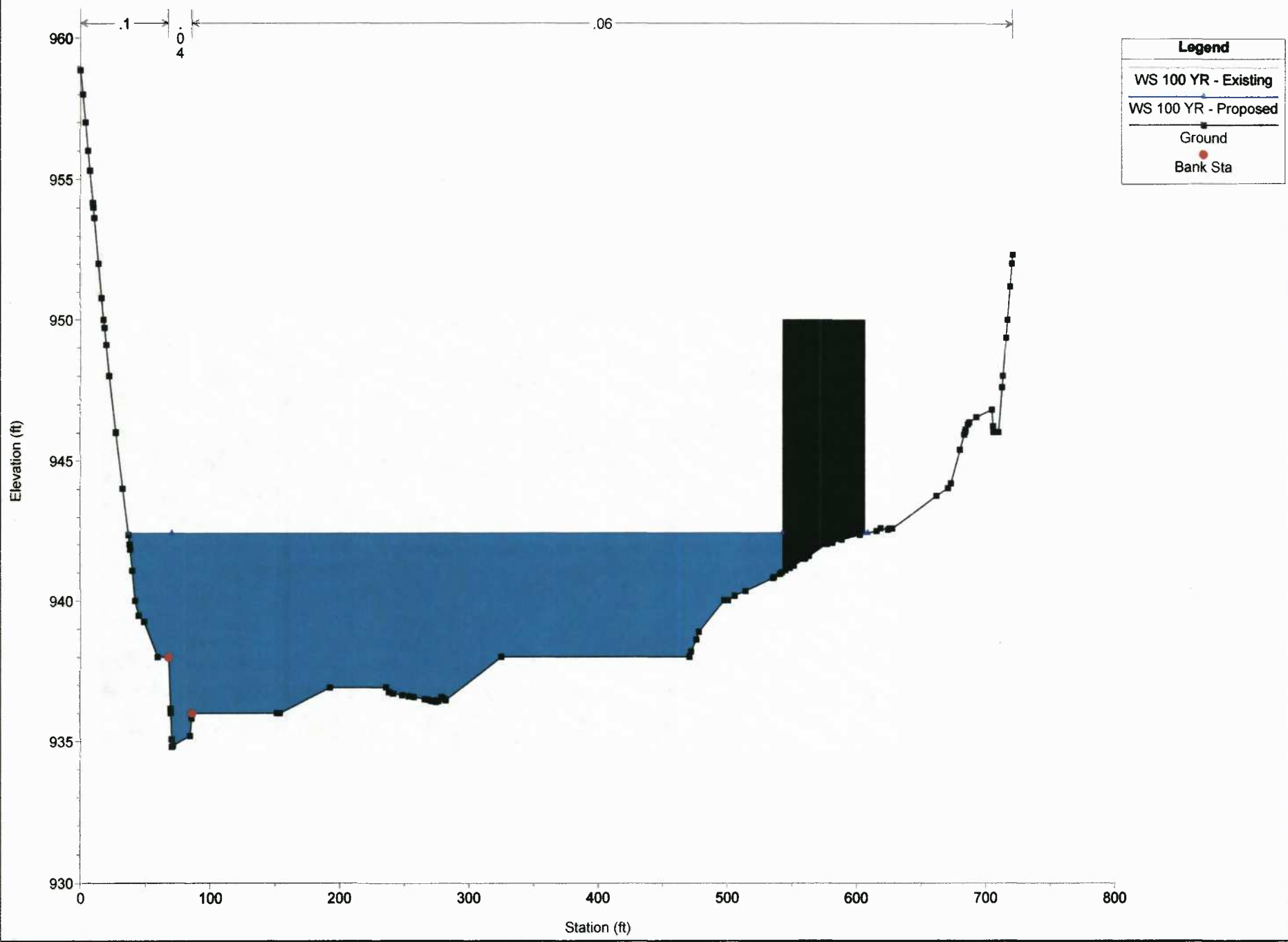
MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

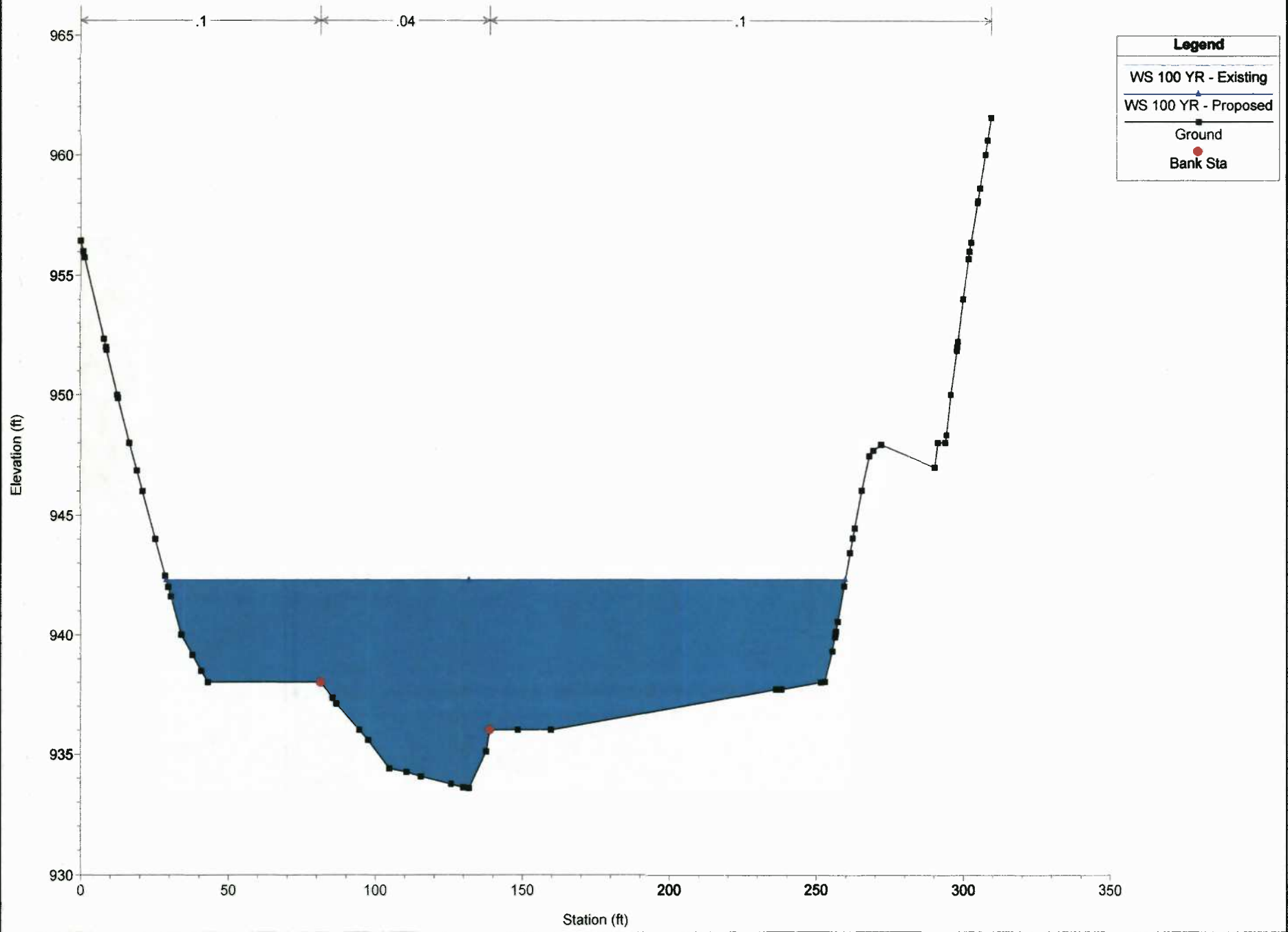


MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

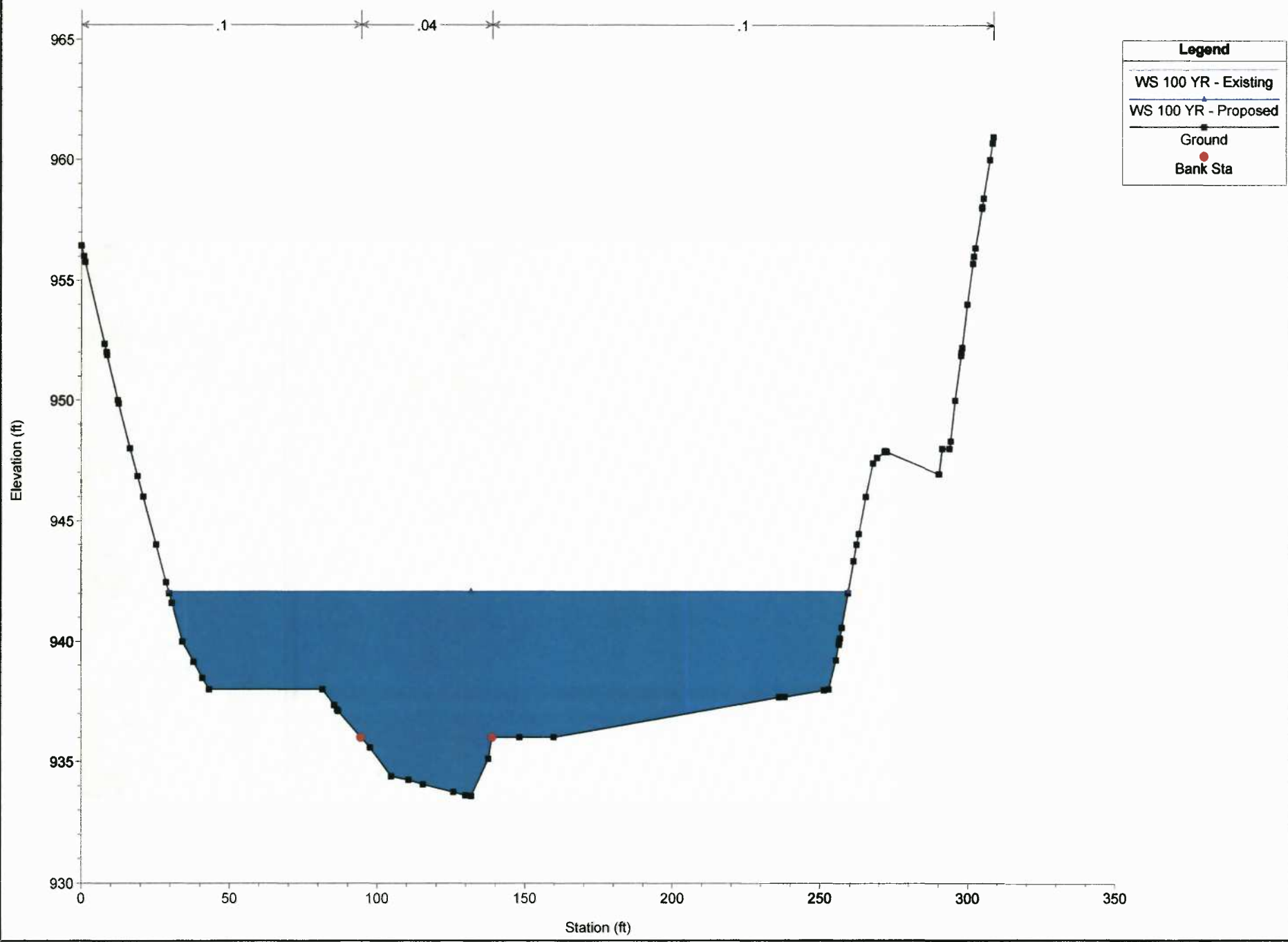


Legend	
WS 100 YR - Existing	(Solid line with square markers)
WS 100 YR - Proposed	(Dashed line with square markers)
Ground	(Solid line with square markers)
Bank Sta	(Red dot)

MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013

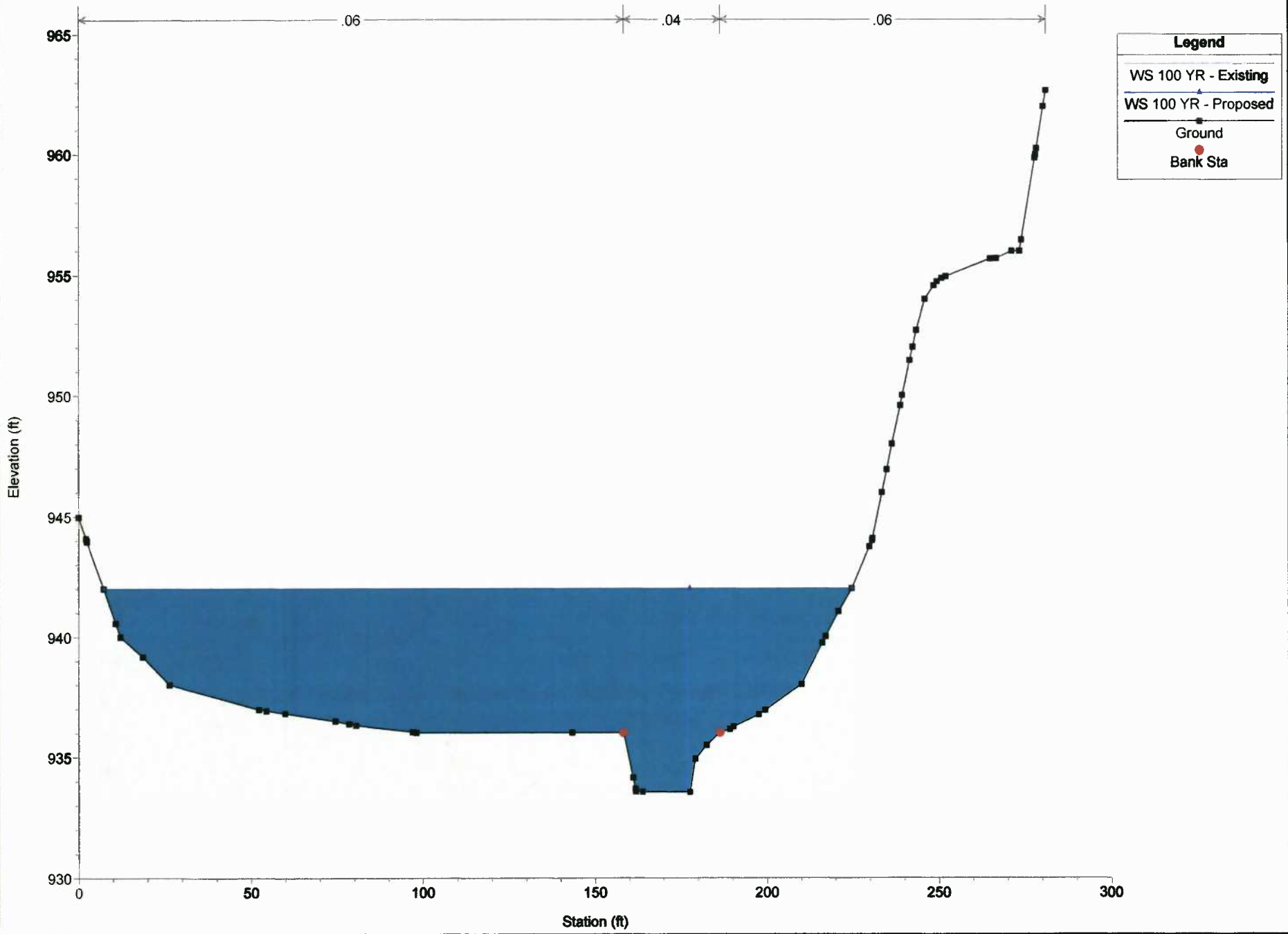


MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



Legend	
WS 100 YR - Existing	— (dashed line)
WS 100 YR - Proposed	— (solid line)
Ground	■ (black square)
Bank Sta	● (red circle)

MEATHOUSE Plan: 1) Existing 5/6/2013 2) Proposed 5/6/2013



CONSTRUCTION AND E&S CONTROL NOTES

CONSTRUCTION NOTES:

- THE CONTRACTOR IS TO VERIFY FIELD CONDITIONS PRIOR TO AND DURING CONSTRUCTION AND WILL NOTIFY NAVIUS ENGINEERING AT (888) 682-4165 IMMEDIATELY IF ANY DISCREPANCIES BETWEEN ACTUAL FIELD CONDITIONS AND THE APPROVED PLAN. ANY WORK PERFORMED BY THE CONTRACTOR AFTER THE FINDING OF SUCH DISCREPANCIES, SHALL BE DONE AT THE CONTRACTOR'S RISK.
- METHODS AND MATERIALS USED IN THE CONSTRUCTION OF THE IMPROVEMENTS HEREIN SHALL CONFORM TO THE CURRENT CONSTRUCTION STANDARDS AND SPECIFICATIONS AND/OR CURRENT WV DEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL STANDARDS AND SPECIFICATIONS. SHOULD A CONFLICT BETWEEN THE DESIGN, SPECIFICATIONS, AND PLANS OCCUR, THE MOST STRINGENT REQUIREMENT WILL APPLY. THE APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE DEVELOPER OR HIS AGENT OF THE RESPONSIBILITIES CONTAINED IN THE WV DEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL.
- AN APPROVED SET OF PLANS AND ALL APPLICABLE PERMITS MUST BE AVAILABLE AT THE CONSTRUCTION SITE. ALSO, A REPRESENTATIVE OF THE DEVELOPER MUST BE AVAILABLE AT ALL TIMES.
- THE CONTRACTOR SHALL PROVIDE ADEQUATE MEANS OF CLEANING MUD FROM TRUCKS AND/OR OTHER EQUIPMENT PRIOR TO ENTERING PUBLIC STREETS, AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO CLEAN STREETS, ALLAY DUST, AND TO TAKE WHATEVER MEASURES ARE NECESSARY TO INSURE THAT THE STREETS ARE MAINTAINED IN A CLEAN, MUD AND DUST FREE CONDITION AT ALL TIMES.
- THE LOCATION OF EXISTING UTILITIES SHOWN IN THESE PLANS ARE FROM FIELD LOCATIONS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UTILITIES AS NEEDED PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL INFORM THE ENGINEER OF ANY CONFLICTS ARISING FROM HIS EXISTING UTILITY VERIFICATION AND THE PROPOSED CONSTRUCTION.
- THE CONTRACTOR SHALL PROVIDE NOTIFICATION TO THE APPROPRIATE UTILITY COMPANY PRIOR TO CONSTRUCTION OF WATER AND/OR GAS PIPE LINES. INFORMATION SHOULD ALSO BE OBTAINED FROM THE APPROPRIATE AUTHORITY CONCERNING PERMITS, CUT SHEETS, AND CONNECTIONS TO EXISTING LINES.
- THE CONTRACTOR WILL BE RESPONSIBLE FOR THE REPAIR OF ANY DAMAGES TO THE EXISTING STREETS AND UTILITIES WHICH OCCURS AS A RESULT OF HIS CONSTRUCTION PROJECT WITHIN OR CONTIGUOUS TO THE EXISTING RIGHT-OF-WAY.
- WHEN GRADING IS PROPOSED WITHIN EASEMENTS OF UTILITIES, LETTERS OF PERMISSION FROM ALL INVOLVED COMPANIES MUST BE OBTAINED PRIOR TO GRADING AND/OR SITE DEVELOPMENT.
- THE DEVELOPER WILL BE RESPONSIBLE FOR THE RELOCATION OF ANY UTILITIES WHICH IS REQUIRED AS A RESULT OF HIS PROJECT. THE RELOCATION SHOULD BE DONE PRIOR TO CONSTRUCTION.
- THESE PLANS IDENTIFY THE LOCATION OF ALL KNOWN GRAVESITES. GRAVESITES SHOWN ON THIS PLAN WILL BE PROTECTED IN ACCORDANCE WITH STATE LAW. IN THE EVENT GRAVESITES ARE DISCOVERED DURING CONSTRUCTION, THE OWNER AND ENGINEER MUST BE NOTIFIED IMMEDIATELY.
- THE CONTRACTOR(S) SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATING OR BLASTING AT LEAST TWO (2) WORKING DAYS, BUT NOT MORE THAN TEN (10) WORKING DAYS, PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION.
- CONTRACTOR TO CONTACT OPERATOR AND ENGINEER IF GROUNDWATER IS ENCOUNTERED DURING CONSTRUCTION.
- THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING WITH THE EROSION AND SEDIMENT CONTROL INSPECTOR, 2 DAYS PRIOR TO THE START OF CONSTRUCTION.
- THE CONTRACTOR IS RESPONSIBLE FOR ALL FILL MATERIAL TESTING REQUIRED DURING THE CONSTRUCTION OF THIS PROJECT. ALL MATERIAL TEST SHALL BE CONDUCTED BY A CERTIFIED MATERIALS TESTING LABORATORY AND A CERTIFICATION OF THE MATERIALS TESTED SHALL BE PROVIDED BY A LICENSED PROFESSIONAL ENGINEER REPRESENTING THE LABORATORY. ALL TEST RESULTS SHALL BE SUBMITTED TO THE ENGINEER CERTIFYING THE CONSTRUCTED FACILITY. FAILURE TO CONDUCT THE DENSITY TEST SHALL BE CAUSE FOR NON-ACCEPTANCE OF THE CONSTRUCTED FACILITY.
- THE CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTING THE SITE IN ACCORDANCE WITH THE DESIGN PLANS AND CONSTRUCTION DOCUMENTS AND THE SCOPE OF WORK SHALL CONFORM WITH THE GRADES, BERMS, DEPTHS, DIMENSIONS, ETC. SHOWN HEREON.

SITE CLEANUP & RECYCLE PROGRAM

- GARBAGE, FUELS OR ANY SUBSTANCE HARMFUL TO HUMAN, AQUATIC OR FISH LIFE, WILL BE PREVENTED FROM ENTERING SPRINGS, STREAMS, PONDS, LAKES, WETLANDS OR ANY WATER COURSE OR WATER BODY.
- OILS, FUELS, LUBRICANTS AND COOLANTS WILL BE PLACED IN SUITABLE CONTAINERS AND DISPOSED PROPERLY.
- ALL TRASH AND GARBAGE WILL BE COLLECTED AND DISPOSED PROPERLY.
- ALL SEDIMENT REMOVED FROM SEDIMENT CAPTURING DEVICES SHALL BE PLACED ON THE TOPSOIL STOCKPILE, THEN SEEDED AND MULCHED, AS NECESSARY. ALTERNATIVELY, THE REMOVED SEDIMENT CAN BE TRANSPORTED TO A SITE WITH AN APPROVED PERMIT.
- ALL POLLUTION AND EMERGENCY SPILLS SHALL BE IMMEDIATELY REPORTED TO THE WVDEP OFFICE OF OIL AND GAS. (EMERGENCY #1-800-642-3074).

EROSION AND SEDIMENT CONTROL NARRATIVE

PROJECT DESCRIPTION: THE PURPOSE OF THIS PROJECT IS CONSTRUCT A CENTRALIZED FRESHWATER IMPOUNDMENT TO AID IN THE DEVELOPMENT OF INDIVIDUAL GAS WELLS. THE ACCESS ROAD TO THE PROPOSED SITE IS LOCATED ON THE NORTH SIDE OF CO. RT. 25, 0.2 MILES NORTHWEST OF THE INTERSECTION OF CO. RT. 48/2 & CO. RT. 25 IN GREENBRIER DISTRICT, DODDRIDGE COUNTY, WEST VIRGINIA. THE TOTAL APPROXIMATE LAND DISTURBANCE ASSOCIATED WITH THIS PROJECT IS 17.34 ACRES.

EXISTING SITE CONDITIONS: THE EXISTING SITE IS MOSTLY FOREST WITH APPROXIMATELY 95% BEING WOODED. THE TOPOGRAPHY RANGES FROM MODERATE TO STEEP TERRAIN (2X TO 60X SLOPES). PRESENT ON SITE ARE 2 EXISTING GAS WELLS AND 2 EXISTING GAS PIPELINES. ALSO PRESENT ARE ACCESS ROADS, STRUCTURES, TANKS ASSOCIATED WITH THE EXISTING GAS WELLS, 3 EXISTING PEM WETLANDS, 2 EXISTING POW WETLANDS, 2 INTERMITTENT STREAMS, 2 EPHEMERAL STREAMS, AND 2 PERENNIAL STREAMS. THE SITE IS LOCATED ON A RIDGE AND DRAINS TO LAUREL RUN. MINIMAL EROSION WAS NOTICED ON SITE.

ADJACENT PROPERTY: THE SITE IS BORDERED BY FORESTED LANDS ON ALL SIDES. THE SITE IS BORDERED BY CO RT. 25 TO THE SOUTH. LAUREL RUN BORDERS THE SITE TO THE SOUTH AND EAST (OPPOSITE SIDE OF CO. RT. 25).

CRITICAL AREAS: THE AREA(S) SHOWN ALONG THE FIELD DELINEATED STREAMS, WETLANDS, AND PONDS, AS SHOWN ON THE PLANS, ARE DESIGNATED AS CRITICAL AREA(S). IF PRESENT, COMPOST FILTER SOCKS ARE TO BE USED TO PROTECT THESE FIELD DELINEATED AREA(S) FROM SEDIMENT LEAVING THE SITE. ADDITIONALLY, ORANGE SAFETY FENCE IS RECOMMENDED TO BE INSTALLED ABOVE/AROUND THESE AREA(S), TO SERVE AS A PHYSICAL BARRIER, ENSURING THE AREA(S) ARE NOT DISTURBED.

SOILS: A SUBSURFACE INVESTIGATION OF THE PROPOSED SITE WAS PERFORMED BY G.A. COVEY ENGINEERING, PLLC ON JANUARY 17, 18, 19, 21, & FEBRUARY 07, 2013. THE REPORT PREPARED BY G.A. COVEY ENGINEERING, PLLC, DATED FEBRUARY 11, 2013, REFLECTS THE RESULTS OF THE SUBSURFACE INVESTIGATION. THE INFORMATION AND RECOMMENDATIONS CONTAINED IN THIS REPORT WAS USED IN THE PREPARATION OF THESE PLANS. PLEASE REFER TO THE SUBSURFACE INVESTIGATION REPORT BY G.A. COVEY ENGINEERING, PLLC FOR ADDITIONAL INFORMATION, AS NEEDED.

THE PROPOSED ACCESS ROAD CUT SLOPE (1.5:1) SHALL BE FIELD VERIFIED BY A CERTIFIED GEOTECHNICAL ENGINEER TO ENSURE THE PROPOSED SLOPES ARE ADEQUATE PRIOR TO CONSTRUCTION. ACCESS ROAD CONSTRUCTION SHALL BE MONITORED BY A GEOTECHNICAL ENGINEER DURING CONSTRUCTION.

OFF SITE AREAS: THERE ARE NO BORROW AREA(S) OR EXPORT STOCKPILE AREA(S) OUTSIDE OF THE PROPOSED LIMITS OF DISTURBANCE FOR THIS PROJECT.

EROSION AND SEDIMENT CONTROL MEASURES: UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE CONSTRUCTED AND MAINTAINED ACCORDING TO MINIMUM STANDARDS AND SPECIFICATIONS OF THE CURRENT WEST VIRGINIA EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL.

STRUCTURAL PRACTICES:

PHASE I:

- INSTALL ORANGE SAFETY FENCE TO ENSURE NO DISTURBANCE TO THE DELINEATED AREA(S).
- INSTALL TEMPORARY CONSTRUCTION ENTRANCE.
- INSTALL COMPOST FILTER SOCKS AS SHOWN ON THE PLANS AS PHASE I CONTROL MEASURES TO REMOVE SEDIMENT FROM RUNOFF. SELECTIVELY REMOVE TREES REQUIRED TO INSTALL COMPOST FILTER SOCK IN WOODED AREAS. CLEARING AND GRUBBING SHALL BE KEPT AT A MINIMUM TO INSTALL E&S CONTROLS.
- EROSION CONTROL BLANKETS SHALL BE PLACED ON ALL CRITICAL SLOPES (3:1 OR GREATER) AND AS NEEDED TO STABILIZE DISTURBED AREAS.

PHASE II:

- ALL CONTROLS INSTALLED IN PHASE I SHALL REMAIN FOR THE DURATION OF THE PROJECT.
- FILL SLOPE SURFACE SHALL BE LEFT IN A ROUGHENED CONDITION TO REDUCE EROSION. CONTRACTOR SHALL REDIRECT RUNOFF AWAY FROM THE FILL SLOPE BY INSTALLING EARTHEN DIVERSION BERMS AND DIVERTING THE RUNOFF TO SEDIMENT TRAPPING DEVICES.
- INSTALL V-DITCHES, DITCH RELIEF CULVERTS, AND OUTLET PROTECTION (RIP-RAP APRONS) AS SHOWN ON THE PLANS.
- EROSION CONTROL BLANKETS SHALL BE PLACED ON ALL CRITICAL SLOPES (3:1 OR GREATER) AND AS NEEDED TO STABILIZE DISTURBED AREAS.

DEVICES LISTED ABOVE ARE CONSIDERED MINIMUM EROSION AND SEDIMENT CONTROLS. ADDITIONAL CONTROL MEASURES MAY BE NECESSARY DUE TO CONTRACTOR PHASING OR OTHER UNFORESEEN CONDITIONS. IMMEDIATELY UPON DISCOVERING UNFORESEEN CIRCUMSTANCES POSING THE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION, THE CONTRACTOR SHALL IMPLEMENT APPROPRIATE BMP'S TO MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENT POLLUTION. ALL MEASURES SHALL BE CONSTRUCTED AND MAINTAINED ACCORDING TO MINIMUM STANDARDS AND SPECIFICATIONS OF THE CURRENT WEST VIRGINIA EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL.

MAINTENANCE PROGRAM:

DURING CONSTRUCTION ACTIVITIES, ALL CONTROL MEASURES SHALL BE INSPECTED DAILY BY THE SITE SUPERINTENDENT OR HIS REPRESENTATIVE AND WITHIN 24 HOURS AFTER ANY RUNOFF EVENT. ONCE CONSTRUCTION ACTIVITIES HAVE CONCLUDED, BI-WEEKLY INSPECTIONS SHALL BE PERFORMED. DAMAGED STRUCTURAL MEASURES ARE TO BE REPAIRED, BY THE END OF THE DAY, OR AT THE EARLIEST TIME IN WHICH IT IS SAFE TO DO SO. SEEDED AREAS SHALL BE CHECKED REGULARLY TO ENSURE THAT A GOOD STAND OF GRASS IS MAINTAINED. ALL AREAS SHALL BE FERTILIZED AND RESEDED AS NEEDED UNTIL GRASS IS ESTABLISHED.

TRAPPED SEDIMENT IS TO BE REMOVED AS REQUIRED TO MAINTAIN 50% TRAP AND/OR SOCK EFFICIENCY AND DISPOSED OF BY SPREADING ON THE STOCKPILE.

INLET OF DITCH RELIEF CULVERTS SHALL BE CHECKED REGULARLY FOR SEDIMENT BUILD-UP. IF THE GRAVEL OUTLET IS CLOGGED BY SEDIMENT, IT SHALL BE REMOVED AND CLEANED OR REPLACED IMMEDIATELY.

SEDIMENT TRACKED ONTO ANY PUBLIC ROADWAY OR SIDEWALK SHALL BE RETURNED TO THE CONSTRUCTION SITE BY THE END OF EACH WORK DAY AND DISPOSED IN THE MANNER DESCRIBED IN THIS PLAN. IN NO CASE SHALL THE SEDIMENT BE WASHED, SHOVELED OR SWEEP INTO ANY ROADSIDE DITCH, CULVERT OR SURFACE WATER.

ANY DISTURBED AREAS ALONG THE ACCESS ROAD SHALL BE STABILIZED PRIOR TO THE END OF EACH DAY WITH EITHER ROCK STABILIZATION OR SEEDING AND MULCHING METHODS.

NOTE: THE WV DEP RETAINS THE RIGHT TO ADD AND/OR MODIFY THESE EROSION AND SEDIMENT CONTROL MEASURES DURING THE CONSTRUCTION PROCESS, WITHIN REASON, TO ENSURE ADEQUATE PROTECTION TO THE PUBLIC AND THE ENVIRONMENT.

SEEDING (SOIL STABILIZATION):

- CONTRACTOR SHALL APPLY SEED AND STABILIZATION IN ACCORDANCE WITH THE WV DEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE (BMP) MANUAL, BASED UPON SITE SPECIFIC SOIL CHARACTERISTICS.
- WHEREVER SEEDING IS TO BE APPLIED TO STEEP SLOPES (≥ 3H:1V), SEED MIXTURES SHOULD BE SELECTED THAT ARE APPROPRIATE FOR STEEP SLOPES.

MUST CONTROL:

- TEMPORARY SEEDING SHALL BE APPLIED TO ALL DISTURBED AREAS SUBJECT TO LITTLE OR NO CONSTRUCTION TRAFFIC.
- ALL HAUL ROADS AND OTHER HEAVY TRAFFIC ROUTES SHALL BE SPRINKLED WITH WATER UNTIL THE SURFACE IS WET AND REPEATED AS NEEDED TO CONTROL DUST.

CONSTRUCTION SEQUENCE

THE DEVELOPMENT OF THIS SITE SHALL BE CONSISTENT WITH THE FOLLOWING GENERAL SEQUENCE OF CONSTRUCTION. THE CONTRACTOR SHALL IMPLEMENT, MAINTAIN, AND OPERATE ALL PROPOSED EROSION AND SEDIMENT CONTROL MEASURES TO EFFECTIVELY MITIGATE THE HAZARD OF ACCELERATED EROSION AND SEDIMENTATION TO ACCEPTABLE LEVELS. MINOR DEVIATIONS FROM THIS SEQUENCE SHALL BE EXECUTED BY THE PROJECT'S SUPERINTENDENT AS NEEDED TO ELIMINATE ANY POTENTIAL EROSION CONDITION THAT MAY ARISE FOR THE DURATION OF THE PROJECT. THE WV DEP OFFICE OF OIL AND GAS SHALL BE NOTIFIED OF ANY AND ALL SUCH DEVIATIONS FROM THE APPROVED PLANS.

- A PRE-CONSTRUCTION CONFERENCE WITH THE CONTRACTOR AND THE APPROPRIATE EROSION AND SEDIMENT CONTROL INSPECTOR 48 HOURS PRIOR TO BEGINNING WORK TO REVIEW THE CONSTRUCTION DRAWINGS AND PROVIDE ANY REQUESTED GUIDANCE.
- STAKE THE LIMITS OF CONSTRUCTION AND MARK ALL IDENTIFIED WETLANDS, STREAMS, AND OTHER AREAS OF CONCERN FOR CONSTRUCTION ACTIVITIES.
- CONSTRUCT THE ROCK CONSTRUCTION ENTRANCE, ALL VEHICLES ENTERING AND EXITING THE SITE SHALL DO SO VIA THE ROCK CONSTRUCTION ENTRANCE.
- CONSTRUCT ALL BMP'S AS SOON AS CLEARING AND GRUBBING OPERATIONS ALLOW. DIVERSIONS AND SEDIMENT TRAP(S)/BASIN(S) SHALL BE SEEDED AND MULCHED IMMEDIATELY.
- IF APPLICABLE, CONVEY UPSLOPE DRAINAGE AROUND THE ACCESS ROAD AND PAD/PT AREA BY CONSTRUCTING ALL DIVERSION BERM(S) AND/OR COMPOST FILTER SOCK DIVERSION(S) AS SHOWN ON THE PLANS.
- CLEAR AND GRUB THE SITE. ALL WOODY MATERIAL, BRUSH, TREES, STUMPS, LARGE ROOTS, BOULDERS, AND DEBRIS SHALL BE CLEARED FROM THE SITE AREA AND KEPT TO THE MINIMUM NECESSARY FOR PROPER CONSTRUCTION, INCLUDING THE INSTALLATION OF NECESSARY SEDIMENT CONTROLS. TREES SIX INCHES IN DIAMETER AND LARGER SHALL BE CUT AND LOGS STACKED. SMALLER TREES, BRUSH, & STUMPS SHALL BE CUT AND/OR GRUBBED AND WHIPPED IN APPROPRIATE AREAS FOR USE AS BRUSH PILE SEDIMENT BARRIERS (AS SHOWN ON THE PLANS), WILDLIFE HABITATS, BURNED (AS PER WV FOREST FIRE LAWS), REMOVED FROM SITE, OR DISPOSED OF BY OTHER METHODS APPROVED BY WV DEP.
- IF APPLICABLE, INSTALL ALL WETLAND OR STREAM CROSSINGS AS SHOWN ON THE PLANS.
- STRIP THE TOPSOIL FROM THE ACCESS ROAD. ALL STRIPPED TOPSOIL SHALL BE STOCKPILED IN AREAS SHOWN IN THE PLANS AND IMMEDIATELY STABILIZED. ADDITIONAL BMP MEASURES SHALL BE CONSTRUCTED AROUND TOPSOIL STOCKPILES, IF NECESSARY.
- CONSTRUCT THE ACCESS ROAD. DITCH RELIEF CULVERTS SHALL BE INSTALLED AT A GRADE OF 1-8% TO MINIMIZE OUTLET VELOCITIES TO THE EXTENT POSSIBLE. INSTALL OUTLET PROTECTION ONCE DITCH RELIEF CULVERTS ARE INSTALLED, AS SHOWN ON PLANS. STABILIZE THE ROAD WITH GEOTEXTILE FABRIC & STONE AND SIDE SLOPES AS SPECIFIED WITH PERMANENT SEEDING. EXCESS MATERIAL SHALL BE STOCKPILED (IF NECESSARY) IN AREAS SHOWN IN THE PLANS AND IMMEDIATELY STABILIZED. ALL DITCH LINES SHALL BE CLEANED PRIOR TO INSTALLATION OF LINED PROTECTION.
- STRIP THE TOPSOIL FROM THE CENTRALIZED FRESHWATER IMPOUNDMENT AREA. ALL STRIPPED TOPSOIL SHALL BE STOCKPILED IN AREAS SHOWN IN THE PLANS AND IMMEDIATELY STABILIZED. ADDITIONAL BMP MEASURES SHALL BE CONSTRUCTED AROUND TOPSOIL STOCKPILES, IF NECESSARY.
- GRADE THE CENTRALIZED FRESHWATER IMPOUNDMENT AREA AS SHOWN ON THE PLANS. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN HORIZONTAL LIFTS WITH A MAXIMUM LOOSE LIFT THICKNESS OF 9" AND MAXIMUM PARTICLE SIZE OF LESS THAN 6". ALL FILL SHALL BE COMPACTED BY A VIBRATING SHEEPSFOOT ROLLER TO 95% PER THE STANDARD PROCTOR TEST (ASTM-D698).
- IMMEDIATELY STABILIZE THE OUTER AREAS OF THE CENTRALIZED FRESHWATER IMPOUNDMENT AND TURNAROUND PAD(S). THE TURNAROUND PAD(S) SHALL BE STABILIZED WITH GEOTEXTILE FABRIC & STONE AND THE SIDE SLOPES WITH EROSION CONTROL BLANKETING WHEN SLOPES ARE 3:1 OR GREATER. APPLY SEED AND MULCH TO ALL DISTURBED AREAS. THIS SHALL INCLUDE ALL AREAS THAT WILL NOT BE SUBJECT TO REGULAR TRAFFIC ACTIVITY (TO BE STABILIZED WITH STONE), OR ANY DISTURBED AREA THAT WILL NOT BE RE-DISTURBED BEFORE SITE RECLAMATION BEGINS.
- PRIOR TO THE INSTALLATION OF THE CENTRALIZED FRESHWATER IMPOUNDMENT LINER SYSTEM, THE CONTRACTOR SHALL CONTACT THE ENGINEER/SURVEYOR TO COMPLETE AN AS-BUILT SURVEY OF THE CONSTRUCTED CENTRALIZED FRESHWATER IMPOUNDMENT TO ENSURE CONFORMANCE WITH THE DESIGN DRAWINGS. THE AS-BUILT WILL BE REVIEWED BY THE ENGINEER AND THE CONTRACTOR IS RESPONSIBLE FOR ANY CORRECTIVE ACTION DEEMED NECESSARY BY THE ENGINEER FOR ANY DEVIATION(S) FROM THE DESIGN DRAWINGS.
- INSTALL THE CENTRALIZED FRESHWATER IMPOUNDMENT LINER SYSTEM AND PERIMETER SAFETY FENCE W/GATE AND EMERGENCY LIFE LINE AS SHOWN ON THE PLANS. SEE DETAILS FOR ADDITIONAL INFORMATION.
- ONCE THE CENTRALIZED FRESHWATER IMPOUNDMENT HAS BEEN COMPLETED, SUBMIT THE AS-BUILT CERTIFICATION FOR THE CENTRALIZED FRESHWATER IMPOUNDMENT FACILITY TO THE WV DEP OFFICE OF OIL AND GAS, PRIOR TO PLACING FLUIDS IN THE STRUCTURE.
- COMMENCE USE OF THE CENTRALIZED FRESHWATER IMPOUNDMENT FACILITY.
- ALL BMP'S MUST REMAIN IN PLACE AND FUNCTIONAL UNTIL ALL AREAS WITHIN THE LIMIT OF DISTURBANCE ARE COMPLETE AND PERMANENTLY STABILIZED. MAINTENANCE MUST INCLUDE INSPECTION OF ALL EROSION AND SEDIMENT CONTROLS AFTER EACH RUNOFF EVENT IN EXCESS OF 0.6" AND ON A BIWEEKLY BASIS.
- THE CONSTRUCTION SITE SHOULD BE STABILIZED AS SOON AS POSSIBLE AFTER COMPLETION. ESTABLISHMENT OF FINAL COVER MUST BE INITIATED NO LATER THAN 7 DAYS AFTER REACHING FINAL GRADE. A NOTICE OF TERMINATION MUST BE FILED WITH THE DEP WHEN THE SITE REACHED FINAL STABILIZATION. FINAL STABILIZATION MEANS THAT ALL SOIL-DISTURBING ACTIVITIES ARE COMPLETED, AND THAT EITHER A PERMANENT VEGETATIVE COVER WITH A DENSITY OF 70% OR GREATER HAS BEEN ESTABLISHED OR THAT THE SURFACE HAS BEEN STABILIZED BY HARD COVER SUCH AS PAVEMENT OR BUILDINGS. IT SHOULD BE NOTED THAT THE 70% REQUIREMENT REFERS TO THE TOTAL AREA VEGETATED AND NOT JUST A PERCENT OF THE SITE.
- ALL PERMANENT SEDIMENT CONTROL MEASURES CAN BE REMOVED AFTER THE SITE IS PERMANENTLY STABILIZED AND APPROVAL IS RECEIVED FROM THE WVDEP.
- ANY AREAS DISTURBED BY REMOVAL OF CONTROLS SHALL BE REPAIRED, STABILIZED, AND PERMANENTLY SEEDED.

CENTRALIZED FRESHWATER IMPOUNDMENT CONSTRUCTION STANDARDS

THE DESIGN, CONSTRUCTION, AND REMOVAL OF EMBANKMENTS ASSOCIATED WITH CENTRALIZED FRESHWATER IMPOUNDMENTS FOR OIL AND GAS WELLS MUST BE ACCOMPLISHED IN SUCH A MANNER AS TO PROTECT THE HEALTH AND SAFETY OF THE PEOPLE, THE NATURAL RESOURCES, AND ENVIRONMENT OF THE STATE. THE CENTRALIZED FRESHWATER IMPOUNDMENT EMBANKMENTS SHALL BE DESIGNED, CONSTRUCTED, AND MAINTAINED TO BE STRUCTURALLY SOUND AND REASONABLY PROTECTED FROM UNAUTHORIZED ACTS OF THIRD PARTIES.

- THE FOUNDATION FOR A CENTRALIZED FRESHWATER IMPOUNDMENT EMBANKMENT MUST BE STRIPPED AND GRUBBED TO SOLID GROUND PRIOR TO THE PLACEMENT AND COMPACTION OF EARTHEN FILL MATERIAL. SHOULD SOLID GROUND NOT BE FOUND WITHIN A DEPTH OF 24", CONTRACTOR WILL NOTIFY NAVIUS ENGINEERING AT (888) 682-4165 IMMEDIATELY. NO EMBANKMENT FILL SHALL CONTAIN OR BE PLACED ON FROZEN MATERIAL.
- ANY SPRINGS ENCOUNTERED WITHIN THE FOUNDATION AREA SHALL BE DRAINED TO THE OUTSIDE/DOWNSTREAM TOE OF EMBANKMENT. CONSTRUCTED DRAIN SECTION SHALL BE AN EXCAVATED 2' x 2' TRENCH AND BACK FILLED WITH TYPE A SAND, COMPACTED BY HAND TAMPER. NO GEOTEXTILES SHALL BE USED TO LINE TRENCH. THE LAST 3' OF DRAIN AT THE DOWNSTREAM END SHALL BE CONSTRUCTED WITH ASHTO #6 MATERIAL.
- SOILS FOR EARTHEN EMBANKMENT CONSTRUCTION SHALL BE LIMITED TO TYPES GC, GM, SC, SM, CL OR ML (ASTM-D2487 - UNIFIED SOILS CLASSIFICATION). SOILS MUST CONTAIN A MINIMUM OF 20% PLUS NO. 200 SIEVE AND BE "WELL GRADED" MATERIAL WITH NO COBBLES OR BOULDER SIZE MATERIAL MIXED WITH THE CLAY. A MINIMUM OF THREE SAMPLES SHALL BE CLASSIFIED.
- ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN HORIZONTAL LIFTS WITH A MAXIMUM LOOSE LIFT THICKNESS OF 9" AND MAXIMUM PARTICLE SIZE OF LESS THAN 6". ALL FILL SHALL BE COMPACTED BY A VIBRATING SHEEPSFOOT ROLLER TO 95% PER THE STANDARD PROCTOR TEST (ASTM-D698).
- THE PLACEMENT OF ALL FILL MATERIAL SHALL BE FREE OF WOOD, STUMPS AND ROOTS, LARGE ROCKS AND BOULDERS, AND ANY OTHER NONCOMPACTABLE SOIL MATERIAL. THE EMBANKMENT SHALL BE COMPACTED TO A MINIMUM OF VISIBLE NON-MOVEMENT, HOWEVER, THE COMPACTION EFFORT SHALL NOT EXCEED THE OPTIMUM MOISTURE LIMITS.
- THE EMBANKMENT TOP SHALL BE A MINIMUM OF 12' IN WIDTH.
- THE MINIMUM INSIDE AND OUTSIDE EMBANKMENT (FILL) SLOPES SHALL BE 2H:1V, UNLESS OTHERWISE SPECIFIED. THE INSIDE AND OUTSIDE EMBANKMENT (FILL) SLOPES MUST ADD UP TO 5H:1V.
- ALL EXPOSED EMBANKMENT SLOPES, NOT COVERED BY COMPACTED ROCKFILL OR RIP-RAP SHALL BE LIMED, FERTILIZED, SEEDED AND MULCHED. PERMANENT VEGETATIVE GROUND COVER IN COMPLIANCE WITH THE WV DEP EROSION AND SEDIMENT CONTROL FIELD MANUAL MUST BE ESTABLISHED UPON THE COMPLETION OF THE CENTRALIZED FRESHWATER IMPOUNDMENT CONSTRUCTION. EMBANKMENTS SHALL BE MAINTAINED WITH A GRASSY VEGETATIVE COVER AND FREE OF BRUSH AND/OR TREES.
- A MINIMUM OF 2' OF FREEBOARD SHALL BE MAINTAINED AT ALL TIMES DURING THE OPERATION OF THE IMPOUNDMENT.
- ALL EMBANKMENT CONSTRUCTION AND COMPACTION TESTING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

CENTRALIZED FRESHWATER IMPOUNDMENT LINER SYSTEM NOTES

THE DESIGNED CENTRALIZED FRESHWATER IMPOUNDMENT FACILITY SHALL BE FULLY LINED WITH A GEOSYNTHETIC LINER SYSTEM. LINERS SHALL BE INSTALLED IN ACCORDANCE TO MANUFACTURER'S SPECIFICATIONS.

- THE SUB-BASE SHALL BEAR THE WEIGHT OF THE LINER SYSTEM, WATER, AND EQUIPMENT OPERATING ON THE CENTRALIZED FRESHWATER IMPOUNDMENT WITHOUT CAUSING OR ALLOWING A FAILURE OF THE LINER SYSTEM.
- THE SUB-BASE SHALL BE COMPACTED TO ACCOMMODATE POTENTIAL SETTLEMENT WITHOUT DAMAGE TO THE LINER SYSTEM.
- THE UPPER 6" OF THE SUB-BASE SHALL BE COMPACTED TO A STANDARD PROCTOR DENSITY OF AT LEAST 95%.
- THE SUB-BASE SHALL BE HARD, UNIFORM, SMOOTH AND FREE OF DEBRIS, ROCK FRAGMENTS, PLANT MATERIAL, AND OTHER FOREIGN MATERIAL.
- THE SUB-BASE SHALL BE COVERED WITH NON-WOVEN GEOTEXTILE FABRIC TO CUSHION THE PRIMARY LINER AND ALLOW FOR ADEQUATE VENTING BETWEEN THE PRIMARY LINER AND THE SUB-BASE TO PREVENT THE ENTRAPMENT OF GASES BENEATH THE LINER SYSTEM.
- THE CENTRALIZED FRESHWATER IMPOUNDMENT AREA SHALL BE DRAINED AND COMPLETELY DRY PRIOR TO THE PLACEMENT OF THE PRIMARY LINER. THE PRIMARY LINER SHALL MEET ALL WV DEP GUIDELINES FOR MINIMUM THICKNESS AND SHALL PREVENT THE MIGRATION OF WATER THROUGH THE LINER TO THE GREATEST DEGREE THAT IS TECHNOLOGICALLY POSSIBLE.
- THE PRIMARY LINER SHALL FULLY COVER THE BOTTOM, SIDEWALLS, AND ANCHORING TRENCH OF THE CENTRALIZED FRESHWATER IMPOUNDMENT. A TEXTURED LINER IS RECOMMENDED TO PROVIDE A SAFER WALKING SURFACE.
- AN ANCHOR TRENCH SHALL BE EXCAVATED COMPLETELY AROUND THE PERIMETER OF THE CENTRALIZED FRESHWATER IMPOUNDMENT AREA AT THE PLANNED ELEVATION OF THE TOP OF THE LINING. THE TRENCH SHALL BE A MINIMUM 36 INCHES DEEP AND 24 INCHES WIDE.
- ALL ELEMENTS OF THE LINER SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS, ALL SEAMS AND SEALS AROUND ANY PROJECTIONS SHALL BE SEALED AND TESTED IN A METHOD APPROVED BY THE MANUFACTURER.
- GAS RELIEF VENTS SHALL BE PROVIDED ALONG THE TOP OF THE LINER AND WITHIN ONE FOOT OF THE PERIMETER OF THE CENTRALIZED FRESHWATER IMPOUNDMENT TO ALLOW GASES TO ESCAPE FROM UNDER THE GEOMEMBRANE. MAXIMUM SPACING FOR VENTS SHALL BE 30 FEET.
- WATER LEVEL MARKINGS SHALL BE CLEARLY PAINTED (6" INCREMENTS) ON THE LINER SYSTEM TO IDENTIFY THE WATER SURFACE ELEVATION.

Engineering
Survey
Environmental
GIS

NAVIUS
ENGINEERING INC.

151 Windy Hill Lane
Winchester, Virginia 22602
Telephone: (888) 682-4165
www.naviusinc.com



DATE	REVISION	REVISED PER	UPDATED WETLANDS
04/11/2013			

ANTERO
RESOURCES
THIS DOCUMENT
WAS PREPARED
BY ANTERO RESOURCES
APPALACHIAN CORE

CONSTRUCTION AND E&S CONTROL NOTES
LAKE
CENTRALIZED FRESHWATER IMPOUNDMENT
GREENBRIER DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 04/03/2013

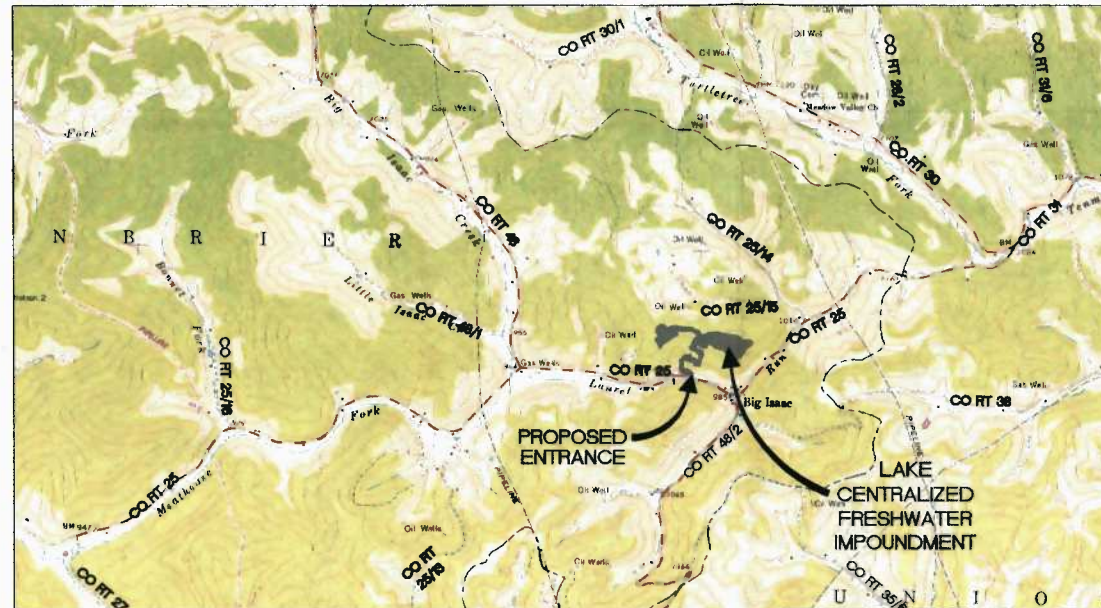
SCALE: N/A

SHEET 02 OF 21

LAKE CENTRALIZED FRESHWATER IMPOUNDMENT SITE DESIGN & CONSTRUCTION PLAN, EROSION & SEDIMENT CONTROL PLANS

GREENBRIER DISTRICT, DODDRIDGE COUNTY, WEST VIRGINIA
MEATHOUSE FORK WATERSHED

USGS 7.5 BIG ISAAC QUAD MAP



WEST VIRGINIA STATE PLANE COORDINATE SYSTEM
NORTH ZONE, NAD83
ELEVATION BASED ON NAVD88
ESTABLISHED BY SURVEY GRADE GPS & OPUS
POST-PROCESSING

SHEET INDEX

- 01 - COVER SHEET
- 02 - CONSTRUCTION AND E&S CONTROL NOTES
- 03 - MATERIAL QUANTITIES
- 04 - EXISTING CONDITIONS
- 05 - OVERALL PLAN SHEET INDEX & VOLUMES
- 06 - ACCESS ROAD PLAN
- 07 - CENTRALIZED FRESHWATER IMPOUNDMENT PLAN
- 08 - EXCESS MATERIAL STOCKPILE PLAN
- 09 - ACCESS ROAD PROFILES
- 10-11 - ACCESS ROAD SECTIONS
- 12-13 - CENTRALIZED FRESHWATER IMPOUNDMENT SECTIONS
- 14-19 - CONSTRUCTION DETAILS
- 20-21 - RECLAMATION PLAN

Limits Of Disturbance Area (ac)	
Total Impacts	
Access Road "A" (1,747')	4.32
Access Road "B" (757')	1.36
Truck Turnaround Pad	1.49
Centralized Freshwater Impoundment	6.09
Topsoil/Excess Material Stockpiles	4.07
Total Affected Area	17.34
Total Wooded Acres Disturbed	16.51
Impacts to Big Isaac U.M. Catchment TM 12-32	
Access Road "A"	0.04
Total Affected Area	0.04
Total Wooded Acres Disturbed	0.01
Impacts to Antero Resources Appalachian Corporation TM 12-19	
Access Road "A" (1,747')	4.29
Access Road "B" (757')	1.36
Truck Turnaround Pad	1.49
Centralized Freshwater Impoundment	6.09
Topsoil/Excess Material Stockpiles	4.07
Total Affected Area	17.30
Total Wooded Acres Disturbed	16.50

LOCATION COORDINATES

ACCESS ROAD ENTRANCE
LATITUDE: 39.201076 LONGITUDE: -80.542308 (NAD 83)
N 4339190.36 E 539520.02 (UTM ZONE 17 METERS)

CENTER OF CENTRALIZED FRESHWATER IMPOUNDMENT
LATITUDE: 39.203073 LONGITUDE: -80.539371 (NAD 83)
N 4339413.28 E 539772.49 (UTM ZONE 17 METERS)

GENERAL DESCRIPTION

THE ACCESS ROAD(S) AND CENTRALIZED FRESHWATER IMPOUNDMENT ARE BEING CONSTRUCTED TO AID IN THE DEVELOPMENT OF INDIVIDUAL MARCELLUS SHALE GAS WELLS.

FLOODPLAIN NOTE

THE PROPOSED SITE IS LOCATED IN FLOODPLAIN ZONES "X" & "AE" PER FEMA MAP NUMBER #54017C0280C. THE SITE ENTRANCE IS LOCATED IN ZONE "AE" AND THE REST OF THE SITE IS LOCATED IN ZONE "X". MINOR EXCAVATION IS REQUIRED FOR THE INSTALLATION OF THE ENTRANCE AND E&S CONTROL IS THE ONLY DISTURBANCE PROPOSED IN ZONE "AE". NO FILL IS PROPOSED IN ZONE "AE".

MISS UTILITY STATEMENT

ANTERO RESOURCES APPALACHIAN CORPORATION WILL NOTIFY MISS UTILITY OF WEST VIRGINIA FOR THE LOCATING OF UTILITIES PRIOR TO THIS PROJECT DESIGN. TICKET #123393023. IN ADDITION, MISS UTILITY WILL BE CONTACTED PRIOR TO START OF THE PROJECT.

ENTRANCE PERMIT

ANTERO RESOURCES APPALACHIAN CORPORATION WILL OBTAIN AN ENCROACHMENT PERMIT (FORM MM-109) FROM THE WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS, PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITIES.

GEOTECHNICAL NOTES

A SUBSURFACE INVESTIGATION OF THE PROPOSED SITE WAS PERFORMED BY G.A. COVEY ENGINEERING, PLLC ON JANUARY 17, 18, 19, 21, & FEBRUARY 07, 2013. THE REPORT PREPARED BY G.A. COVEY ENGINEERING, PLLC, DATED FEBRUARY 11, 2013, REFLECTS THE RESULTS OF THE SUBSURFACE INVESTIGATION. THE INFORMATION AND RECOMMENDATIONS CONTAINED IN THIS REPORT WAS USED IN THE PREPARATION OF THESE PLANS. PLEASE REFER TO THE SUBSURFACE INVESTIGATION REPORT BY G.A. COVEY ENGINEERING, PLLC FOR ADDITIONAL INFORMATION, AS NEEDED.

THE PROPOSED ACCESS ROAD CUT SLOPE (1.5:1) SHALL BE FIELD VERIFIED BY A CERTIFIED GEOTECHNICAL ENGINEER TO ENSURE THE PROPOSED SLOPES ARE ADEQUATE PRIOR TO CONSTRUCTION. ACCESS ROAD CONSTRUCTION SHALL BE MONITORED BY A GEOTECHNICAL ENGINEER DURING CONSTRUCTION.

ENVIRONMENTAL NOTES

STREAM AND WETLAND DELINEATIONS WERE PERFORMED IN OCTOBER, 2012 BY ALLSTAR ECOLOGY TO REVIEW THE SITE FOR WATERS AND WETLANDS THAT ARE MOST LIKELY WITHIN THE REGULATORY PURVIEW OF THE U.S. ARMY CORPS OF ENGINEERS (USACE) AND/OR THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (WVDEP). THE FEBRUARY 14, 2013 STREAM AND WETLAND DELINEATION INDEX MAP WAS PREPARED BY ALLSTAR ECOLOGY AND SUMMARIZES THE RESULTS OF THE FIELD DELINEATION. THE MAP DOES NOT, IN ANY WAY, REPRESENT A JURISDICTIONAL DETERMINATION OF THE LANDWARD LIMITS OF WATERS AND WETLANDS WHICH MAY BE REGULATED BY THE USACE OR THE WVDEP.

PROJECT CONTACTS

OPERATOR:
ANTERO RESOURCES APPALACHIAN CORPORATION
981 EAST WASHINGTON AVENUE
ELLENBORO, WV 26346
PHONE: (304) 869-3405
FAX: (304) 869-3408

ELI WAGONER - ENVIRONMENTAL ENGINEER
OFFICE: (304) 622-3842, EXT. 311 CELL: (304) 476-9770

CHRIS BROWN - WATER RESOURCES
OFFICE: (304) 622-3842 CELL: (304) 877-8233

JOHN KAWCAK - OPERATIONS SUPERINTENDENT
CELL: (817) 368-1553

AARON KUNZLER - CONSTRUCTION SUPERVISOR
CELL: (405) 227-8344

ANTHONY SMITH - FIELD ENGINEER
OFFICE: (304) 869-3405 CELL: (304) 873-6196

BURT SIMCOX - LAND AGENT
CELL: (304) 282-9372

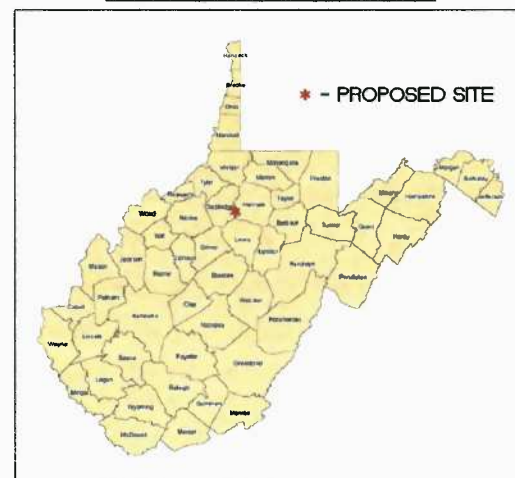
ENGINEER/SURVEYOR:
NAVITUS ENGINEERING, INC.
CYRUS S. KUMP, PE - PROJECT MANAGER/ENGINEER
OFFICE: (866) 662-4185 CELL: (540) 866-6747

ENVIRONMENTAL:
ALLSTAR ECOLOGY, LLC
RYAN L. WARD - ENVIRONMENTAL SCIENTIST
OFFICE: (866) 213-2666 CELL: (304) 892-7477

RESTRICTIONS NOTES:

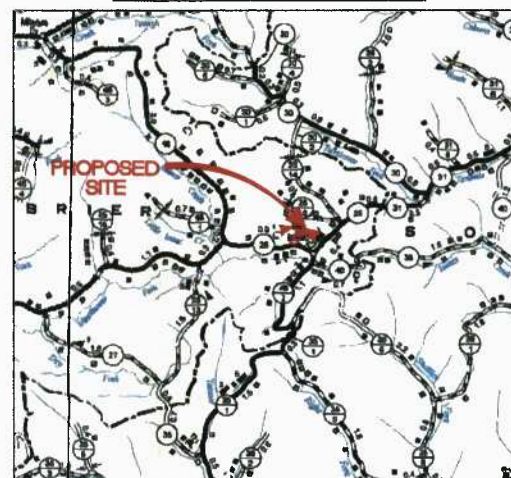
1. THERE ARE NO PERENNIAL STREAMS, LAKES, PONDS, OR RESERVOIRS WITHIN 100 FEET OF THE CENTRALIZED FRESHWATER IMPOUNDMENT. THERE IS A WETLAND ADJACENT TO THE ACCESS ROAD WHICH WILL REMAIN UNDISTURBED.
2. THERE ARE NO NATURALLY PRODUCING TROUT STREAMS WITHIN 300 FEET OF THE CENTRALIZED FRESHWATER IMPOUNDMENT.
3. THERE ARE NO GROUNDWATER INTAKE OR PUBLIC WATER SUPPLY FACILITIES WITHIN 1000 FEET OF THE CENTRALIZED FRESHWATER IMPOUNDMENT.
4. THERE ARE NO EXISTING WATER WELLS OR DEVELOPED SPRINGS WITHIN 250 FEET OF THE CENTRALIZED FRESHWATER IMPOUNDMENT.
5. THERE ARE NO OCCUPIED DWELLING STRUCTURES WITHIN 625 FEET OF THE CENTER OF THE CENTRALIZED FRESHWATER IMPOUNDMENT.
6. THERE ARE NO AGRICULTURAL BUILDINGS LARGER THAN 2,500 SQUARE FEET WITHIN 625 FEET OF THE CENTER OF THE CENTRALIZED FRESHWATER IMPOUNDMENT.

WEST VIRGINIA COUNTY MAP



(NOT TO SCALE)

WVDOH COUNTY ROAD MAP



SCALE: 1" = 5000'

MISS Utility of West Virginia
1-800-245-4848
West Virginia State Law
(Section XIV: Chapter 24-C)
Requires that you call two
business days before you dig in
the state of West Virginia.
IT'S THE LAW!!



REVISION	DATE	DESCRIPTION
01	04/11/2013	REVISED PER UPDATED WETLANDS



COVER SHEET
LAKE
CENTRALIZED FRESHWATER IMPOUNDMENT
GREENBRIER DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 04/03/2013

SCALE: AS SHOWN

SHEET 01 OF 21

MATERIAL QUANTITIES

MATERIAL QUANTITIES				
LAKE CENTRALIZED FRESHWATER IMPOUNDMENT				
Item Description	Quantity	Unit	Unit Cost	Item Total
1.0 Mobilization				
(Limited to 10% of Total Base Bid)	1.0	LS	\$	\$
2.0 Erosion & Sediment Control				
2.1 Clearing and Grubbing				
2.1.1 Wooded	16.5	AC	\$	\$
2.1.2 Open Field	0.8	AC	\$	\$
2.2 Silt Fence				
		LF	\$	\$
2.3 Reinforced Silt Fence				
		LF	\$	\$
2.4 Super Silt Fence				
		LF	\$	\$
2.5 12" Compost Filter Sock	3,149.1	LF	\$	\$
2.6 18" Compost Filter Sock				
		LF	\$	\$
2.7 24" Compost Filter Sock				
		LF	\$	\$
2.8 32" Compost Filter Sock	1,101.6			
2.9 12" Straw Wattles				
		LF	\$	\$
2.10 Earthen Diversion Berms				
		LF	\$	\$
3.0 Unclassified Earthwork				
3.1 Access Road "A"				
3.1.1 Topsoil Removal to Stockpile (Assume 6" Depth)	2,368.9	CY	\$	\$
3.1.2 Excavation (Cut to Compact Fill)	10,325.4	CY	\$	\$
3.1.3 Excavation (Export to Stockpile)	8,128.8	CY	\$	\$
3.2 Access Road "B"				
3.2.1 Topsoil Removal to Stockpile (Assume 6" Depth)	656.6	CY	\$	\$
3.2.2 Excavation (Cut to Compact Fill)	1,212.5	CY	\$	\$
3.2.3 Excavation (Import from Stockpile)	79.8	CY	\$	\$
3.3 Truck Turnaround Pad				
3.3.1 Topsoil Removal to Stockpile (Assume 6" Depth)	817.8	CY	\$	\$
3.3.2 Excavation (Cut to Compact Fill)	0.2	CY	\$	\$
3.3.3 Excavation (Import from Stockpile)	13,146.1	CY	\$	\$
3.4 Centralized Freshwater Impoundment Site				
3.4.1 Topsoil Removal to Stockpile (Assume 6" Depth)	3,952.3	CY	\$	\$
3.4.2 Excavation (Cut to Compact Fill)	40,662.1	CY	\$	\$
3.4.3 Excavation (Export to Stockpile)	40,733.3	CY	\$	\$
3.5 Excavation/Undiggable Material (Hammering)				
		CY	\$	\$
3.5 Excavation/Undiggable Material (Blasting)				
		CY	\$	\$

4.0 Stone and Aggregate Surfacing				
4.1 Construction Entrance (3"-4" Stone) 6" Depth	50.5	TONS	\$	\$
4.1.1 Geotextile Fabric (US 200 or Equal)	1,816.9	SF	\$	\$
4.2 Access Road "A" (2"-3" Aggregate) 6" Depth	1,075.2	TONS	\$	\$
4.2.1 Geotextile Fabric (US 200 or Equal)	38,705.2	SF	\$	\$
4.3 Access Road "B" (2"-3" Aggregate) 6" Depth	257.1	TONS	\$	\$
4.3.1 Geotextile Fabric (US 200 or Equal)	9,256.9	SF	\$	\$
4.4 Truck Turnaround Pad (2"-3" Aggregate) 6" Depth	590.1	TONS	\$	\$
4.4.1 Geotextile Fabric (US 200 or Equal)	21,242.0	SF	\$	\$
4.5 4" Rip Rap (Outlets/Level Spreaders) 18" Depth	110.4	TONS	\$	\$
4.6 4" Rip Rap (Rock-Lined Ditches) 18" Depth		TONS	\$	\$
4.7 Rock Fill Check Dams (#3 Stone)	14.6	TONS	\$	\$
5.0 Ditch Relief and Drainage Culverts				
5.1 15" CPP (total)	388.0	LF	\$	\$
5.2 18" CPP (total)		LF	\$	\$
5.3 24" CPP (total)		LF	\$	\$
5.4 24" Sump Pipe w/Grate		EA	\$	\$
6.0 Liner System				
6.1 Centralized Freshwater Impoundment				
6.1.1 Primary Liner (60 Mil Textured)	89,990.5	SF	\$	\$
6.1.2 Non-woven Geotextile Fabric Cushion (16 oz.)	89,990.5	SF	\$	\$
7.0 Miscellaneous				
7.1 Centralized Freshwater Impoundment Perimeter Safety Fence				
7.1.1 Woven Wire Fence (4' height)	1,303.9	LF	\$	\$
7.1.2 Wood Treated Fence Post (7' length)	130	EA	\$	\$
7.1.3 Gate	1	EA	\$	\$
7.1.4 Emergency Lifeline	1	EA	\$	\$
7.2 Seeding and Mulching				
7.2.1 Temporary Seeding (Vegetation & Mulch)	7.0	AC	\$	\$
7.2.2 Permanent Seeding (Vegetation & Mulch / Fertilizer/ Lime)	16.2	AC	\$	\$
7.2.3 Lime, Fertilizer, Seeding, and Hydro-Mulch w/ack (HYC2 or Equal)		AC	\$	\$

NOTE:

1. THE SQUARE FOOTAGE FOR THE GEOTEXTILE FABRIC AND THE LINER SYSTEM DOES NOT ACCOUNT FOR MATERIAL OVERLAP AND WASTE.

LAKE CENTRALIZED FRESHWATER IMPOUNDMENT QUANTITIES						
Description	Cut (CY)	Fill (CY)	Spoil (CY)	Borrow (CY)	Max. Slope	Length of Slope
Access Road "A"	18454.2	10325.4	8128.8	0.0	20.0%	469 feet
Access Road "B"	1212.5	1292.3	0.0	79.8	13.2%	259 feet
Truck Turnaround Pad	0.2	13148.3	0.0	13148.1	n/a	n/a
Centralized Freshwater Impoundment	81395.4	40662.1	40733.3	0.0	n/a	n/a
Stripped Topsoil (6")	7795.6	0.0	7795.6	0.0	n/a	n/a
Topsoil/Excess Stockpiles	0.0	43500.0	0.0	43500.0	n/a	n/a
Totals	108857.9	108928.1	56657.7	56727.9	n/a	n/a
		Total Spoil (CY) =	-70.2			

THE EARTHWORK QUANTITIES PROVIDED ARE AN ESTIMATE FOR CONSIDERATION. THE QUANTITIES SHOWN ARE CALCULATED USING A 1:1 CUT/SWELL & FILL SHRINK FACTOR. THE QUANTITIES SHOWN MAY BE GREATER OR LESSER THAN ACTUALLY EXCAVATED. THE ENGINEER IS NOT RESPONSIBLE FOR VARIANCES FROM THE ESTIMATED QUANTITIES AND DOES NOT CERTIFY TO THEIR ACCURACY.

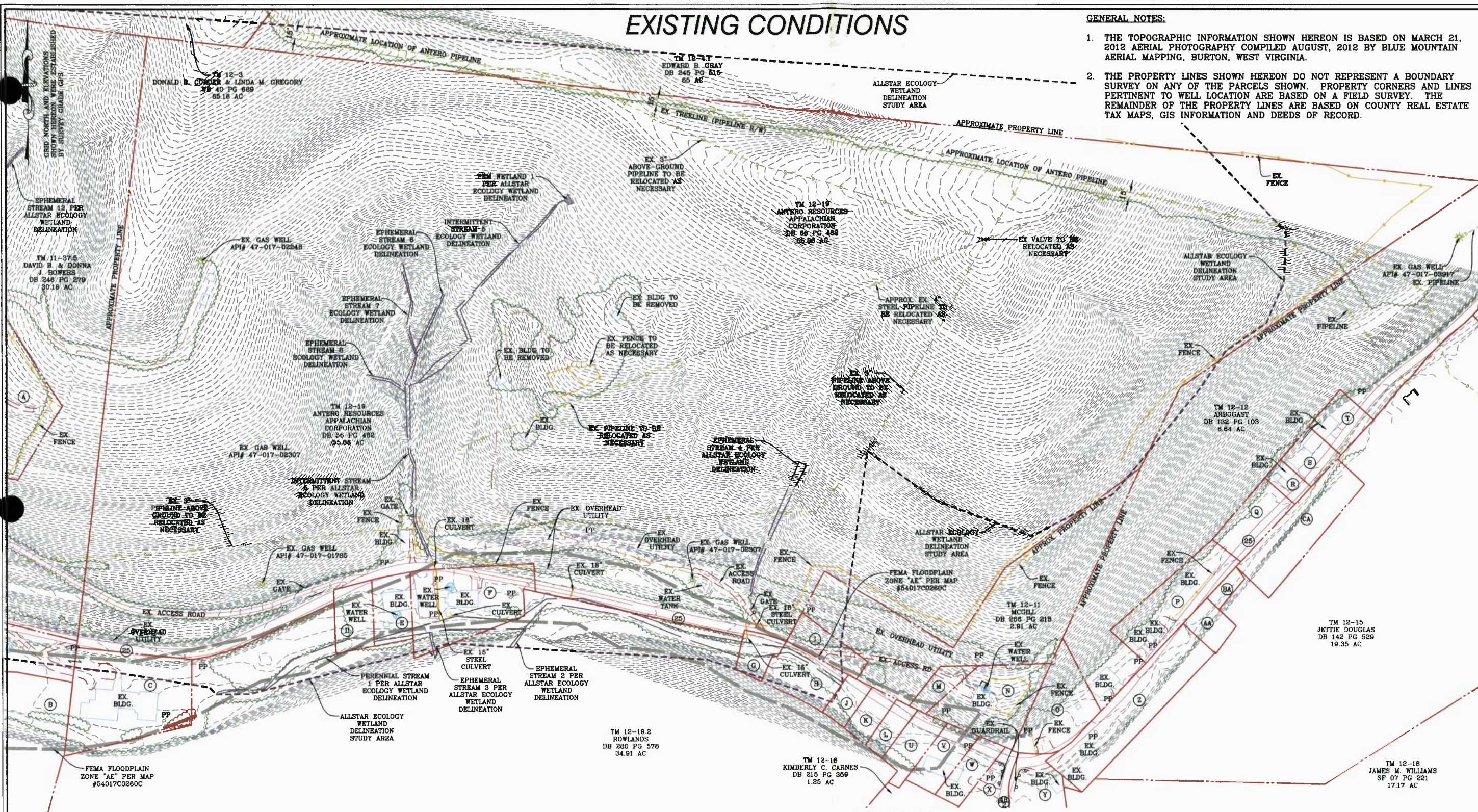
DATE	REVISION	REVISION PER	UPDATED	WETLANDS
04/11/2013				



EXISTING CONDITIONS

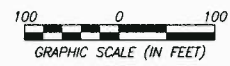
GENERAL NOTES:

1. THE TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED ON MARCH 21, 2012 AERIAL PHOTOGRAPHY COMPILED AUGUST, 2012 BY BLUE MOUNTAIN AERIAL MAPPING, BURTON, WEST VIRGINIA.
2. THE PROPERTY LINES SHOWN HEREON DO NOT REPRESENT A BOUNDARY SURVEY ON ANY OF THE PARCELS SHOWN. PROPERTY CORNERS AND LINES PERTINENT TO WELL LOCATION ARE BASED ON A FIELD SURVEY. THE REMAINDER OF THE PROPERTY LINES ARE BASED ON COUNTY REAL ESTATE TAX MAPS, GIS INFORMATION AND DEEDS OF RECORD.



LEGEND

EX INDEX CONTOUR	- 700
EX INTERMEDIATE CONTOUR	- 700
EX PROPERTY LINE	- 700
EX ROAD EDGE OF GRAVEL/DIRT	- 700
EX ROAD EDGE OF PAVEMENT	- 700
EX ROAD CENTERLINE	- 700
EX DITCHLINE	- 700
EX CULVERT	- 700
EX FENCELINE	- 700
EX OVERHEAD UTILITY	- 700
EX POWER POLE/GUY WIRE	- 700
EX GASLINE	- 700
EX TREELINE	- 700
EX DELINEATED STREAM	- 700
EX DELINEATED WETLAND	- 700
EX BUILDING	- 700
DELINEATION STUDY AREA	- 700



OWNER TABULATION

(A) TRUSTEES OF THE BIG ISAAC CEMETERY DB 240 PG 307 2.4 AC	(F) TM 12-32 BIG ISAAC U.M. CHURCH WB 4 PG 229 0.76 AC	(K) TM 12-21 JUDITH E. JOZWICK DB 253 PG 537 0.2 AC	(P) WILLIAM D. & MARY K. ARBOGAST DB 243 PG 080 0.57 AC	(U) JUDITH E. JOZWICK & MICHAEL L. WEEKLEY DB 243 PG 314 0.2 AC
(B) TM 11-37 EARL RICHARDS (LIFE) DB 226 PG 330 57.53 ACRES	(G) TM 12-31 POSEY WB 36 PG 632 0.18 AC	(L) JUDITH E. JOZWICK & MICHAEL L. WEEKLEY DB 243 PG 314 0.1 AC	(Q) WILLIAM D. & MARY K. ARBOGAST DB 200 PG 637 0.36 AC	(V) WILLIAM D. & DONNA S. RICHARDS DB 235 PG 144 0.19 AC
(C) TM 11-41 ROWLANDS DB 264 PG 478 1 AC	(H) TM 12-10 PORTER L. MCGILL DB 226 PG 218 0.5 AC	(M) JUDITH E. JOZWICK & MICHAEL L. WEEKLEY DB 243 PG 314 0.22 AC	(R) TM 12-12.2 WILLIAM D. RICHARDS DB 175 PG 792 0.04 AC	(W) JUDITH E. JOZWICK & MICHAEL L. WEEKLEY DB 243 PG 314 0.13 AC
(D) TM 12-19.1 BIG ISAAC U.M. CHURCH DB 173 PG 536 0.27 AC	(I) TM 12-24.2 PORTER L. MCGILL DB 257 PG 656 0.17 AC	(N) JUDITH E. JOZWICK & MICHAEL L. WEEKLEY DB 243 PG 314 0.24 AC	(S) WILLIAM D. & DONNA RICHARDS DB 163 PG 052 0.25 AC	(X) JUDITH E. JOZWICK & MICHAEL L. WEEKLEY DB 243 PG 314 0.28 AC
(E) TM 12-9 BIG ISAAC U.M. CHURCH DB 9 PG 398 0.27 AC	(J) TM 12-20 JUDITH E. JOZWICK DB 253 PG 537 0.2 AC	(O) JUDITH E. JOZWICK & MICHAEL L. WEEKLEY DB 243 PG 314 0.28 AC	(T) TM 12-13 WILLIAM D. RICHARDS DB 181 PG 680 0.19 AC	(Y) JUDITH E. JOZWICK & MICHAEL L. WEEKLEY DB 243 PG 314 0.28 AC
				(Z) TM 12-29 JUDITH E. JOZWICK & MICHAEL L. WEEKLEY DB 243 PG 314 0.28 AC
				(AA) WILLIAM D. & MARY K. ARBOGAST DB 200 PG 637 0.15 AC
				(BB) WILLIAM D. & MARY K. ARBOGAST DB 243 PG 080 0.06 AC
				(CA) TM 12-27 WILLIAM D. & DONNA S. RICHARDS DB 190 PG 703 0.45 AC

Engineering Survey Environmental GIS

NAVITUS ENGINEERING INC.

151 Windy Hill Lane Winchester, Virginia 21802 Telephone: (888) 662-1155 www.navituseng.com

DATE	REVISION
04/11/2013	REVISED PER UPDATED WETLANDS

ANTERO RESOURCES

THIS DOCUMENT WAS PREPARED FOR ANTERO RESOURCES APPALACHIAN CORP.

EXISTING CONDITIONS

LAKE

CENTRALIZED FRESHWATER IMPOUNDMENT

GREENBRIER DISTRICT

DODDRIDGE COUNTY, WEST VIRGINIA

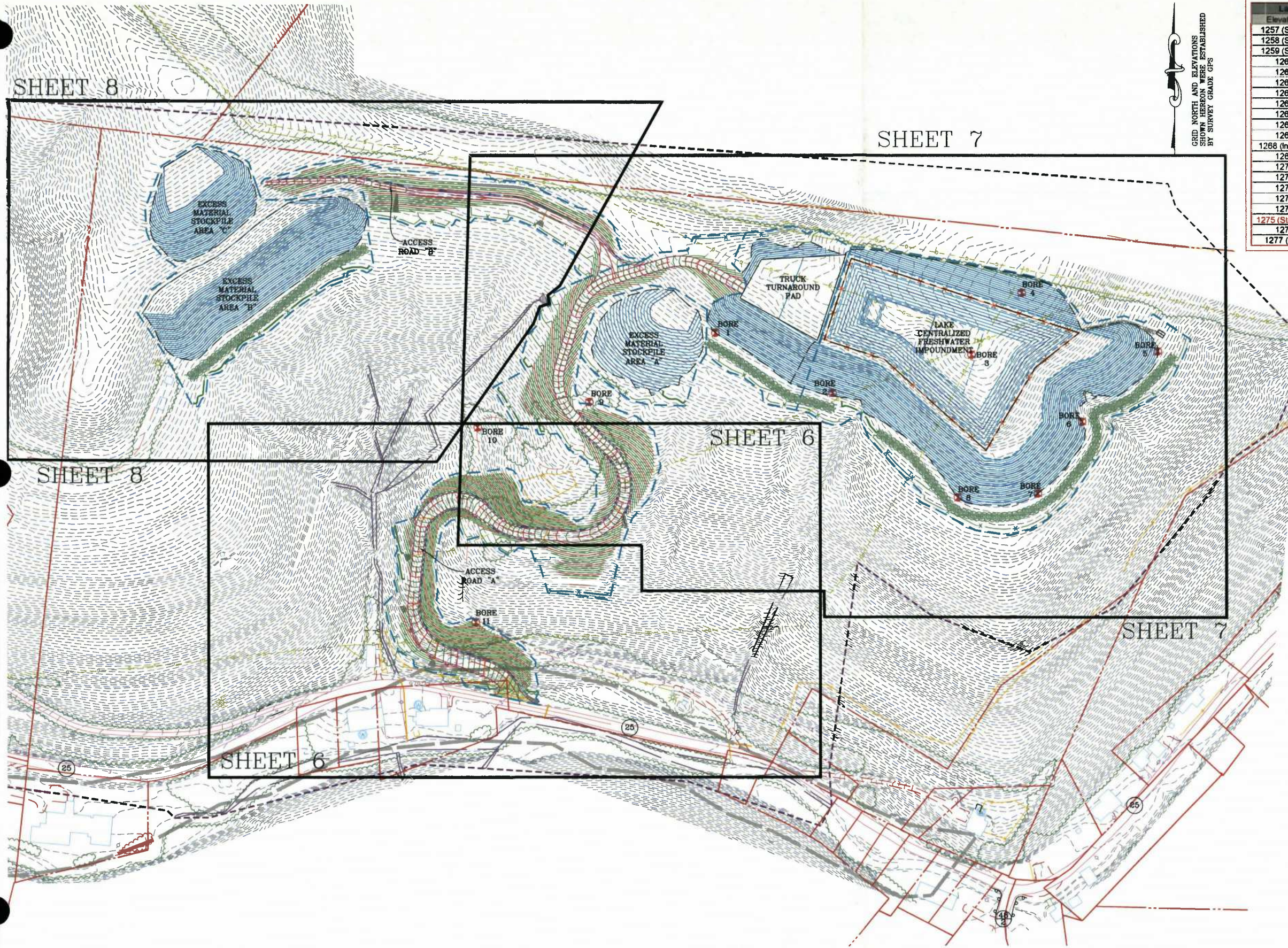


DATE: 04/03/2013

SCALE: 1" = 100'

SHEET 04 OF 21

OVERALL PLAN SHEET INDEX & VOLUMES



GRID NORTH AND ELEVATIONS SHOWN HEREON WERE ESTABLISHED BY SURVEY GRADE GPS

Lake Centralized Freshwater Impoundment Volume			
Elevation	Barrels	Gallons	Acres-Ft
1257 (Sump)	0	0.0	0.00000
1258 (Sump)	166	6963.4	0.02137
1259 (Sump)	406	17195.2	0.05277
1260	1236	51921.2	0.15934
1261	3679	154535.0	0.47425
1262	8535	358472.4	1.10011
1263	14220	597256.3	1.83291
1264	20378	855874.8	2.62658
1265	27023	1134963.3	3.48307
1266	34171	1435166.9	4.40436
1267	41836	1757104.8	5.39235
1268 (Incised)	50033	2101406.0	6.44897
1269	58779	2468702.4	7.57616
1270	68086	2859626.3	8.77586
1271	77973	3274858.8	10.05016
1272	88454	3715051.4	11.40106
1273	99544	4180856.0	12.83056
1274	111260	4672904.7	14.34060
1275 (Storage)	123611	5191643.8	15.93255
1276	136610	5737620.9	17.80809
1277 (Top)	150290	6312181.7	19.37135

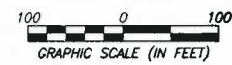
STOCKPILE VOLUMES	
STOCKPILE	CY
A	7,800
B	24,200
C	11,300

Proposed Centralized Freshwater Impoundment
 Topsoil Removal: 3,952.3 C.Y.
 Total cut: 81,395.4 C.Y. (Cut/Swell=1)
 Total fill: 40,662.1 C.Y. (Fill/Shrink=1)
 Top of dam elevation: 1277.0'
 Bottom of pit elevation (Sump): 1257.0'
 Top of dam width: Varies

Proposed Truck Turnaround Pad
 Topsoil Removal: 817.8 C.Y.
 Total cut: 0.2 C.Y. (Cut/Swell=1)
 Total fill: 13,148.3 C.Y. (Fill/Shrink=1)
 Gravel (6" depth): 393.4 C.Y.

Proposed Access Road "A"
 Topsoil Removal: 2,368.9 C.Y.
 Total cut: 18,454.2 C.Y. (Cut/Swell=1)
 Total fill: 10,325.4 C.Y. (Fill/Shrink=1)
 Gravel (8" depth): 716.8 C.Y.

Proposed Access Road "B"
 Topsoil Removal: 656.6 C.Y.
 Total cut: 1,212.5 C.Y. (Cut/Swell=1)
 Total fill: 1,292.3 C.Y. (Fill/Shrink=1)
 Gravel (6" depth): 171.4 C.Y.



Engineering Survey Environmental GIS

NAVITUS ENGINEERING INC.

151 Windy Hill Lane
 Winchester, Virginia 22602
 Telephone: (888) 662-4185
 www.navituseng.com

DATE	REVISION	REVISION PER	UPDATED WETLANDS
04/11/2013			

ANTERO RESOURCES
 THIS DOCUMENT WAS PREPARED FOR:
 ANTERO RESOURCES
 APPALACHIAN CORE

OVERALL PLAN SHEET INDEX & VOLUMES

LAKE
CENTRALIZED FRESHWATER IMPOUNDMENT
 GREENBRIER DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA

DATE: 04/03/2013
 SCALE: 1" = 100'
 SHEET 05 OF 21

ACCESS ROAD PLAN

Engineering
Survey
Environmental
GIS

NAVITUS ENGINEERING INC.

151 Windy Hill Lane
Winchester, VA 22602
Telephone: (800) 404-4185
www.navituseng.com

DATE	REVISION
04/11/2013	REVISED PER UPDATED WETLANDS

ANTERO RESOURCES

THIS DOCUMENT WAS PREPARED BY ANTERO RESOURCES APPALACHIAN CORP.

ACCESS ROAD PLAN

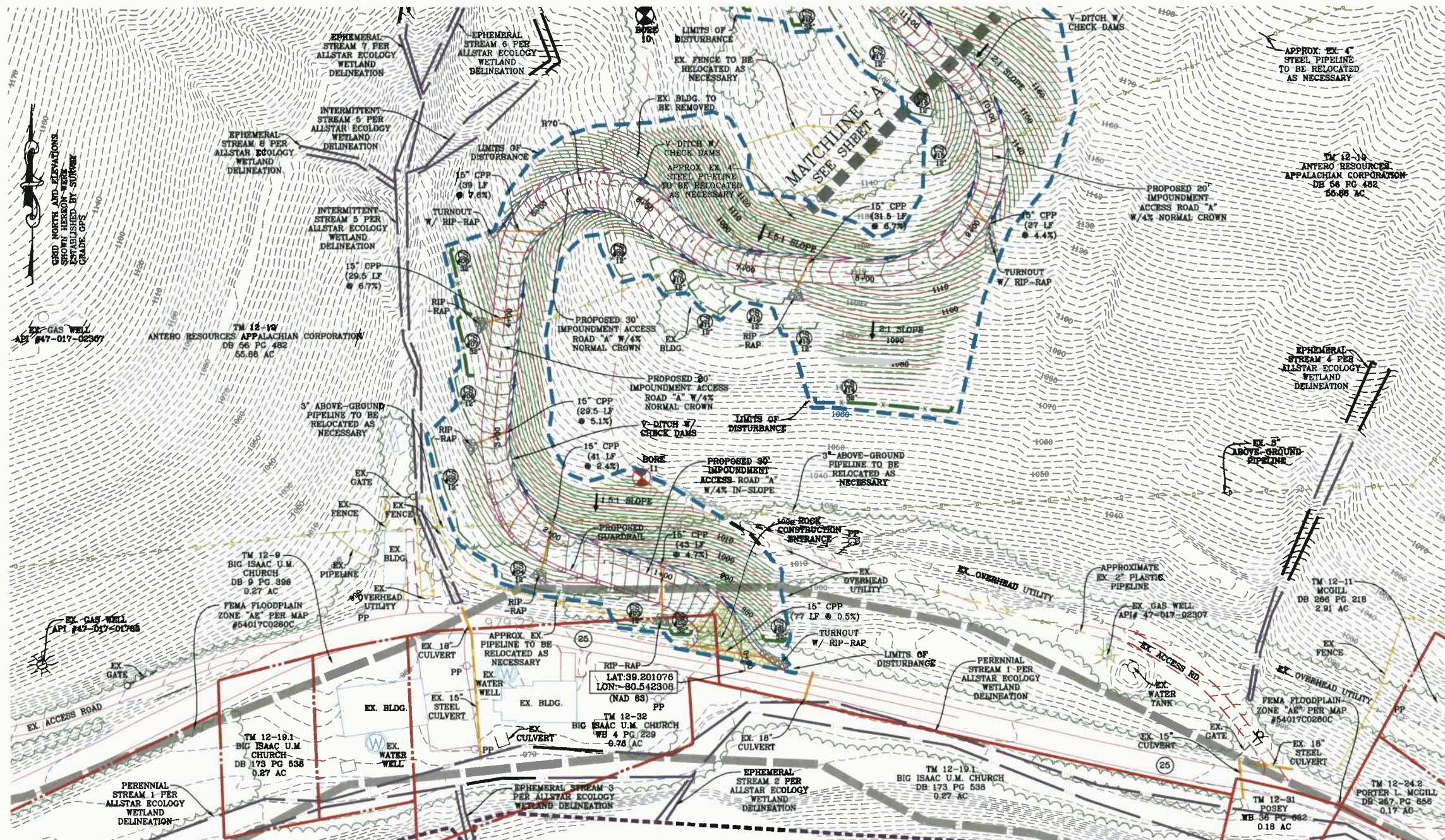
LAKE

CENTRALIZED FRESHWATER IMPOUNDMENT

GREENBRIER DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 04/03/2013
SCALE: 1" = 50'
SHEET 08 OF 21



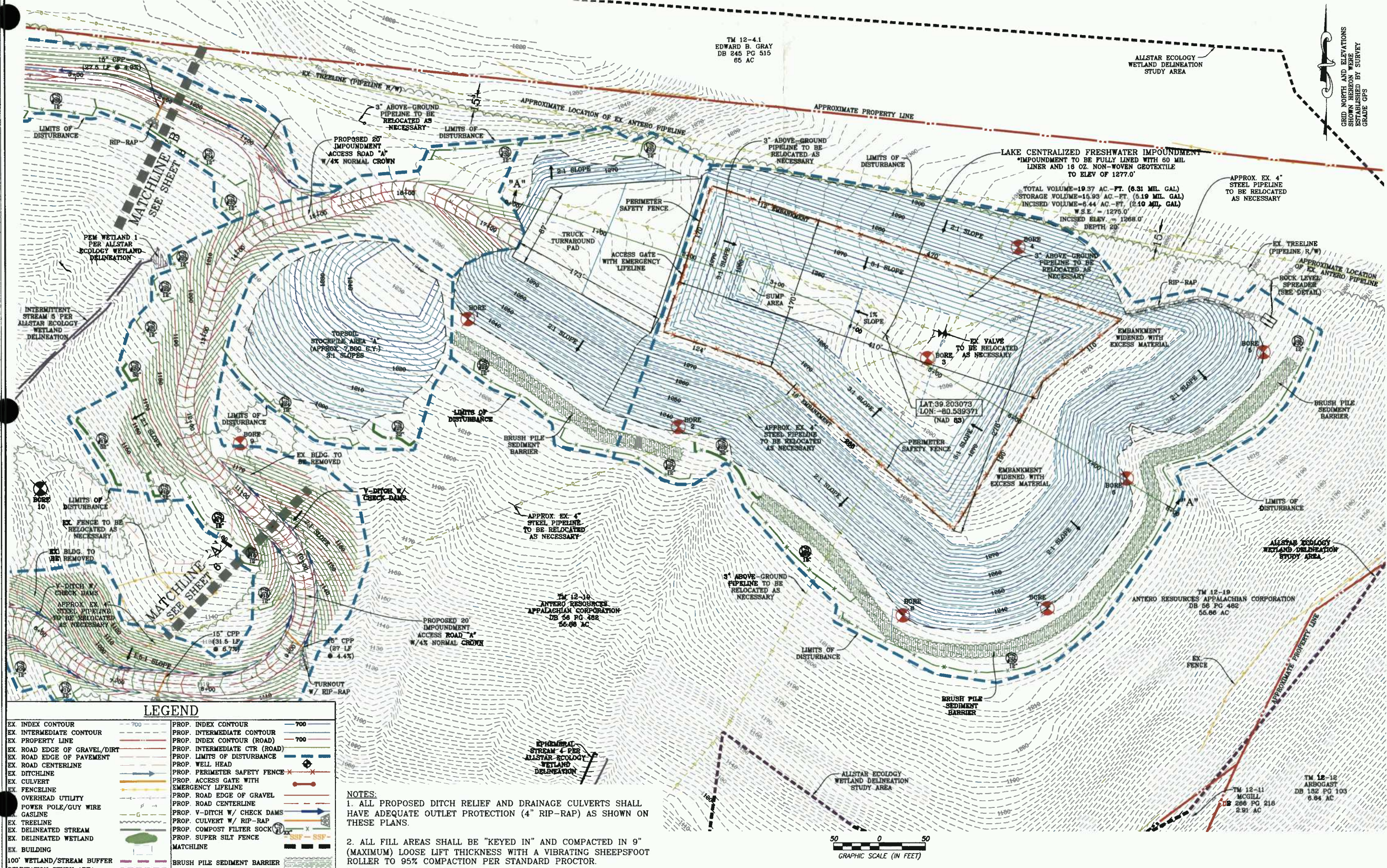
LEGEND

EX INDEX CONTOUR	PROP. INDEX CONTOUR	700
EX INTERMEDIATE CONTOUR	PROP. INTERMEDIATE CONTOUR	700
EX PROPERTY LINE	PROP. INDEX CONTOUR (ROAD)	
EX ROAD EDGE OF GRAVEL/DIRT	PROP. INTERMEDIATE CTR (ROAD)	
EX ROAD EDGE OF PAVEMENT	PROP. LIMITS OF DISTURBANCE	
EX ROAD CENTERLINE	PROP. WELL HEAD	
EX DITCHLINE	PROP. PERIMETER SAFETY FENCE	
EX CULVERT	PROP. ACCESS GATE WITH EMERGENCY LIFELINE	
EX FENCELINE	PROP. ROAD EDGE OF GRAVEL	
OVERHEAD UTILITY	PROP. ROAD CENTERLINE	
POWER POLE/GUY WIRE	PROP. V-DITCH W/ CHECK DAMS	
GASLINE	PROP. CULVERT W/ RIP-RAP	
EX TREELINE	PROP. COMPOST FILTER SOCK	
EX DELINEATED STREAM	PROP. SUPER SILT FENCE	
EX DELINEATED WETLAND	MATCHLINE	
EX BUILDING	BRUSH PILE SEDIMENT BARRIER	
100' WETLAND/STREAM BUFFER DELINEATION STUDY AREA		

NOTES:

1. ALL PROPOSED DITCH RELIEF AND DRAINAGE CULVERTS SHALL HAVE ADEQUATE OUTLET PROTECTION (4" RIP-RAP) AS SHOWN ON THESE PLANS.
2. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 9" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.

CENTRALIZED FRESHWATER IMPOUNDMENT PLAN



LEGEND

EX INDEX CONTOUR	700	PROP. INDEX CONTOUR	700
EX INTERMEDIATE CONTOUR	700	PROP. INTERMEDIATE CONTOUR	700
EX PROPERTY LINE	---	PROP. INDEX CONTOUR (ROAD)	---
EX. ROAD EDGE OF GRAVEL/DIRT	---	PROP. INTERMEDIATE CTR (ROAD)	---
EX. ROAD EDGE OF PAVEMENT	---	PROP. LIMITS OF DISTURBANCE	---
EX. ROAD CENTERLINE	---	PROP. WELL HEAD	---
EX. DITCHLINE	---	PROP. PERIMETER SAFETY FENCE	---
EX. CULVERT	---	PROP. ACCESS GATE WITH EMERGENCY LIFELINE	---
EX. FENCELINE	---	PROP. ROAD EDGE OF GRAVEL	---
EX. OVERHEAD UTILITY	---	PROP. ROAD CENTERLINE	---
EX. GASLINE	---	PROP. V-DITCH W/ CHECK DAMS	---
EX. TREELINE	---	PROP. CULVERT W/ RIP-RAP	---
EX. DELINEATED STREAM	---	PROP. COMPOST FILTER SOCK	---
EX. DELINEATED WETLAND	---	PROP. SUPER SILT FENCE	---
EX. BUILDING	---	MATCHLINE	---
100' WETLAND/STREAM BUFFER DELINEATION STUDY AREA	---	BRUSH PILE SEDIMENT BARRIER	---

NOTES:
 1. ALL PROPOSED DITCH RELIEF AND DRAINAGE CULVERTS SHALL HAVE ADEQUATE OUTLET PROTECTION (4" RIP-RAP) AS SHOWN ON THESE PLANS.
 2. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 9" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.

Engineering Survey Environmental GIS

NAVITUS ENGINEERING INC.
 151 Windy Hill Lane
 Winchester, Virginia 22602
 Telephone: (888) 664-1185
 www.navituseng.com

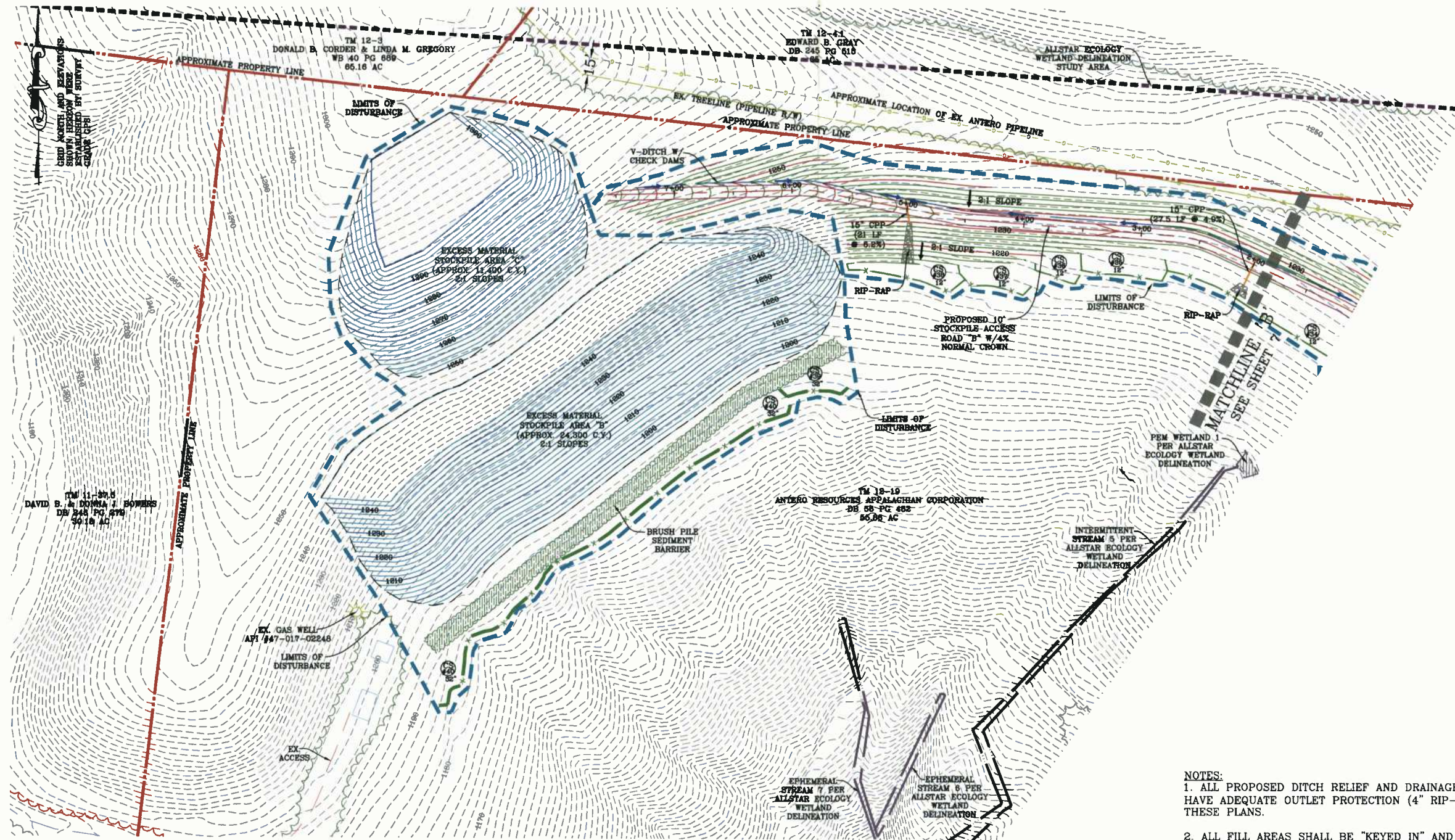
DATE: 04/11/2013
 REVISION: REVISED PER UPDATED WETLANDS

ANTERO RESOURCES
 THIS DOCUMENT WAS PREPARED BY ANTERO RESOURCES APPALACHIAN CORP.

CENTRALIZED FRESHWATER IMPOUNDMENT PLAN
LAKE
 CENTRALIZED FRESHWATER IMPOUNDMENT
 GREENBRIER DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA

DATE: 04/03/2013
 SCALE: 1" = 50'
 SHEET 07 OF

EXCESS MATERIAL STOCKPILE PLAN



- NOTES:**
- ALL PROPOSED DITCH RELIEF AND DRAINAGE CULVERTS SHALL HAVE ADEQUATE OUTLET PROTECTION (4" RIP-RAP) AS SHOWN ON THESE PLANS.
 - ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 9" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.

LEGEND	
EX INDEX CONTOUR	--- 700 ---
EX INTERMEDIATE CONTOUR	--- 700 ---
EX PROPERTY LINE	---
EX ROAD EDGE OF GRAVEL/DIRT	---
EX ROAD EDGE OF PAVEMENT	---
EX ROAD CENTERLINE	---
EX DITCHLINE	---
EX CULVERT	---
EX FENCELINE	---
EX OVERHEAD UTILITY	---
EX POWER POLE/GUY WIRE	---
EX GASLINE	---
EX TREELINE	---
EX DELINEATED STREAM	---
EX DELINEATED WETLAND	---
EX BUILDING	---
100' WETLAND/STREAM BUFFER DELINEATION STUDY AREA	---
PROP. INDEX CONTOUR	--- 700 ---
PROP. INTERMEDIATE CONTOUR	---
PROP. INDEX CONTOUR (ROAD)	---
PROP. INTERMEDIATE CTR (ROAD)	---
PROP. LIMITS OF DISTURBANCE	---
PROP. WELL HEAD	---
PROP. PERIMETER SAFETY FENCE	---
PROP. ACCESS GATE WITH EMERGENCY LIFELINE	---
PROP. ROAD EDGE OF GRAVEL	---
PROP. ROAD CENTERLINE	---
PROP. V-DITCH W/ CHECK DAMS	---
PROP. CULVERT W/ RIP-RAP	---
PROP. COMPOST FILTER SOCK	---
PROP. SUPER SILT FENCE	---
MATCHLINE	---
BRUSH PILE SEDIMENT BARRIER	---

NAVITUS ENGINEERING INC.
Engineering Survey Environmental GIS
151 Windy Hill Lane
Winchester, Virginia 22602
Telephone: (888) 662-4185
www.navituseng.com

DATE	04/11/2013
REVISION	REVISED PER UPDATED WETLANDS

ANTERO RESOURCES
THIS DOCUMENT WAS PREPARED BY ANTERO RESOURCES APPALACHIAN CORE

EXCESS MATERIAL STOCKPILE PLAN

LAKE

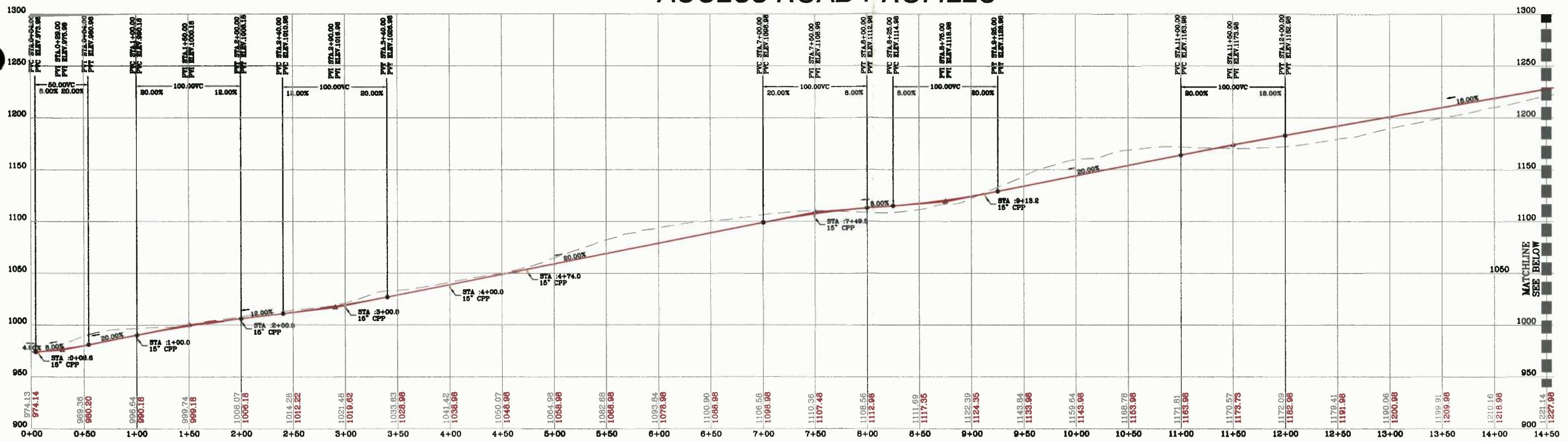
CENTRALIZED FRESHWATER IMPOUNDMENT

GREENBRIER DISTRICT

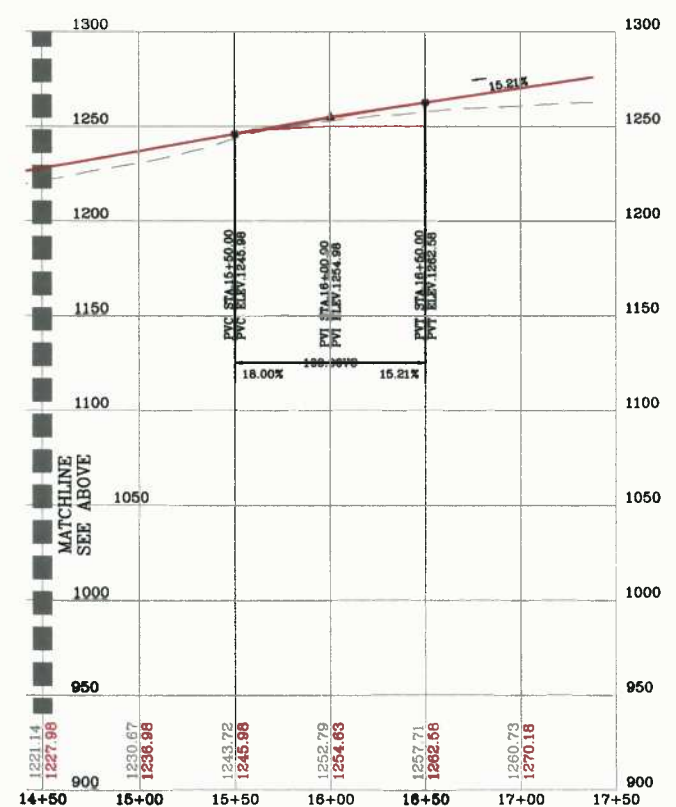
DODDRIDGE COUNTY, WEST VIRGINIA

DATE: 04/03/2013
SCALE: 1" = 50'
SHEET 08 OF 21

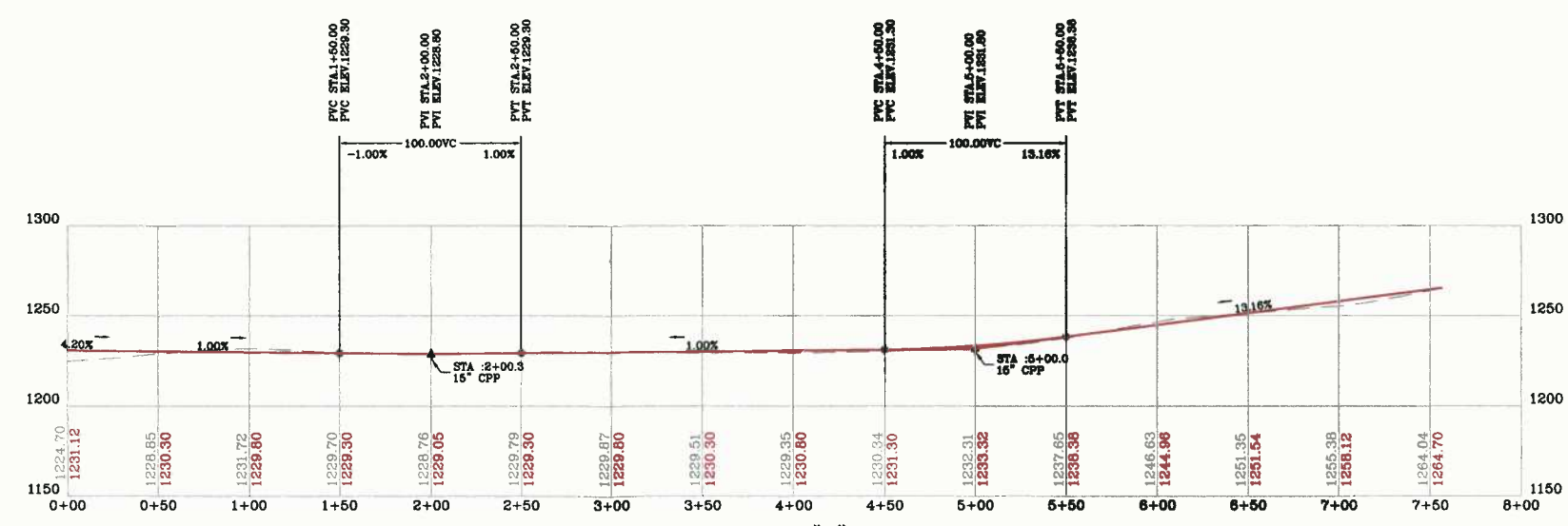
ACCESS ROAD PROFILES



ACCESS ROAD "A" PROFILE
 SCALE: HORIZ. 1" = 50' VERT. 1" = 50'



ACCESS ROAD "A" PROFILE
 SCALE: HORIZ. 1" = 50' VERT. 1" = 50'



ACCESS ROAD "B" PROFILE
 SCALE: HORIZ. 1" = 50' VERT. 1" = 50'

LEGEND

- X-SECTION GRID INDEX
- X-SECTION GRID INTERMEDIATE
- X-SECTION PROPOSED GRADE
- X-SECTION EXISTING GRADE
- X-SECTION WATER SURFACE
- MATCHLINE

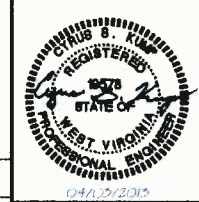
NAVITUS ENGINEERING INC.
 151 Woody Hill Lane
 Winchester, Virginia 22602
 Telephone: (888) 662-4183
 www.navituseng.com

Engineering Survey Environmental GIS

DATE	REVISION	REVISOR	DESCRIPTION
04/11/2013	REVISED PER UPDATED WETLANDS		

ANTERO RESOURCES
 THIS DOCUMENT WAS PREPARED BY ANTERO RESOURCES APPALACHIAN CORE

ACCESS ROAD PROFILES
LAKE
 CENTRALIZED FRESHWATER IMPOUNDMENT
 GREENBRIER DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA

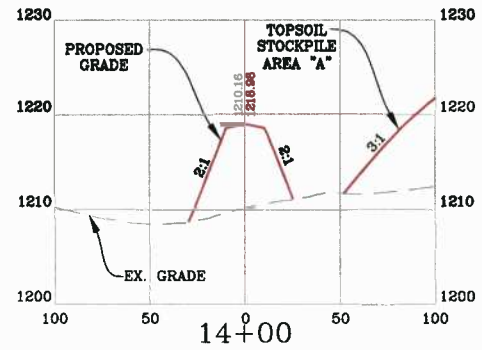
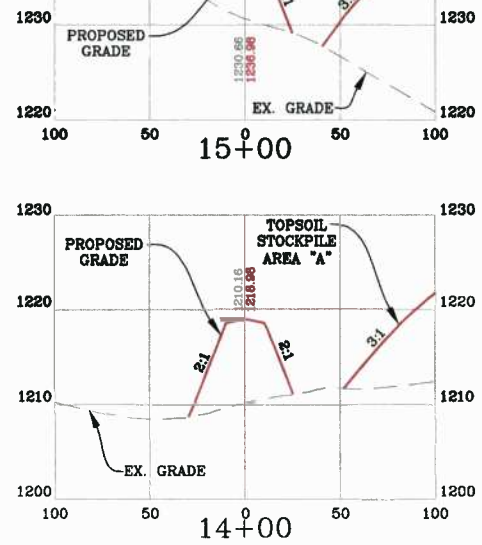
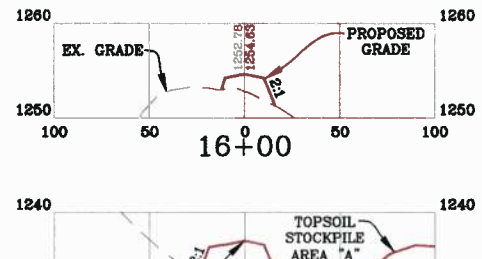
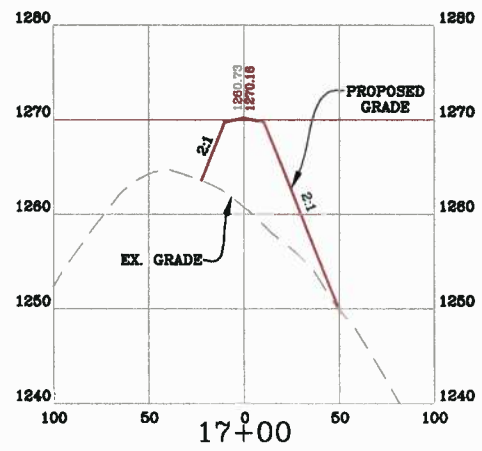
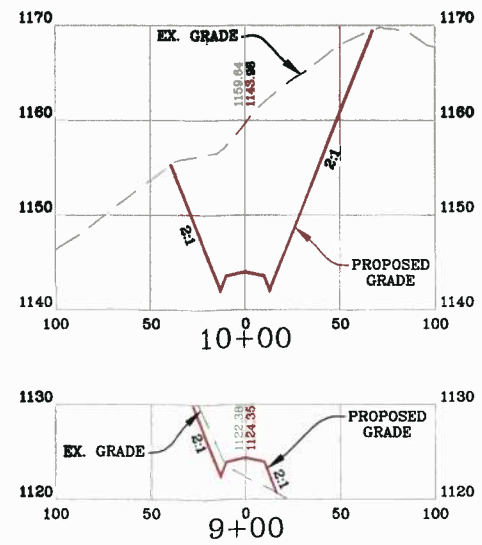
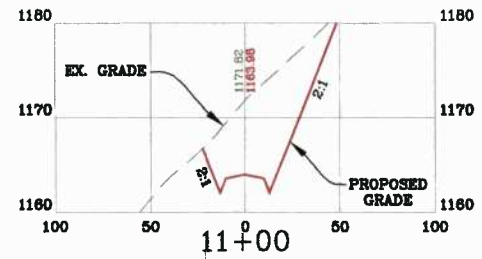
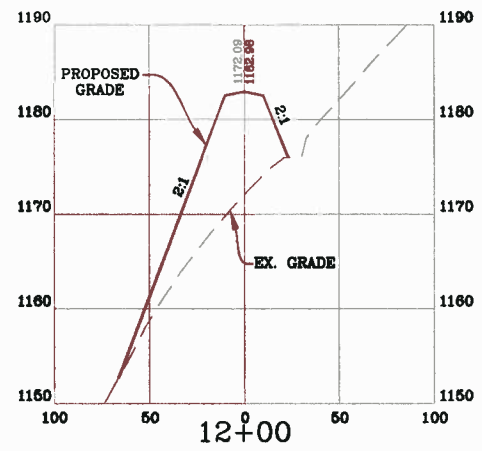
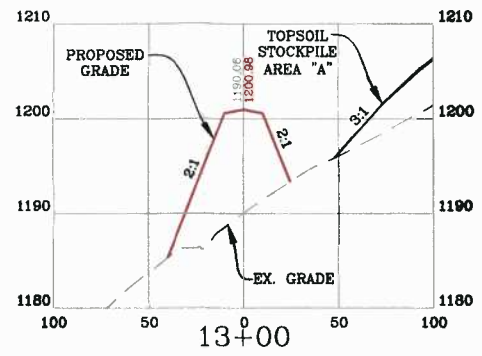
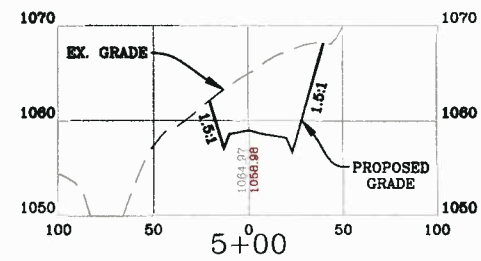
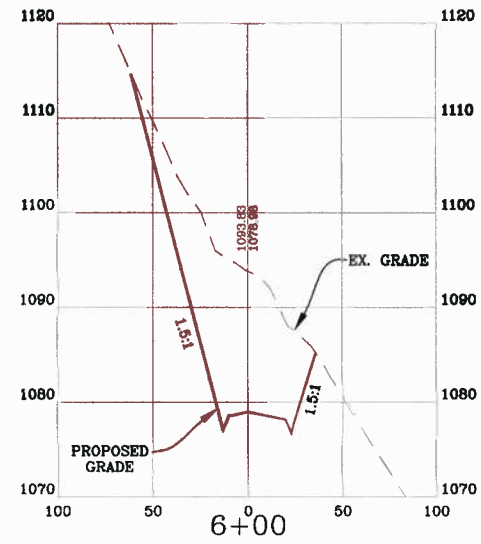
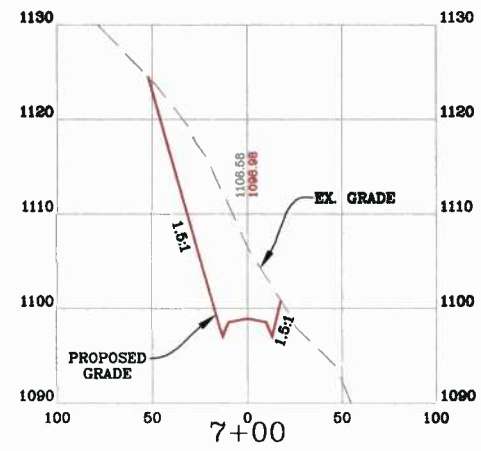
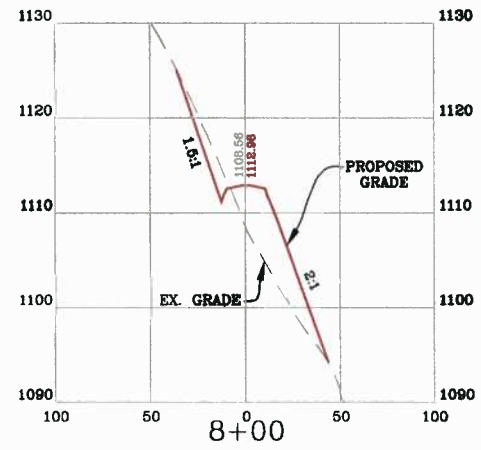
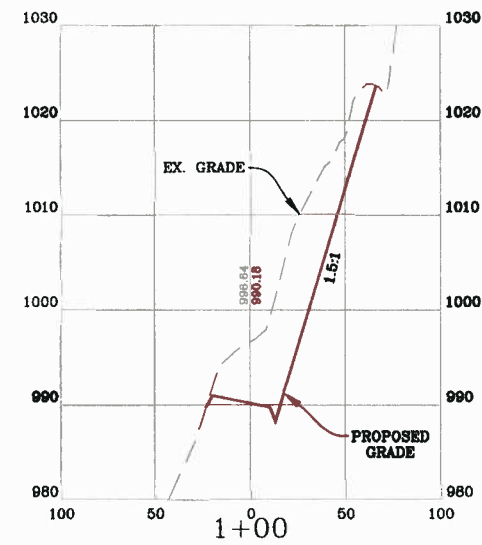
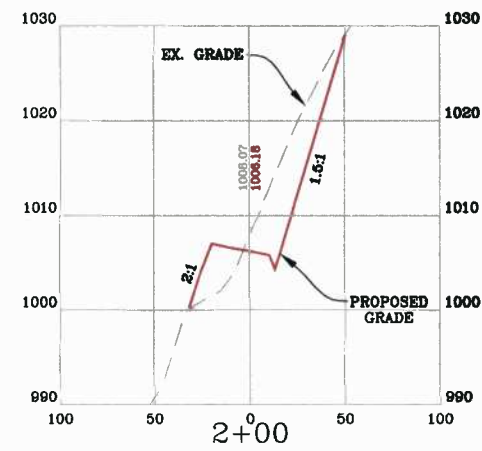
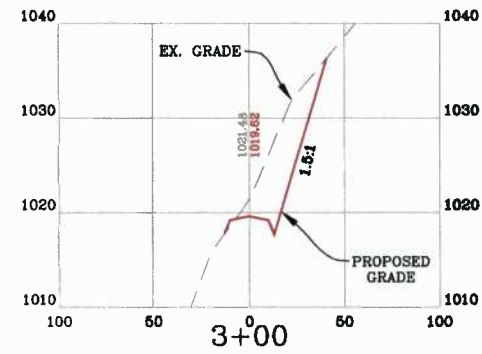
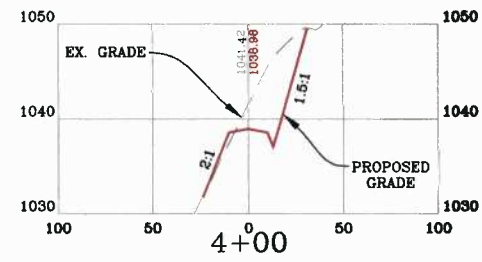


DATE: 04/03/2013
 SCALE: AS SHOWN
 SHEET 09 OF 21

ACCESS ROAD SECTIONS

ACCESS ROAD "A" CROSS-SECTIONS

SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



NOTE:
1. ALL CUT & FILL SLOPES ALONG THE ACCESS ROAD SHALL BE 2:1 UNLESS STATED OTHERWISE.

LEGEND	
X-SECTION GRID INDEX	---
X-SECTION GRID INTERMEDIATE	---
X-SECTION PROPOSED GRADE	---
X-SECTION EXISTING GRADE	---
X-SECTION WATER SURFACE	---
X-SECTION MATCHLINE	---

Engineering
Survey
Environmental
GIS

NAVITUS
ENGINEERING INC.

151 W. 4th St.
Winchester, Virginia 22602
Telephone: (888) 662-4185
www.navituseng.com

DATE	REVISION	REVISION PER	WETLANDS
04/11/2013			

ANTERO
RESOURCES
THIS DOCUMENT
WAS PREPARED
FOR:
ANTERO RESOURCES
APPALACHIAN CORP

ACCESS ROAD SECTIONS

LAKE

CENTRALIZED FRESHWATER IMPOUNDMENT
GREENBRIER DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA

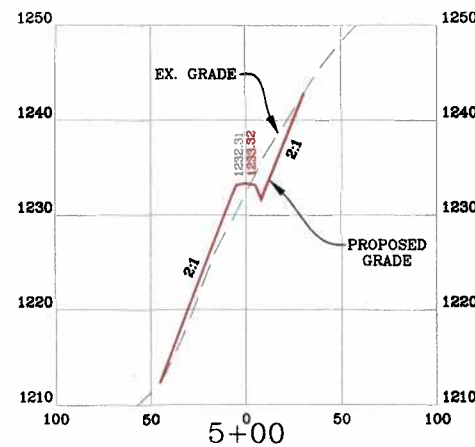
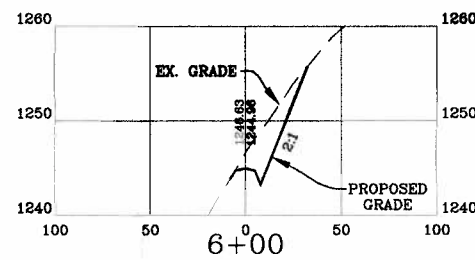
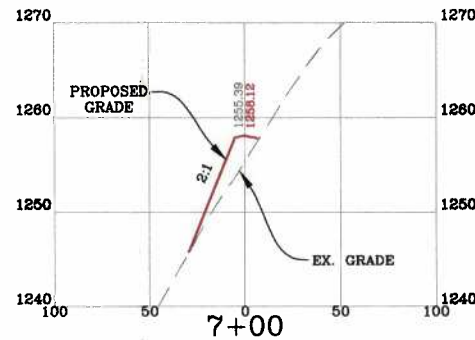
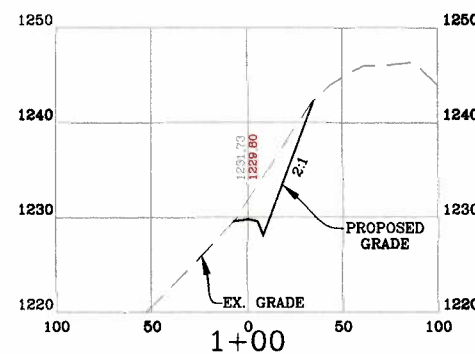
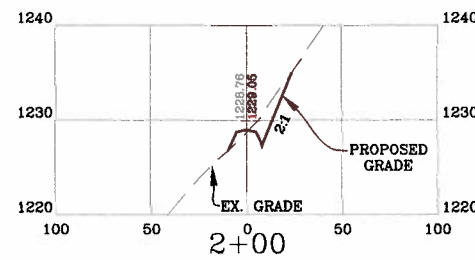
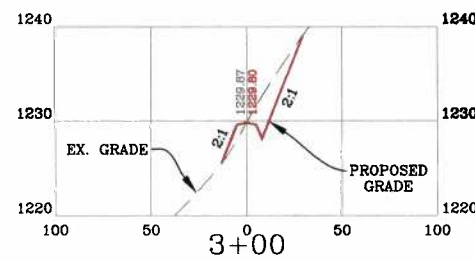
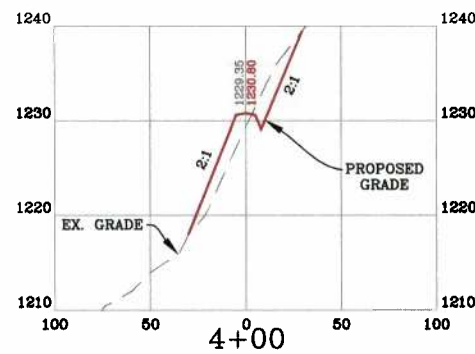


DATE: 04/03/2013
SCALE: AS SHOWN
SHEET 10 OF 21

ACCESS ROAD SECTIONS

ACCESS ROAD "B" CROSS-SECTIONS

SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



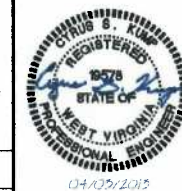
NOTE:
1. ALL CUT & FILL SLOPES ALONG THE ACCESS ROAD SHALL BE 2:1 UNLESS STATED OTHERWISE.

LEGEND	
X-SECTION GRID INDEX	—
X-SECTION GRID INTERMEDIATE	—
X-SECTION PROPOSED GRADE	—
X-SECTION EXISTING GRADE	—
X-SECTION WATER SURFACE	—
MATCHLINE	—

DATE	REVISION
04/11/2013	REVISED PER UPDATED WETLANDS

ANTERO RESOURCES
THIS DOCUMENT WAS PREPARED BY ANTERO RESOURCES APPALACHIAN CORP.

ACCESS ROAD SECTIONS
LAKE
CENTRALIZED FRESHWATER IMPOUNDMENT
GREENBRIER DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 04/03/2013
SCALE: AS SHOWN
SHEET 11 OF 21

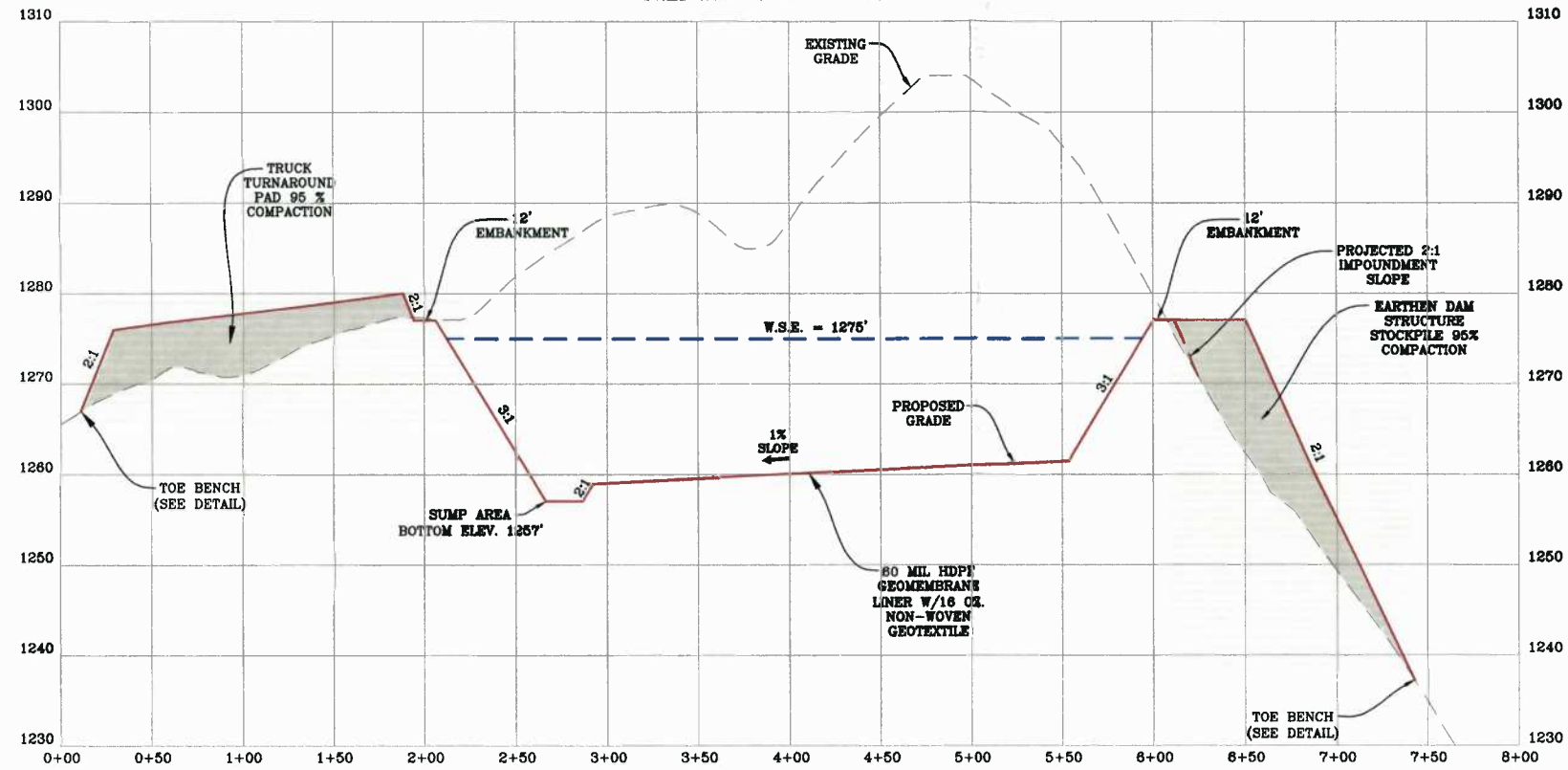
NAVITUS ENGINEERING INC.
151 Windy Hill Lane
Winchester, Virginia 22602
Telephone: (888) 662-4185
www.navituseng.com

Engineering
Survey
Environmental
GIS

CENTRALIZED FRESHWATER IMPOUNDMENT SECTIONS

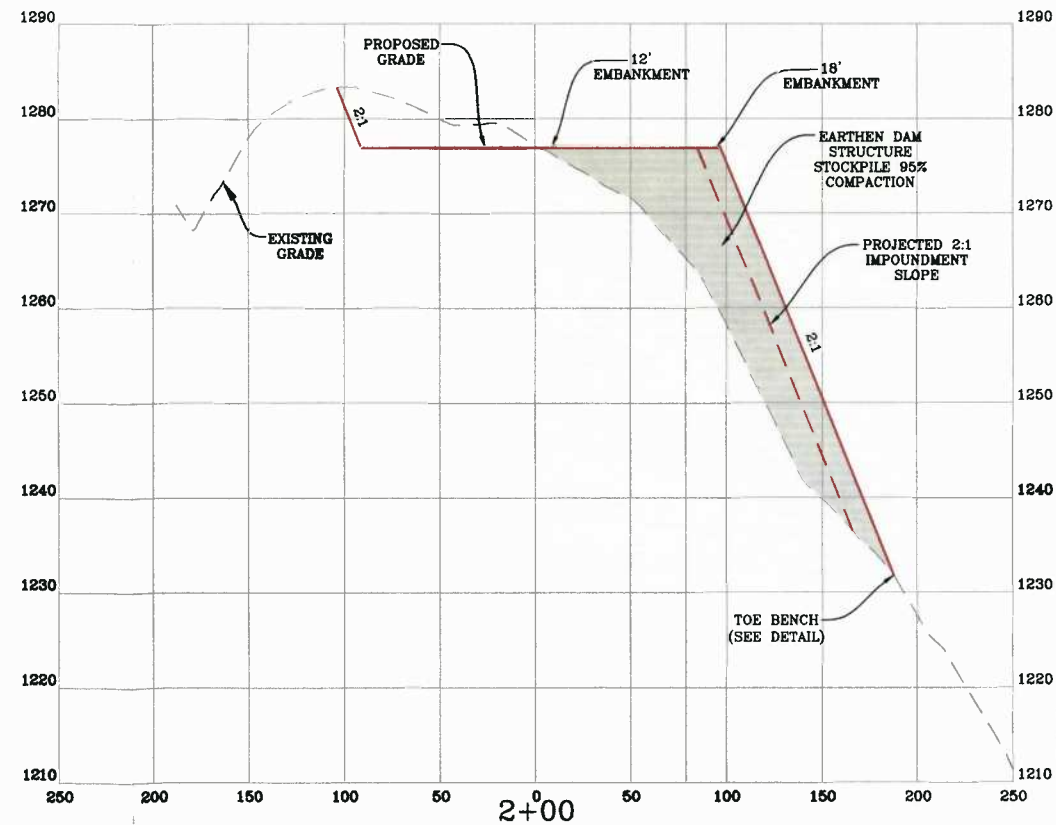
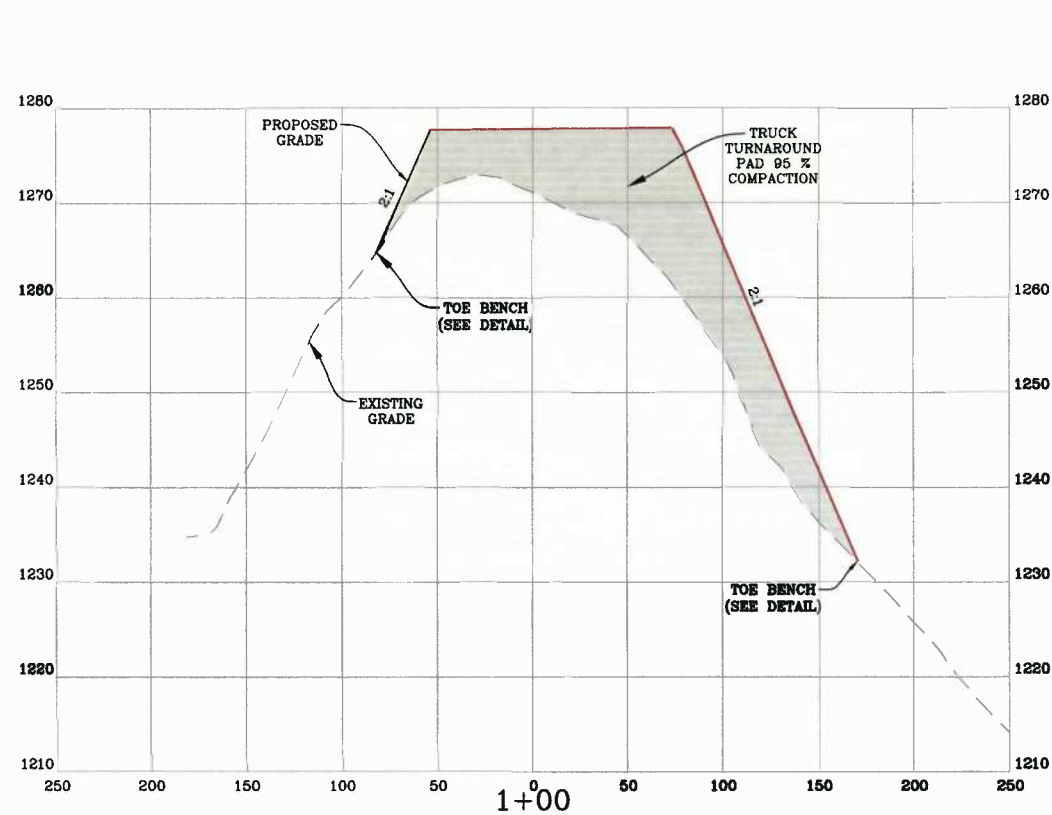
CENTRALIZED FRESHWATER IMPOUNDMENT CROSS-SECTION "A-A"

SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



CENTRALIZED FRESHWATER IMPOUNDMENT CROSS-SECTIONS ALONG BASELINE "A-A"

SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



LEGEND

X-SECTION GRID INDEX	—
X-SECTION GRID INTERMEDIATE	—
X-SECTION PROPOSED GRADE	—
X-SECTION EXISTING GRADE	---
X-SECTION WATER SURFACE	---
MATCHLINE	—

NOTE:
1. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 9" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.



DATE	REVISION
04/11/2013	REVISED PER UPDATED WETLANDS

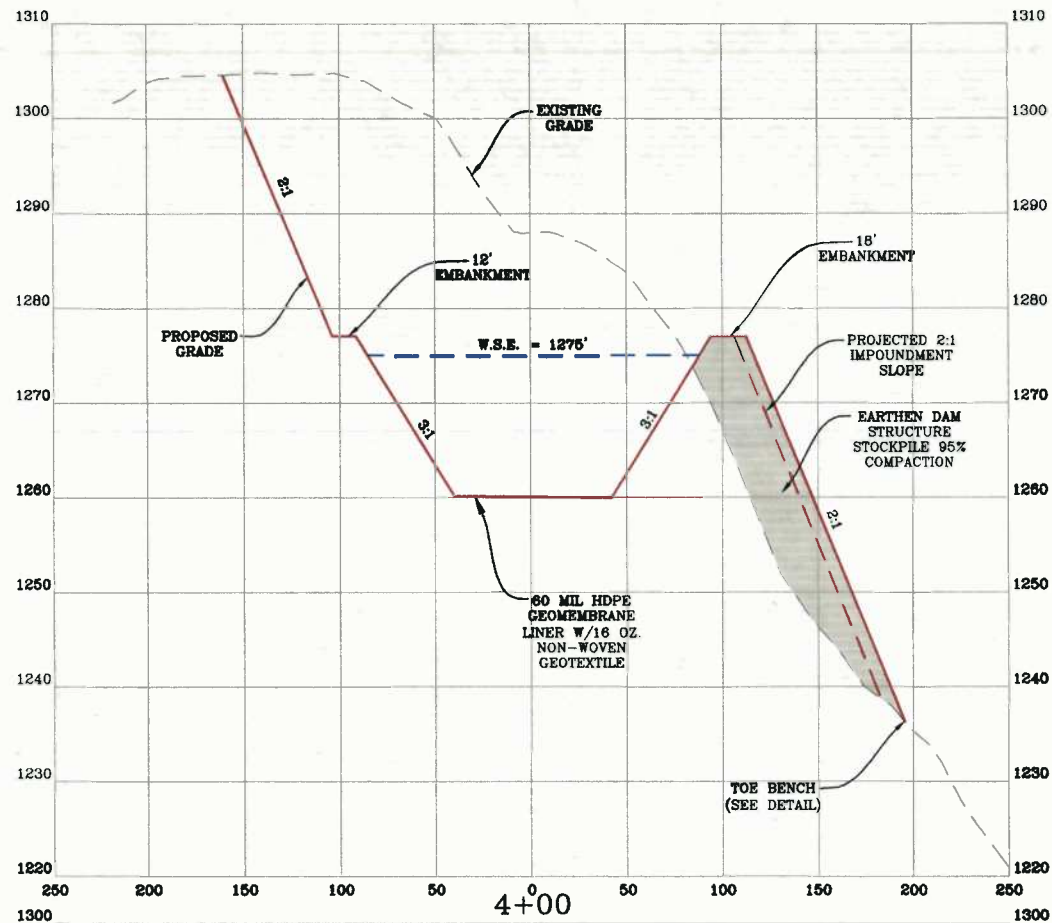


CENTRALIZED FRESHWATER IMPOUNDMENT SECTIONS
LAKE
CENTRALIZED FRESHWATER IMPOUNDMENT
GREENBRIER DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA

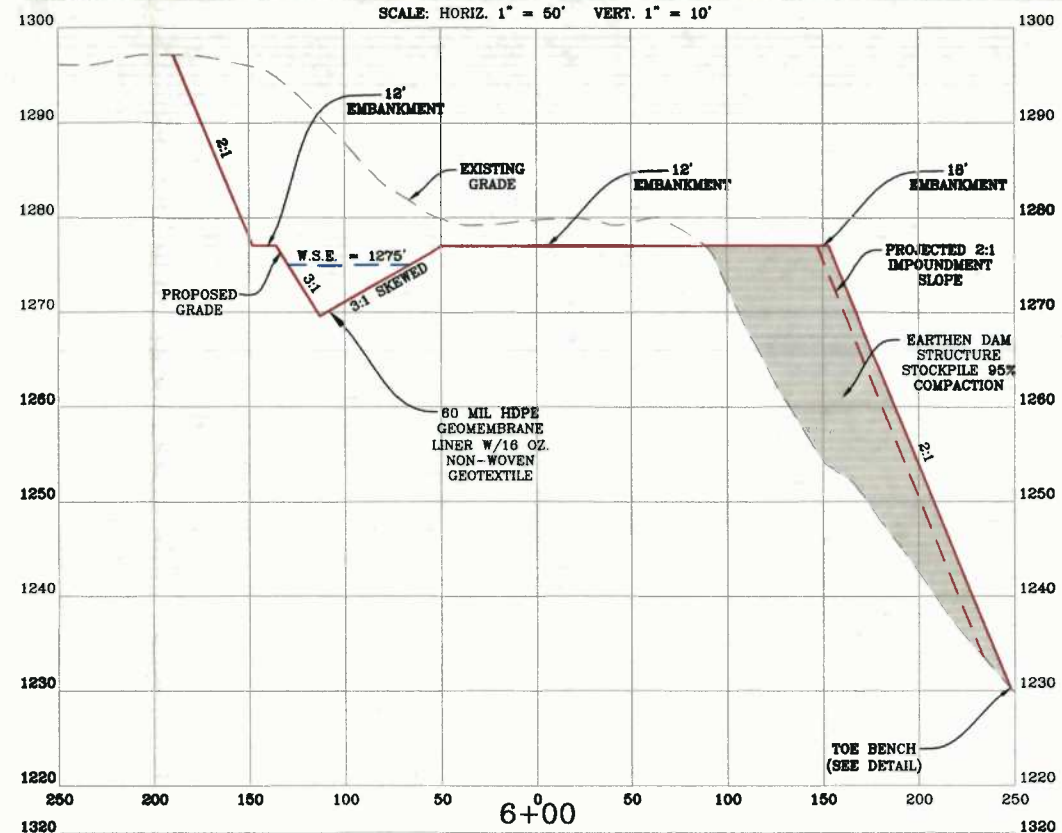


DATE: 04/03/2013
SCALE: AS SHOWN
SHEET 12 OF 21

CENTRALIZED FRESHWATER IMPOUNDMENT SECTIONS



CENTRALIZED FRESHWATER IMPOUNDMENT CROSS-SECTIONS ALONG BASELINE "A-A"



NOTE:
1. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 9" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.

LEGEND	
X-SECTION GRID INDEX	---
X-SECTION GRID INTERMEDIATE	---
X-SECTION PROPOSED GRADE	---
X-SECTION EXISTING GRADE	---
X-SECTION WATER SURFACE	---
MATCHLINE	---

DATE	REVISION
04/11/2013	REVISED PER UPDATED WETLANDS

ANTERO RESOURCES
THIS DOCUMENT WAS PREPARED FOR:
ANTERO RESOURCES
APPALACHIAN CORP.

CENTRALIZED FRESHWATER IMPOUNDMENT SECTIONS
LAKE
CENTRALIZED FRESHWATER IMPOUNDMENT
GREENBRIER DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA

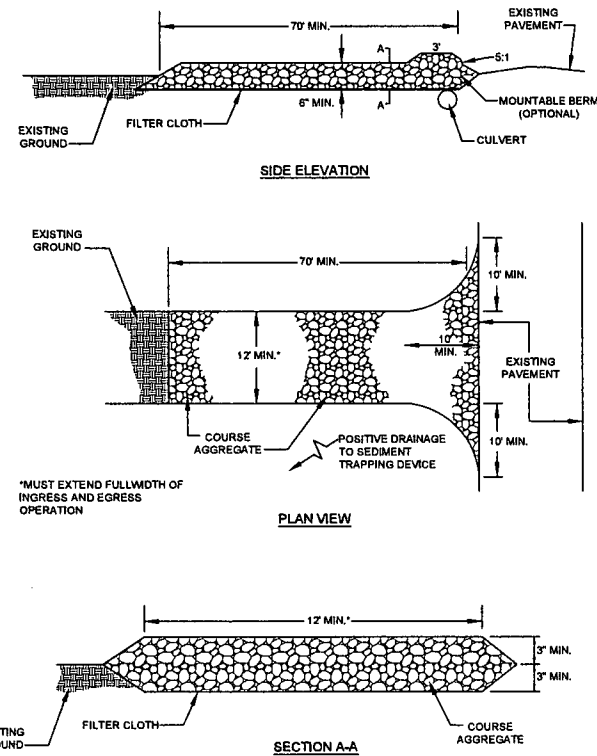


DATE: 04/03/2013
SCALE: AS SHOWN
SHEET 13 OF 21

Engineering Survey Environmental GIS
NAVITUS ENGINEERING INC.
151 Windy Hill Lane
Winchester, Virginia 25602
Telephone: (888) 764-1185
www.navituseng.com

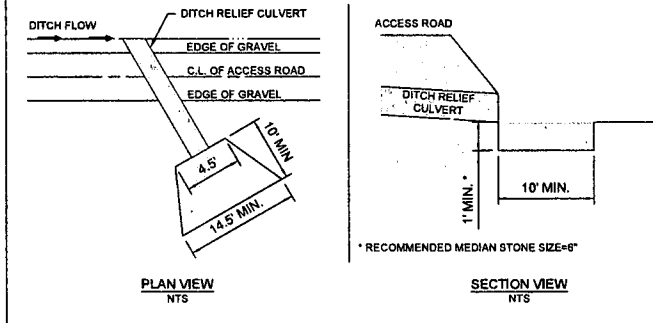
FIGURE 3.02.1

STONE CONSTRUCTION ENTRANCE



SOURCE: ADAPTED FROM THE 1983 MARYLAND STANDARDS FOR GOLF EROSION AND SEDIMENT CONTROL AND VA DCR-OSMC

TYPICAL DITCH RELIEF CULVERT OUTLET TREATMENT



NOTE:
 ALL DITCH LINE PROTECTION SHALL BE INSTALLED AS RECOMMENDED IN THE WEST VIRGINIA EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE (BMP) MANUAL. DITCH LINE PROTECTION SHALL BE BASED ON THE FOLLOWING GRADES:

1. LESS THAN 3% - GRASS
 2. 3-8% - GRASS WITH ROLLED EROSION CONTROL PRODUCTS (RECP)
 3. GREATER THAN 8% - RIPRAP OR EQUIVALENT GEOTEXTILE
- IF HIGH EROSION SOILS ARE ENCOUNTERED DURING CONSTRUCTION, THE ENGINEER SHOULD BE CONTACTED FOR FURTHER EVALUATION.

Modified Figure 3.1 - Typical Roadside Ditch Section Sump at Ditch Relief Culvert

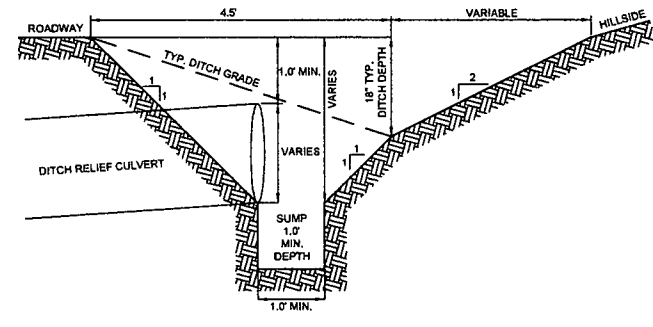
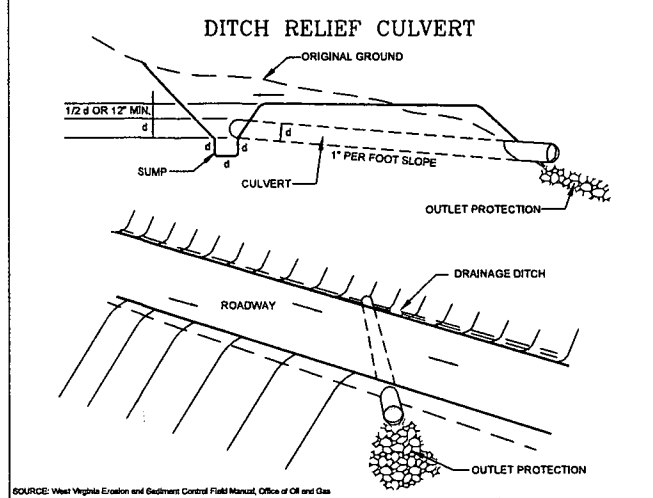


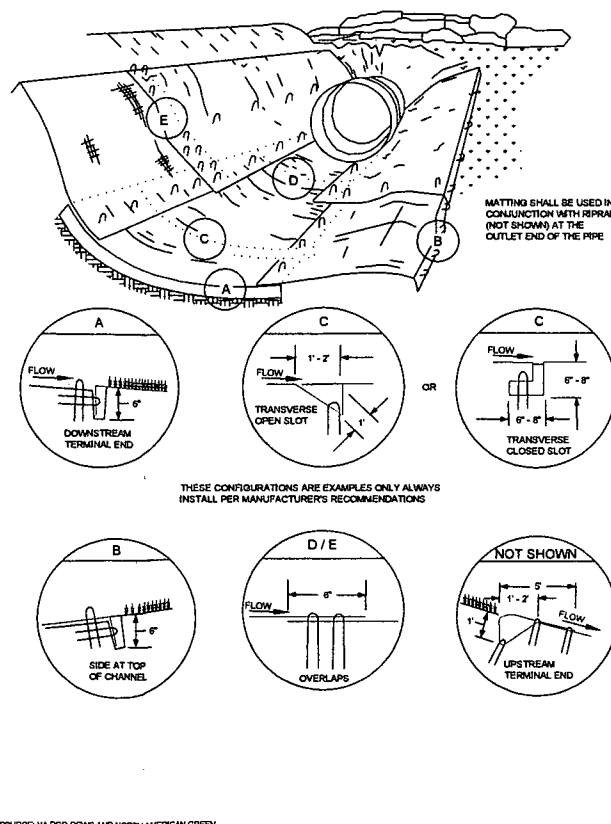
FIGURE II-4



SOURCE: WEST VIRGINIA EROSION AND SEDIMENT CONTROL FIELD MANUAL, OFFICE OF OIL AND GAS

FIGURE 3.13.1

TYPICAL RECP CHANNEL INSTALLATION



SOURCE: VA DCR-OSMC AND NORTH AMERICAN GREEN

Table II-5 Pipe Sizes for Culverts Across Roads

Drainage Area (Ac)	Pipe Diameter (In)	Pipe Capacity (Cfs)
10	15	5
20	18	9
30	21	12
50	24	18
80	27	24
100	30	29
300	36	60
500	42	85

Table II-6 Spacing of Culverts

Road Grade %	Distance (Ft)
2-5	500-300
6-10	300-200
11-15	200-100
16-20	100

TURNOUT

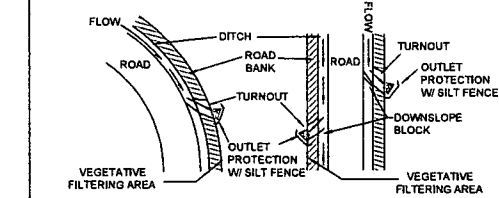
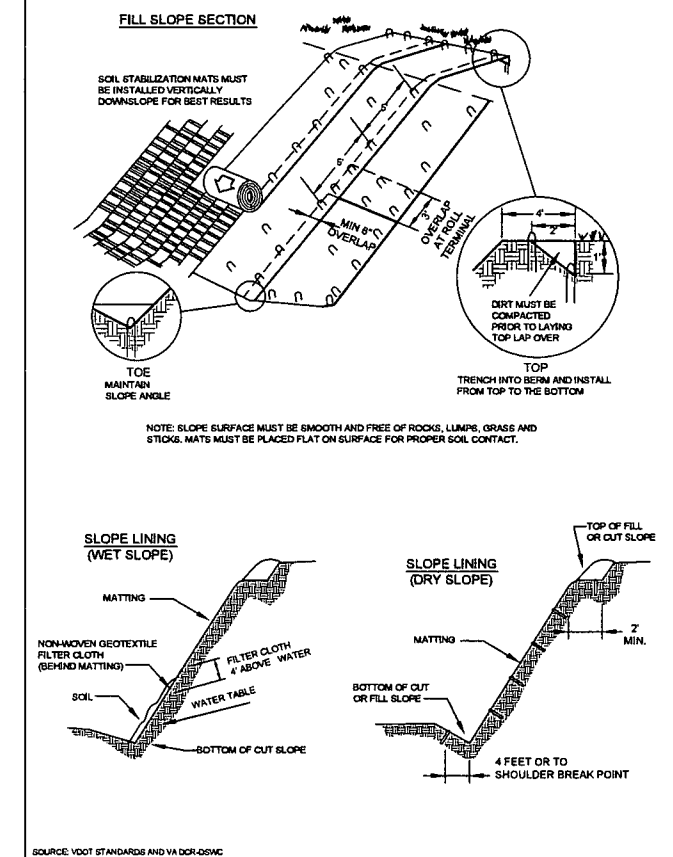


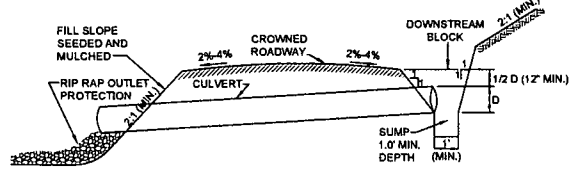
FIGURE 3.13.2

ROLLED EROSION CONTROL PRODUCTS

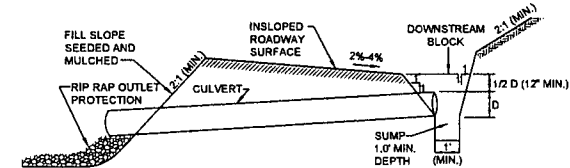


SOURCE: VDOT STANDARDS AND VA DCR-OSMC

CROWNED ROADWAY



INSLOPED ROADWAY

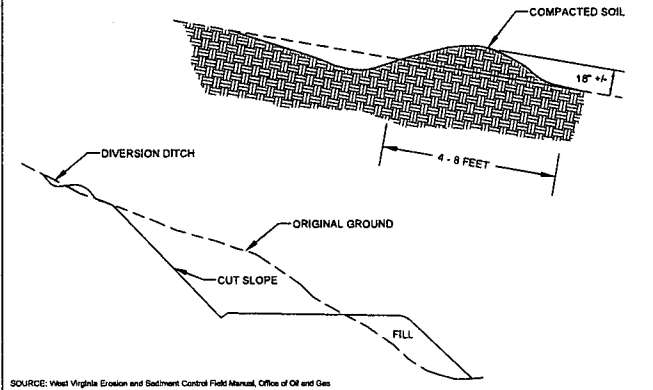


Cut and fill slopes shall be stabilized immediately upon completion of roadway grading. These areas shall be blanketed wherever they are located within 50 feet of a surface water or within 100 feet of a surface water where a suitable vegetative filter strip does not exist. A durable top dressing shall be provided for soils having low strength. Roadside ditches shall be provided with adequate protective lining. Adequately sized culverts or other suitable cross drains shall be provided at all seeps, springs, and drainageways. Roadway shall be inspected weekly and after each runoff event. Damaged roadways, ditches, or cross drains shall be repaired immediately.

SOURCE: PA DEPARTMENT OF ENVIRONMENTAL PROTECTION, BUREAU OF OIL AND GAS MANAGEMENT 8888-FR-020(11) APPROXIMATE BMP CONSTRUCTION DETAILS (MODIFIED)

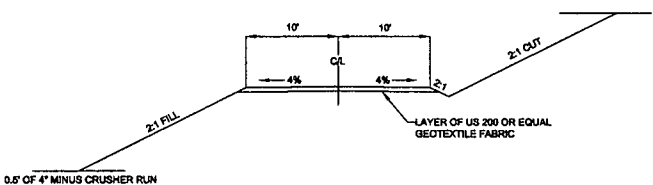
FIGURE II-3

DIVERSION DITCH - TEMPORARY



SOURCE: WEST VIRGINIA EROSION AND SEDIMENT CONTROL FIELD MANUAL, OFFICE OF OIL AND GAS

TYPICAL ROAD CROSS SECTION DETAIL



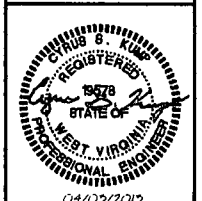
DATE	REVISION	REVISOR	REASON FOR UPDATE
04/11/2013	REVISED PER	UPDATED	WETLANDS

ANTERO RESOURCES
 THIS DOCUMENT WAS PREPARED FOR:
ANTERO RESOURCES APPALACHIAN CORP

CONSTRUCTION DETAILS

LAKE

CENTRALIZED FRESHWATER IMPOUNDMENT
 GREENBRIER DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA



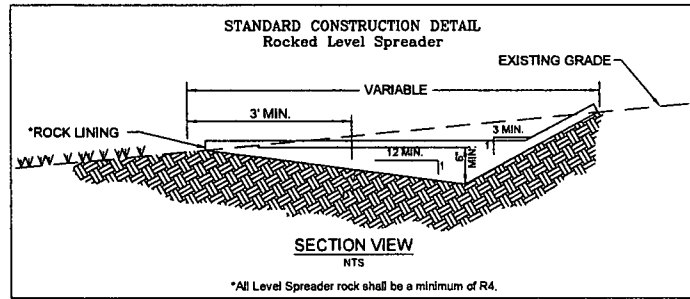
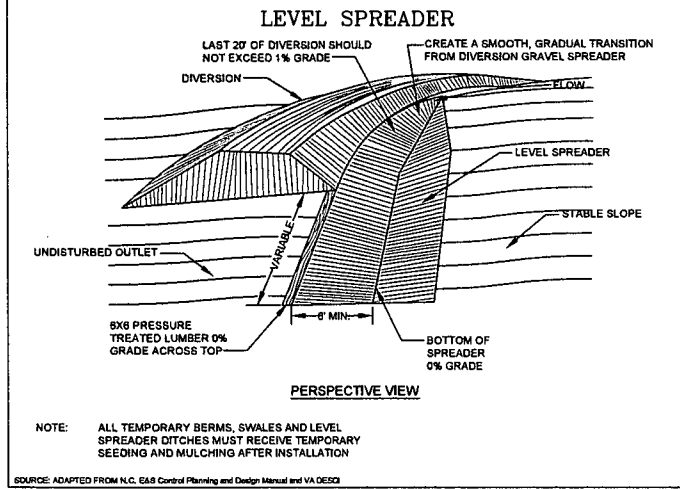


FIGURE 3.02.1



SOURCE: ADAPTED FROM N.C. E&S Control Planning and Design Manual and VA DESD

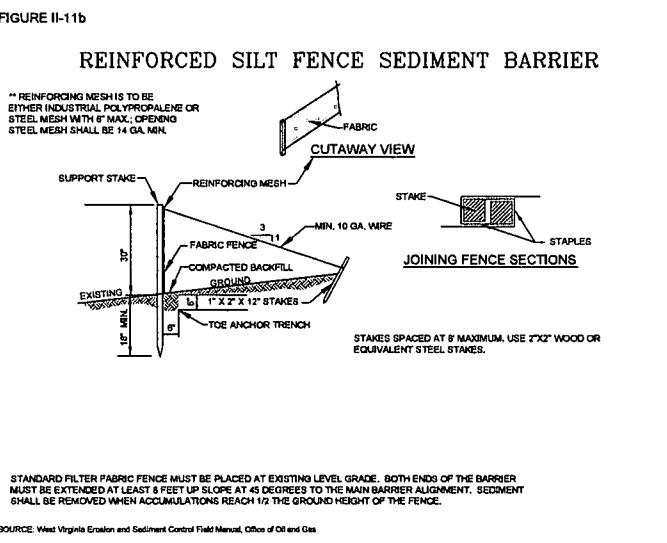
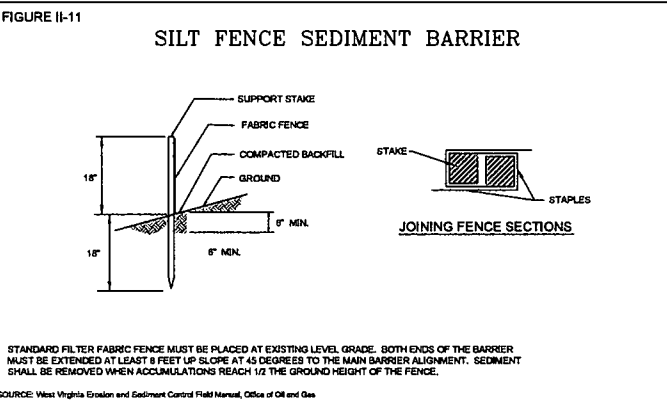
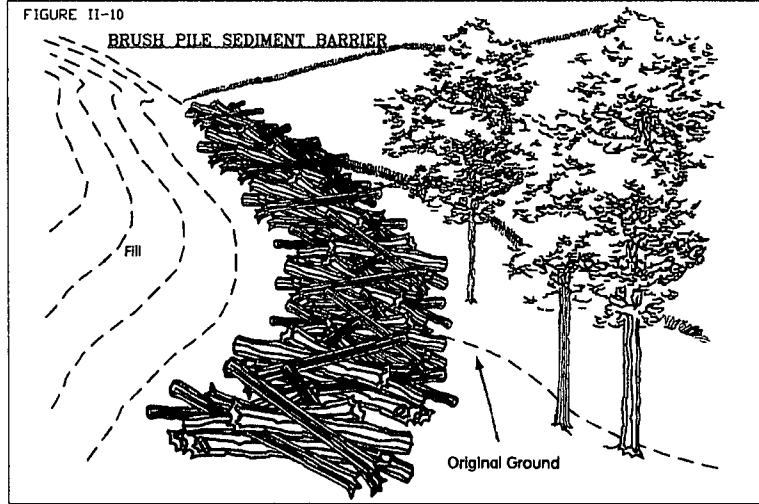
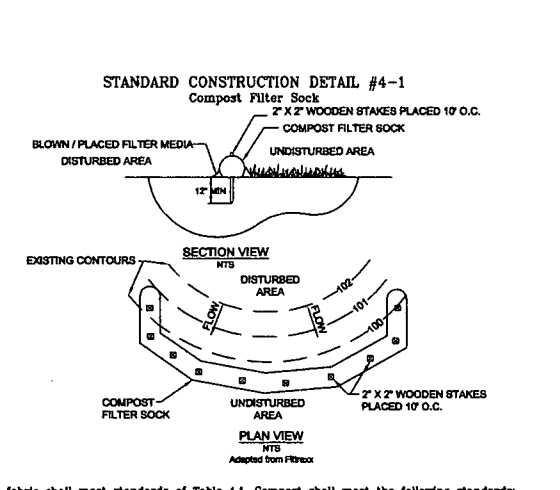
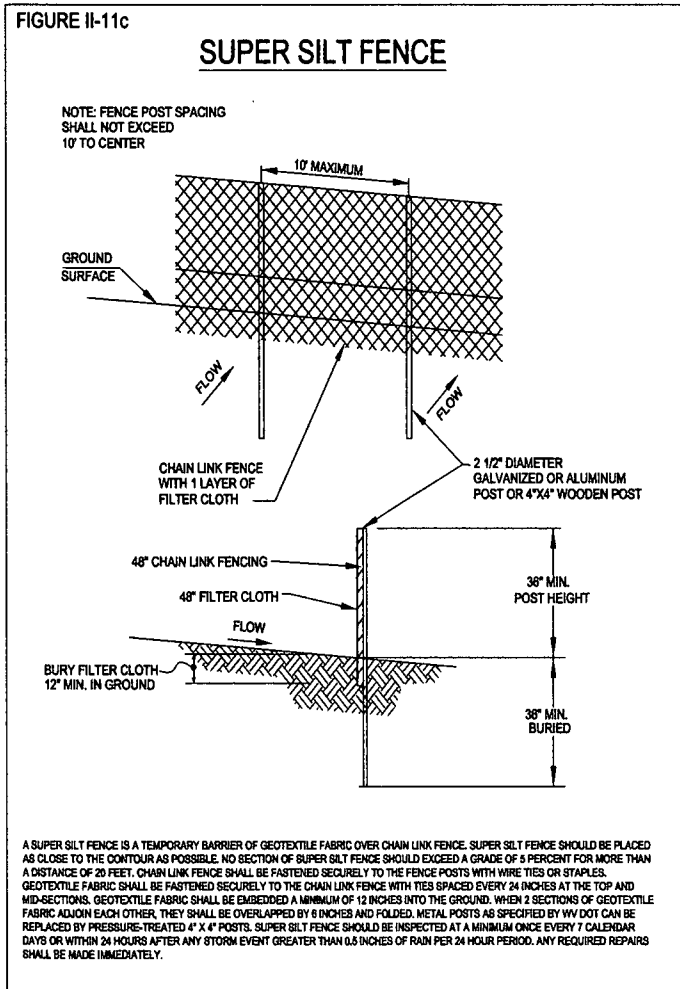
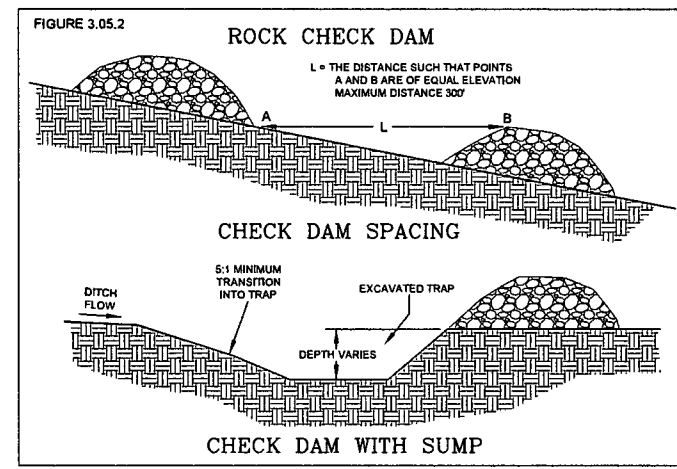
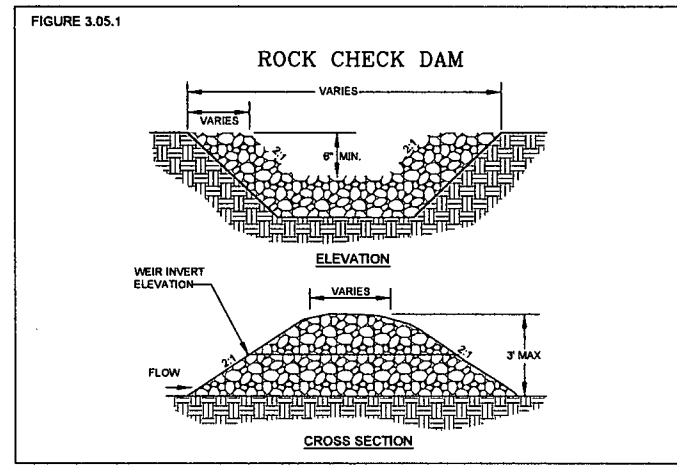


Table 4.1
Compost Sock Fabric Minimum Specifications

Material Type	3 mil HDPE	5 mil HDPE	5 mil HDPE	Multi-Filament Polypropylene (MPPP)	Heavy Duty Multi-Filament Polypropylene (HDMPPP)
Material Characteristics	Photo-degradable	Photo-degradable	Bio-degradable	Photo-degradable	Photo-degradable
Mesh Opening	12"	12"	12"	12"	12"
Socket Diameters	12" 18"	18" 24"	18" 24"	18" 24"	18" 24"
Textile Strength	3/8"	3/8"	3/8"	3/8"	1/8"
Ultraviolet Stability % Original Strength (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
Minimum Functional Longevity	6 months	9 months	6 months	1 year	2 years
Inner Containment Netting	HDPE biaxial net Continuously wound Fusion-welded junctures 3/4" x 3/4" Max. aperture size				
Outer Filtration Mesh	Composite Polypropylene Fabric (Woven layer & non-woven fleeces mechanically fused via needles punch) 3/16" Max. aperture size				

Two-ply systems

Sock fabrics composed of burlap may be used on projects lasting 6 months or less.



Sock fabric shall meet standards of Table 4.1. Compost shall meet the following standards:

Organic Matter Content	80% -100% (dry weight basis)
Organic Portion	Fibrous and elongated
pH	5.5-8.0
Moisture Content	35%-55%
Particle Size	98% pass through 1" screen
Soluble Salt Concentration	5.0 dS Maximum

Compost Filter Sock shall be placed at existing level grade. Both ends of the sock shall be extended at least 8 feet up the slope at 45 degrees to the main sock alignment (see figure 4.1). Maximum slope above any sock shall not exceed that shown on figure 4.2.

Traffic shall not be permitted to cross filter socks.

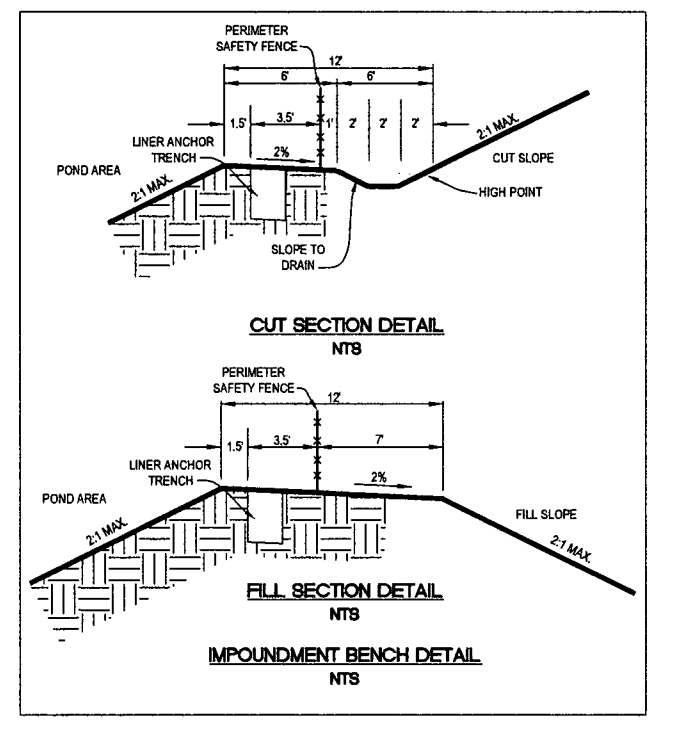
Accumulated Sediment shall be removed when it reaches 1/2 the above ground height of the sock and disposed in the manner described elsewhere in the plan.

Socks shall be inspected weekly and after each runoff event. Damaged socks shall be repaired according to manufacturer's specifications or replaced within 24 hours of inspection.

Biodegradable filter socks shall be replaced after 6 months; photodegradable socks after 1 year. Polypropylene socks shall be replaced according to manufacturer's recommendations.

Upon stabilization of the area tributary to the sock, stakes shall be removed. The sock may be left in place and vegetated or removed. In the latter case, the mesh shall be cut open and the mulch spread as a soil supplement.

In the event the ground is frozen, #5 rebar with safety caps shall be used instead of wooden stakes to anchor the filter sock. Once the ground thaws the rebar anchors shall be removed and replaced with 2" x 2" wooden stakes and installed as shown in the detail above.



Engineering Survey Environmental GIS

NAVITUS ENGINEERING INC.

151 Wandy Hill Lane
Fayetteville, AR 72703
Tel: 479-888-2185
www.navituseng.com

DATE	REVISION	REVISION PER	UPDATED WETLANDS
04/11/2013			

ANTERO RESOURCES
THIS DOCUMENT WAS PREPARED FOR
ANTERO RESOURCES
APPALACHIAN CORP.

CONSTRUCTION DETAILS

LAKE

CENTRALIZED FRESHWATER IMPOUNDMENT
GREENBRIER DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA

PROFESSIONAL ENGINEER
WEST VIRGINIA
1957
STATE OF
04/02/2013

DATE: 04/03/2013
SCALE: N/A
SHEET 15 OF 21

REVEGETATION

Taken from the
West Virginia Erosion and Sediment Control Field Manual
West Virginia Division of Environmental Protection Office of Oil and Gas
Charleston, W.Va.
Section IV

Temporary Seeding

a. General Conditions Where Practice Applies

Where exposed soil surfaces are not to be fine-graded or worked for periods longer than 21 days. Temporary vegetative cover with sediment controls must be established where runoff will go directly into a stream. Immediately upon construction of the site (site includes road and location), vegetation must be established on road bank and location slopes. A permanent vegetative cover shall be applied to areas that will be left un-worked for a period of more than six months.

b. Seed Mixtures and Planting Dates

Refer to Tables 2 through 4 for recommended dates to establish vegetative cover and the approved lists of temporary and permanent plant species, and planting rates. Table 3 gives recommended types of temporary vegetation, rates of application, and optimum seeding dates. In situations where another cover is desired, contact the local soil conservation district for seeding recommendations.

c. Seed Application

Apply seed by broadcasting, drilling, or by hydroseed according to the rates indicates in Table IV-3. Perform all planting operations at right angles to the slope. Necessary site preparation and roughening of the soil surface should be done just prior to seeding. Seedbed preparation may not be required on newly disturbed areas.

Permanent Seeding

a. General

Permanent vegetative cover will be established where no further soil disturbance is anticipated or needed. Soil fertility and pH level should be tested and adjusted according to seed species planted. Planting of permanent vegetative covers must be performed on all disturbed areas after completion of the drilling process. Any site that contains significant amounts of topsoil shall have the topsoil removed and stockpiled when feasible. Topsoil should not be added to slopes steeper than 2:1 unless a good bonding to the sub-layer can be achieved. After proper grading and seedbed preparation, the vegetation will reestablish ground cover for the control of surface water runoff erosion. All required seedbed preparation and loosening of soil by disking or dozer tracking should be performed just prior to seeding. If seedbed preparation is not feasible, 50% more seed shall be added to the recommended rates shown in Tables IV-3 and IV-4.

When hydroseeding, seedbed preparation may not be necessary if adequate site preparation was performed. Incorporate the appropriate amount of lime and/or fertilizer in the slurry mix when hydroseeding.

When hydroseeding, first mix the lime, fertilizer, and hydro-mulch in the recommended amount of water. Mix the seed and inoculants together within one hour prior to planting, and add to the slurry just before seeding. Apply the slurry uniformly over the prepared site. Assume that agitation is continuous throughout the seeding operation and the mix is applied within one hour of initial mixing.

b. Lime and Fertilizer

- Lime shall be applied to all permanent seedings. The pH of the soil is to be determined and lime applied accordingly. Once the pH is known, select the amount of lime to be applied from Table IV-5.
- Fertilizer shall be applied in all permanent seedings. Apply the equivalent for 500 lbs. minimum 10-20-20 fertilizer per acre or use the amount of fertilizer and lime recommended by a certified soil test.
- Application: For best results and maximum benefits, the lime and fertilizer are to be applied at the time of seedbed preparation.

c. Permanent Seed Mixtures

Planners should take into consideration the species makeup of the existing pasture and the landowner's future pasture management plans when recommending seed mixtures. Selection: From Tables IV 4a and b, Permanent Seeding Mixtures Suitable for Establishment in West Virginia.

Notes:

- All legumes must be planted with the proper inoculants prior to seeding.
- Lathco Flatpea is potentially poisonous to some livestock.
- Only endophyte free varieties of Tall Fescue should be used. Tall Fescue and Crownvetch are also very invasive species, non-native to WV.
- For unprepared seedbeds or seeding outside the optimum timeframes, add 50% more seed to the specified rate. Mixtures in Table 4b are more wildlife and farm friendly; those listed in bold are suitable for use in shaded woodland settings. Mixtures in italic are suitable for use in filter strips.

d. Seeding for Wildlife Habitat

Consider the use of the native plants or locally adapted plants when selecting cover types and species for wildlife habitat. Wildlife friendly species or mixes that have multiple values should be considered. See wildlife friendly species/mixtures in Table IV-4b. Consider selecting no or low maintenance long-lived plants adaptable to sites which may be difficult to maintain with equipment.

Mulching

a. General Organic Mulches

The application of straw, hay or other suitable materials to the soil surface to prevent erosion. Straw made from wheat or oats is the preferred mulch, the use of hay is permissible, but not encouraged due to the risk of spreading invasive species. Mulch must be applied to all temporary and permanent seeding on all disturbed areas. Depending on site conditions, in critical areas such as waterways or steep slopes, additional or substitute soil protective measures may be used if deemed necessary. Examples include jute mesh and soil stabilization blankets or erosion control matting. Areas that have been temporarily or permanently seeded should be mulched immediately following seeding. Mulches conserve desirable soil properties, reduce soil moisture loss, prevent crusting and sealing of the soil surface and provide a suitable microclimate for seed germination.

Areas that cannot be seeded because of the season should be mulched to provide some protection to the soil surface. An organic mulch, straw or hay should be used and the area then seeded as soon as weather or seasonal conditions permit. Do not use fiber mulch (cellulose-hydroseed) alone for this practice; at normal application rates it will not give the soil protection of other types of mulch.

Wood cellulose fiber mulch is used in hydroseeding operations and applied as part of the slurry. It creates the best seed-soil contact when applied over the top of (as a separate operation) newly seeded areas. Fiber mulch does not alone provide sufficient protection on highly erodible soils, or during less than favorable growing conditions. Fiber mulch should not be used alone during the dry summer months or when used for late fall mulch cover. Use straw mulch during these periods and fiber mulch may be used to tack (anchor) the straw mulch. Fiber mulch is well suited for steep slopes, critical areas and areas susceptible to wind.

b. Chemical Mulches, Soil Binders and Tackifiers

A wide range of synthetic spray on materials are marketed to stabilize and protect the soil surface. These are mixed with water and sprayed over the mulch and to the soil. They may be used alone in some cases as temporary stabilizers, or in conjunction with fiber mulch, straw or hay. When used alone most chemical mulches do not have the capability to insulate the soil or retain soil moisture that organic mulches have.

c. Specifications

From Table IV-6 select the type of mulch and rate of application that will best suit the conditions at the site.

d. Anchoring

Depending on the field situation, mulch may not stay in place because of wind action or rapid water runoff. In such cases, mulch is to be anchored mechanically or with mulch netting.

1. Mechanical Anchoring

Apply mulch and pull mulch anchoring tool over the mulch. When a disk is used set the disk straight and pull across slope. Mulch material should be tucked into the soil about three inches.

2. Mulch netting

Follow manufacturer's recommendation when positioning and stapling the mulch netting in the soil.

**Table IV-1
Recommended Seeding Dates**

Planting Dates	Suitability
March 1 - April 15 and August 1 - October 1	Best Seeding Periods
April 15 - August 1	HIGH RISK - moisture stress likely
October 1 - December 1	HIGH RISK - freeze damage to young seedlings
December 1 - March 1	Good seeding period. Dormant seeding

**Table 2
Acceptable Fertilization Recommendation**

Species	N (lbs/ac)	P2O5 (lbs/ac)	Example Rec. (per acre)
Cool Season Grass	40	80	400 lbs. 10-20-20
CS Grass & Legume	30	60	300 lbs. 10-20-20
Temporary Cover	40	40	200 lbs. 19-19-19

**Table 3
Temporary Cover**

Species	Seeding Rate (lbs/acre)	Optimum Seeding Dates	Drainage	pH Range
Annual Ryegrass	40	3/1 - 6/15 or 8/15 - 9/15	Well - Poorly	5.5 - 7.5
Field Bromegrass	40	3/1 - 6/15 or 8/15 - 9/15	Well - Mod. Well	6.0 - 7.0
Spring Oats	96	3/1 - 6/15	Well - Poorly	5.5 - 7.0
Sundangrass	40	5/15 - 8/15	Well - Poorly	5.5 - 7.5
Winter Rye	168	8/15 - 10/15	Well - Poorly	5.5 - 7.5
Winter Wheat	180	8/15 - 11/15	Well - Mod. Well	5.5 - 7.0
Japanese Millet	30	6/15 - 8/15	Well	4.5 - 7.0
Redtop	5	3/1 - 6/15	Well	4.0 - 7.5
Annual Ryegrass	26	3/1 - 6/15	Well - Poorly	5.5 - 7.5
Spring Oats	64	3/1 - 6/15	Well - Poorly	5.5 - 7.5

NOTE: These rates should be increased by 50% if planted April 15 - August 1 and October 1 - March 1.

**Table 4a
Permanent Seeding Mixture**

Species/Mixture	Seeding Rate (lbs/acre)	Soil Drainage preference	pH Range
Crownvetch / Tall Fescue	10 - 15	Well - Mod. Well	5.0 - 7.5
Crownvetch / Perennial Ryegrass	10 - 15	Well - Mod. Well	5.0 - 7.5
Flatpea or Perennial Pea / Tall Fescue	20	Well - Mod. Well	4.0 - 8.0
Ladino Clover / Serecia Lespedeza / Tall Fescue	30	Well - Mod. Well	4.5 - 7.5
Ladino Clover / Redtop	2	Well - Mod. Well	5.0 - 7.5
Crownvetch / Tall Fescue / Redtop	3	Well - Mod. Well	5.0 - 7.5
Birdsfoot Trefoil / Redtop	10	Well - Mod. Well	5.0 - 7.5
Serecia Lespedeza / Tall Fescue / Redtop	25	Well - Mod. Well	4.5 - 7.5
Tall Fescue / Redtop	30	Well - Mod. Well	5.0 - 7.5
Creeping Red / Tall Fescue	50	Well - Poorly	4.5 - 7.5
Perennial Ryegrass / Tall Fescue / Lathco Flatpea *	10	Well - Poorly	5.8 - 8.0

* Lathco Flatpea is potentially poisonous to some livestock. All legumes should be planted with proper inoculants prior to seeding. For unprepared seedbeds or seeding outside the optimum timeframe, add 50% more seed to the specified rate.

Mixtures listed in bold are suitable for use in shaded woodland settings; those in italics are suitable for use in filter strips.

**Table 4b
Wildlife and Farm Friendly Seed Mixtures**

Species/Mixture	Seeding Rate (lbs/acre)	Soil Drainage preference	pH Range
IV Bluegrass / Redtop / Ladino Clover or Birdsfoot Trefoil	20	Well - Mod. Well	5.5 - 7.5
Timothy / Alfalfa	3	Well - Mod. Well	6.5 - 8.0
Timothy / Birdsfoot Trefoil	5	Well - Poorly	5.5 - 7.5
Crchardgrass / Ladino Clover / Redtop	8	Well - Mod. Well	5.5 - 7.5
Crchardgrass / Ladino Clover / Crchardgrass / Perennial Ryegrass	10	Well - Mod. Well	5.5 - 7.5
Creeping Red Fescue / Perennial Ryegrass	2	Well - Mod. Well	5.5 - 7.5
Orchardgrass or KY Bluegrass	20	Well - Mod. Well	6.0 - 7.5
Birdsfoot Trefoil / Redtop / Orchardgrass	10	Well - Mod. Well	5.5 - 7.5
Lathco Flatpea * / Perennial Ryegrass	5	Well - Mod. Well	5.5 - 7.5
Lathco Flatpea * / Orchardgrass	20	Well - Mod. Well	5.5 - 7.5

* Lathco Flatpea is potentially poisonous to some livestock. All legumes should be planted with proper inoculants prior to seeding. For unprepared seedbeds or seeding outside the optimum timeframe, add 50% more seed to the specified rate.

Mixtures listed in bold are suitable for use in shaded woodland settings; those in italics are suitable for use in filter strips.

**Table IV-5
Lime and Fertilizer Application Table**

pH of Soil	Lime in Tons per Acre	Fertilizer, Lbs., per Acre (10-20-20 or Equivalent)
Above 6.0	2	500
5.0 to 6.0	3	500
Below 5.0	4	500

The pH can be determined with a portable pH testing kit or by sending the soil samples to a soil testing laboratory. When 4 tons of lime per acre are applied it must be incorporated into the soil by disking, backblading or tracking up and down the slope.

**Table IV-6
Mulch Materials Rates and Uses**

Material	Minimum Rates per acre	Coverage	Remarks
Hay or Straw	2 to 3 Tons	Cover 75% to 90% of Surface	Subject to wind blowing or washing unless tied down
Wood Fiber	100 to 150 bales	Cover all	For hydroseeding
Pulp Fiber	1000 to 1500 lbs	Disturbed Areas	
Wood - Cellulose			
Recirculated Paper			



DATE	REVISION	REVISED PER	UPDATED	WETLANDS
04/11/2013				



THIS DOCUMENT WAS PREPARED FOR ANTERO RESOURCES CORPORATION
CENTRALIZED FRESHWATER IMPOUNDMENT
GREENBRIER DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA

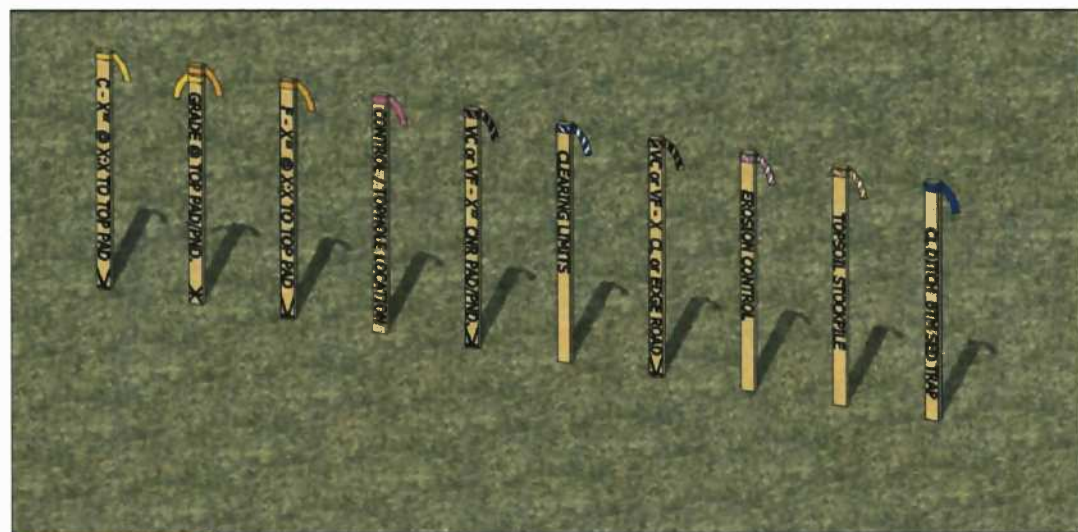
CONSTRUCTION DETAILS











DATE: 04/03/2013

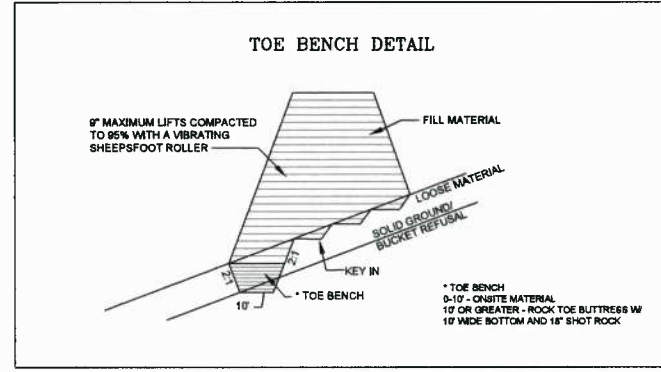
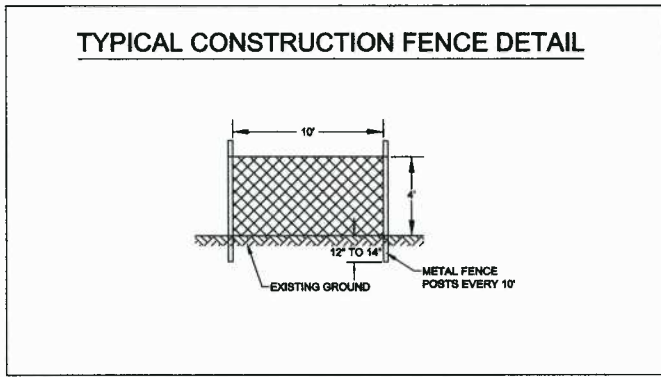
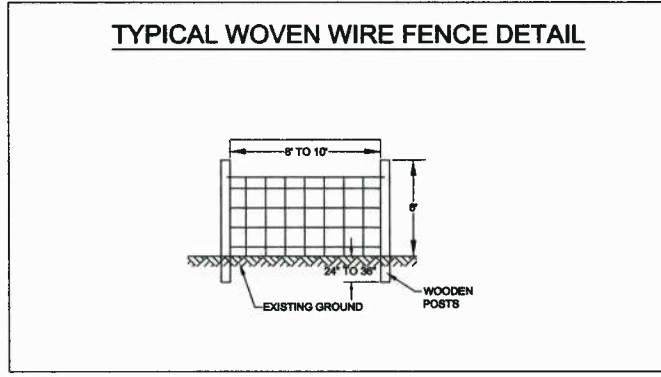
SCALE: N/A

SHEET 16 OF 21



	Yellow Ribbon: Yellow Ribbon used to indicate top of Cuts (C) Cut to be determined at time of stakeout Slope determined by site design
	Yellow & Orange Ribbon: Yellow and Orange Ribbon used to indicate Grade at Top of Pad/Pond/Pit
	Orange Ribbon: Orange Ribbon used to indicate toes of Fills (F) Fill to be determined at time of stakeout Slope determined by site design
	Pink Ribbon: Pink Ribbon used to indicate Top Hole Location Pink Ribbon used to indicate Survey Control Location
	Pink & Black Stripe Ribbon: Pink & Black Stripe Ribbon used to indicate Vertical Cut (VC) at Pad/Pond/Pit corner or edge Pink & Black Stripe Ribbon used to indicate Vertical Fill (VF) at Pad/Pond/Pit corner or edge Vertical Cut/Vertical Fill to be determined at time of stakeout
	Blue & White Stripe Ribbon: Blue & White Stripe Ribbon used to indicate clearing limits/construction limits
	Orange & Black Stripe Ribbon: Orange & Black Stripe Ribbon used to indicate Vertical Cut (VC) at Centerline or edge of access road Orange & Black Stripe Ribbon used to indicate Vertical Fill (VF) at centerline or edge of access road
	Pink & White Stripe Ribbon: Pink & White Stripe Ribbon used to indicate Erosion and Sediment Control Structures Silt Fence (SF) Reinforced Filter Fence (RFF) Super Silt Fence (SSF) Filter Sock (FS)
	Orange & White Stripe Ribbon: Orange & White Stripe Ribbon used to indicate Topsoil Stockpile Locations
	Blue Ribbon: Blue Ribbon used to indicate Centerline (C) Ditch Blue Ribbon used to indicate Bottom (BTM) Sediment Traps

ANTERO RESOURCES APPALACHIAN CORPORATION STANDARD RIBBON COLOR SCHEME
PROVIDED BY ANTERO RESOURCES APPALACHIAN CORPORATION

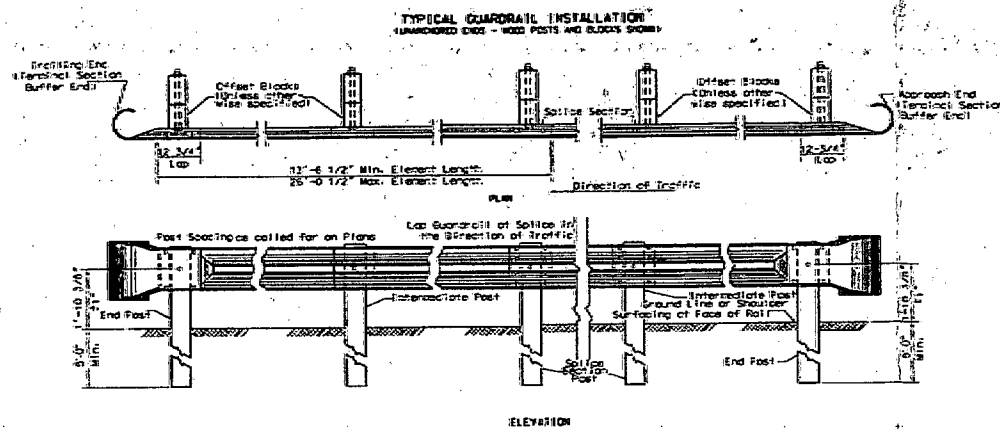


DATE	REVISION
04/11/2013	REVISED PER UPDATED WETLANDS

ANTERO RESOURCES
THIS DOCUMENT WAS PREPARED FOR:
ANTERO RESOURCES APPALACHIAN CORP.

CONSTRUCTION DETAILS
LAKE
CENTRALIZED FRESHWATER IMPOUNDMENT
GREENBRIER DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA





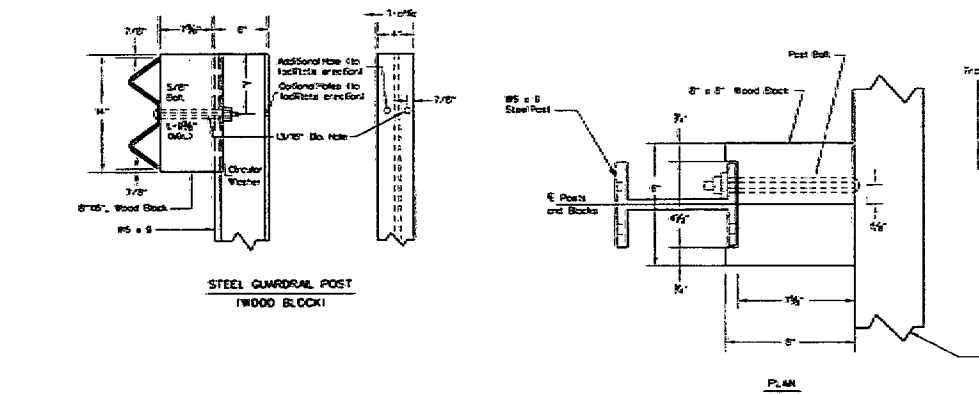
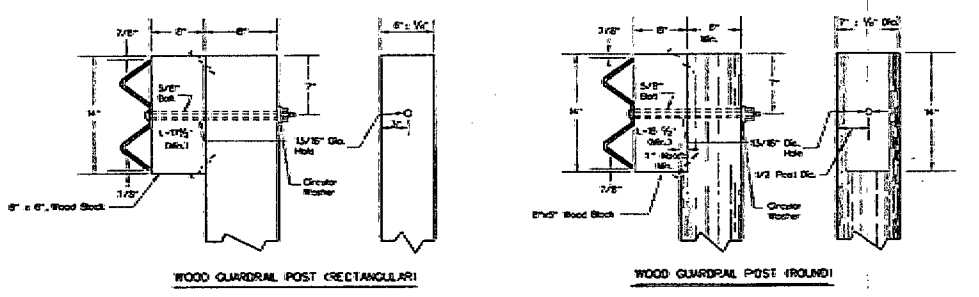
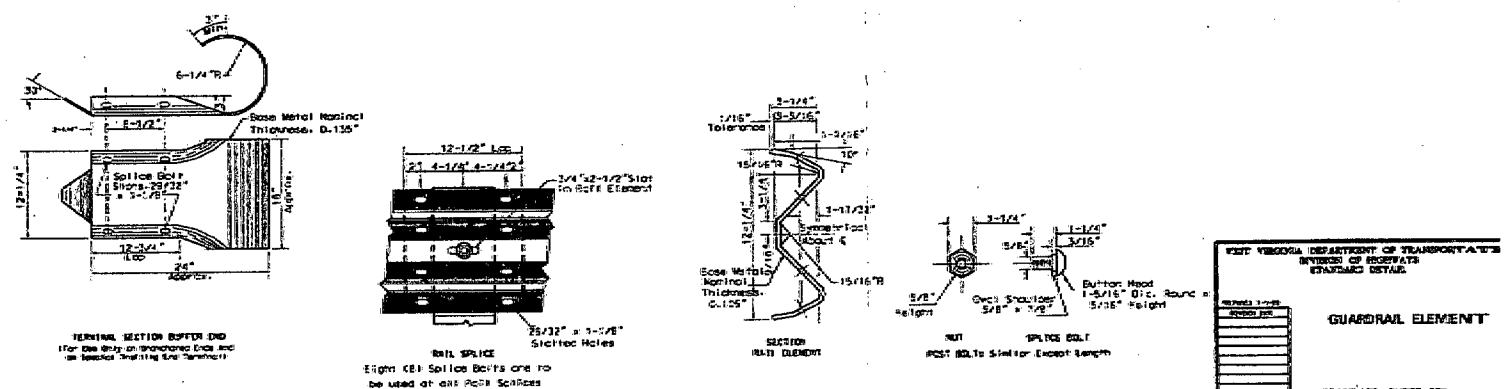
NOTES

Guardrail shall be secured to the blocks, posts and to other elements by 5/8\"/>

Approach and Trailing End treatments shall be as shown or specified on the Plans or directed by the Engineer. Approach and trailing ends shall be anchored unless otherwise specified on the Plans; the specific anchor treatment to be utilized shall be as shown or specified.

The pay quantity of guardrail will be the linear feet of guardrail measured along the face of the rail from center to center of end posts. Cost of the Terminal Section Buffer End shall be included in the cost of the Guardrail.

The approach slope to the face of guardrail shall be 10:1 or better.



GENERAL:

Only one type of block, steel or wood, shall be used throughout any project, unless otherwise specified. Blocks for "black-outs" shall be used on all projects except when otherwise noted on Plans. When blocks are not provided, the post details will be as shown herein, except the 1/2\"/>

The circular washers shall be made of steel and galvanized in accordance with, or in accordance with the requirements of ASTM A653.

WOOD POSTS:

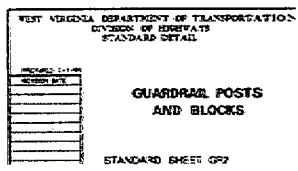
Wood posts and blocks shall be the same type (species). Wood posts shall be pressure-treated after cutting, in accordance with Section 710.5 of the specifications. The P dimension noted as shown for round wooden posts shall be located along the vertical diameter for the entire upper 14\"/>

STEEL POSTS:

Blocks shall be centered on their posts and the center of the block holes, for both connecting rails to blocks, shall be horizontally offset 1/8\"/>

WOOD BLOCKS:

The type (species) of wood for blocks is to be one of the types (species) permitted by specifications for wood posts. Wood blocks shall be pressure-treated in accordance with the requirements for wood posts. However, preservative oil is not permitted as a preservative in the pressure treatment of wood blocks to be erected on steel posts. 8\"/>



Engineering Survey Environmental GIS

NAVITUS ENGINEERING INC.

151 Windy Hill Lane
Wachter, VA 22641-1155
www.navituseng.com

DATE	REVISION	REVISOR	REASON
04/11/2019	REVISED PER UPDATED WETLANDS		

ANTERO RESOURCES

THIS DOCUMENT WAS PREPARED FOR:

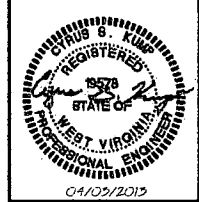
ANTERO RESOURCES APPALACHIAN CORP

CONSTRUCTION DETAILS

LAKE

CENTRALIZED FRESHWATER IMPOUNDMENT

GREENBRIER DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA

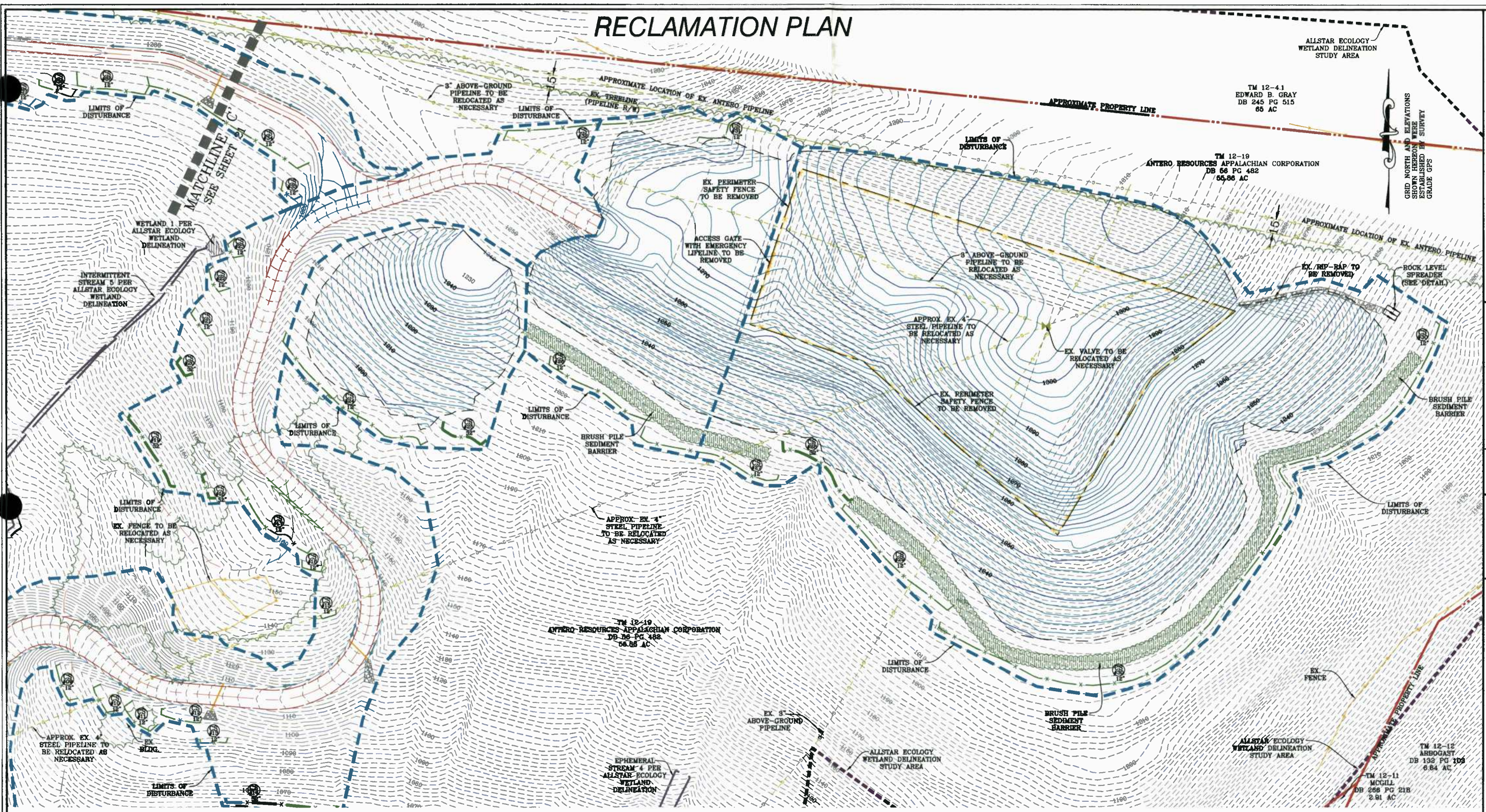


DATE: 04/03/2019

SCALE: N/A

SHEET 19 OF 21

RECLAMATION PLAN

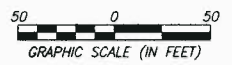


SITE RECLAMATION NARRATIVE

POST CONSTRUCTION - THE CONSTRUCTION SITE SHALL BE STABILIZED AS SOON AS POSSIBLE AFTER COMPLETION. THE ESTABLISHMENT OF FINAL COVER MUST BE INITIATED NO LATER THAN 7 DAYS AFTER REACHING FINAL GRADE. THE ACCESS ROADS AND THE CENTRALIZED FRESHWATER IMPOUNDMENT ARE TO BE MAINTAINED THROUGHOUT THE LIFE OF THE FACILITY. ALL CULVERTS, ROADSIDE DITCHES, BROAD-BASED DIPS, DIVERSION DITCHES, ETC. MUST BE MAINTAINED IN PROPER WORKING ORDER. ANY SOIL THAT IS DISTURBED ALONG THE ACCESS ROAD OR CENTRALIZED WATER IMPOUNDMENT MUST BE REVEGETATED ACCORDING TO THESE PLANS AND THE WDEP OFFICE OF OIL AND GAS FIELD MANUAL. IF NECESSARY, ALL TEMPORARY BMP MEASURES CAN BE REMOVED AFTER THE SITE IS PERMANENTLY STABILIZED AND APPROVAL IS RECEIVED FROM THE WDEP. ANY AREAS DISTURBED BY REMOVAL OF THE BMPS SHALL BE REPAIRED, STABILIZED, AND PERMANENTLY SEEDED.

POST USE - WITHIN 6 MONTHS OF THE EXPIRATION OF THE CERTIFICATE OF APPROVAL OF THE CENTRALIZED FRESHWATER IMPOUNDMENT FACILITY, THE SITE SHALL BE CLOSED AND RESTORED TO A PRE-CONSTRUCTION CONDITION. THE LINER SYSTEM SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED RECYCLING OR WASTE DISPOSAL FACILITY. ALL PIPING FOR THE GROUNDWATER DEWATERING SYSTEM, WATER LINES, AND ASSOCIATED STRUCTURES SHALL BE REMOVED. ALL EXISTING BMP'S SHOWN SHALL BE INSPECTED FOR DAMAGE AND REPLACED AS NECESSARY BEFORE RECLAMATION CAN BEGIN. THE SITE SHALL BE REGRADED AS INDICATED ON THE PLANS TO PRE-CONSTRUCTION GRADES. UPON COMPLETION OF THE GRADING, THE SITE SHALL BE SEEDED AND MULCHED PER THE REVEGETATION DETAILS. A NOTICE OF TERMINATION MUST BE FILED WITH THE DEP WHEN THE SITE REACHES FINAL STABILIZATION. FINAL STABILIZATION MEANS THAT ALL SOIL-DISTURBING ACTIVITIES ARE COMPLETED, AND THAT EITHER A PERMANENT VEGETATIVE COVER WITH A DENSITY OF 70% OR GREATER HAS BEEN ESTABLISHED OR THAT THE SURFACE HAS BEEN STABILIZED BY HARD COVER SUCH AS GRAVEL AND PAVEMENT ACCESS ROADS OR BUILDINGS. IT SHOULD BE NOTED THAT THE 70% REQUIREMENT REFERS TO THE TOTAL AREA VEGETATED AND NOT JUST A PERCENT OF THE SITE.

NOTE:
 1. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 9" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.



LEGEND

EX INDEX CONTOUR	---	700	PROP. INDEX CONTOUR	---	700
EX INTERMEDIATE CONTOUR	---	700	PROP. INTERMEDIATE CONTOUR	---	700
EX PROPERTY LINE	---	---	PROP. INDEX CONTOUR (ROAD)	---	---
EX ROAD EDGE OF GRAVEL/DIRT	---	---	PROP. INTERMEDIATE CTR (ROAD)	---	---
EX ROAD EDGE OF PAVEMENT	---	---	PROP. LIMITS OF DISTURBANCE	---	---
EX ROAD CENTERLINE	---	---	PROP. WELL HEAD	---	---
EX DITCHLINE	---	---	PROP. PERIMETER SAFETY FENCE	---	---
EX CULVERT	---	---	PROP. ACCESS GATE WITH EMERGENCY LIFELINE	---	---
EX FENCELINE	---	---	PROP. ROAD EDGE OF GRAVEL	---	---
EX OVERHEAD UTILITY	---	---	PROP. ROAD CENTERLINE	---	---
EX POWER POLE/GUY WIRE	---	---	PROP. V-DITCH W/ CHECK DAMS	---	---
EX GASLINE	---	---	PROP. CULVERT W/ RIP-RAP	---	---
EX TREELINE	---	---	PROP. COMPOST FILTER SOCK	---	---
EX DELINEATED STREAM	---	---	PROP. SUPER SILT FENCE	---	---
EX DELINEATED WETLAND	---	---	MATCHLINE	---	---
EX BUILDING	---	---	BRUSH PILE SEDIMENT BARRIER	---	---
100' WETLAND/STREAM BUFFER	---	---			
DELINEATION STUDY AREA	---	---			

Engineering Survey Environmental GIS

NAVITUS ENGINEERING INC.
 151 Windy Hill Lane
 Winchester, Virginia 22602
 Telephone: (885) 662-4185
 www.navituseng.com

DATE	REVISION
04/11/2013	REVISED PER UPDATED WETLANDS

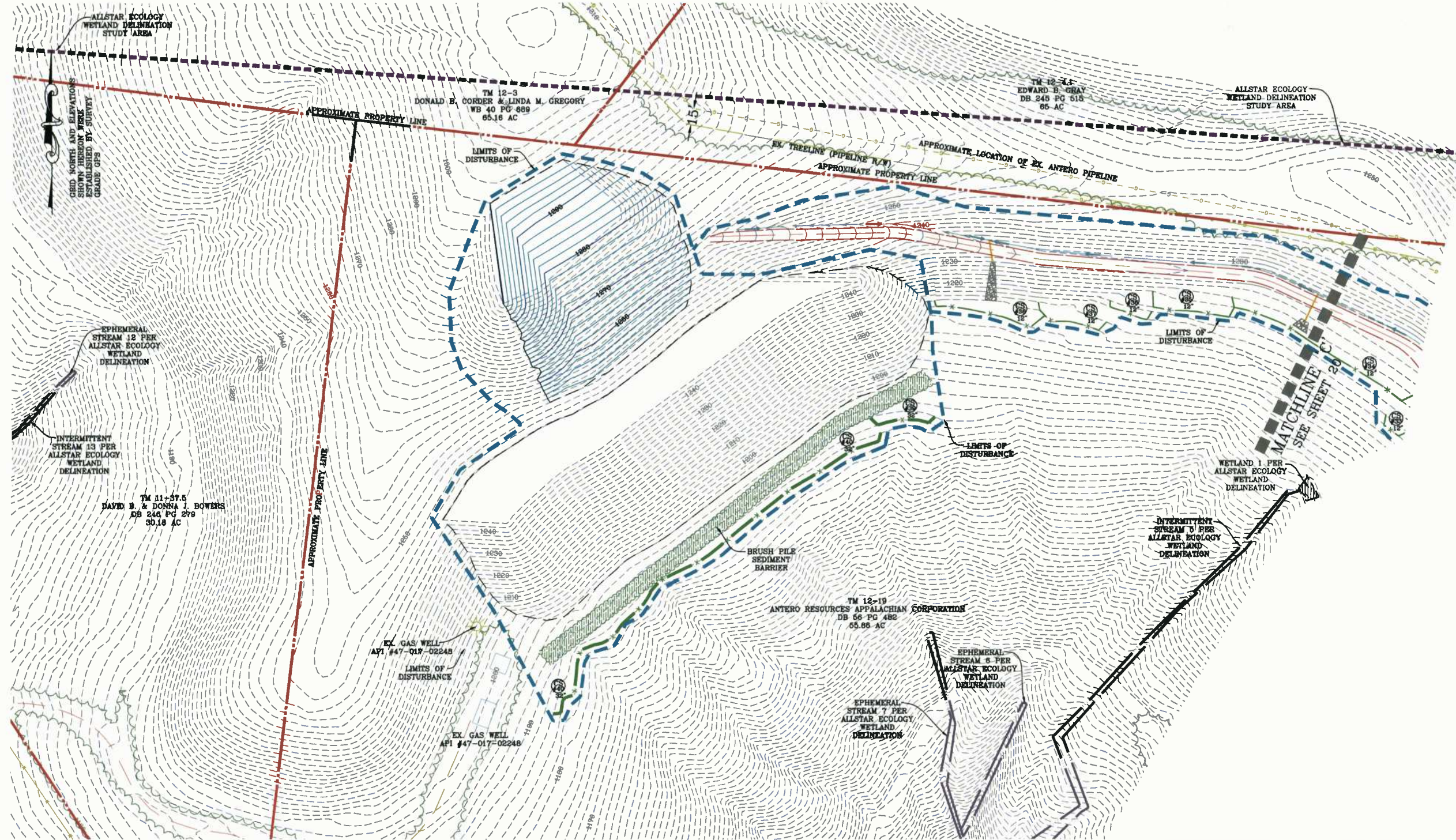
ANTERO RESOURCES
 THIS DOCUMENT WAS PREPARED BY ANTERO RESOURCES APPALACHIAN CORE

RECLAMATION PLAN
LAKE
 CENTRALIZED FRESHWATER IMPOUNDMENT
 GREENBRIER DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 04/03/2013
 SCALE: 1" = 50'
 SHEET 20 OF 21

RECLAMATION PLAN



SITE RECLAMATION NARRATIVE

POST CONSTRUCTION - THE CONSTRUCTION SITE SHALL BE STABILIZED AS SOON AS POSSIBLE AFTER COMPLETION. THE ESTABLISHMENT OF FINAL COVER MUST BE INITIATED NO LATER THAN 7 DAYS AFTER REACHING FINAL GRADE. THE ACCESS ROADS AND THE CENTRALIZED FRESHWATER IMPOUNDMENT ARE TO BE MAINTAINED THROUGHOUT THE LIFE OF THE FACILITY. ALL CULVERTS, ROADSIDE DITCHES, BROAD-BASED DIPS, DIVERSION DITCHES, ETC. MUST BE MAINTAINED IN PROPER WORKING ORDER. ANY SOIL THAT IS DISTURBED ALONG THE ACCESS ROAD OR CENTRALIZED WATER IMPOUNDMENT MUST BE REVEGETATED ACCORDING TO THESE PLANS AND THE WVDEP OFFICE OF OIL AND GAS FIELD MANUAL. IF NECESSARY, ALL TEMPORARY BMP MEASURES CAN BE REMOVED AFTER THE SITE IS PERMANENTLY STABILIZED AND APPROVAL IS RECEIVED FROM THE WVDEP. ANY AREAS DISTURBED BY REMOVAL OF THE BMPS SHALL BE REPAIRED, STABILIZED, AND PERMANENTLY SEEDED.

POST USE - WITHIN 6 MONTHS OF THE EXPIRATION OF THE CERTIFICATE OF APPROVAL OF THE CENTRALIZED FRESHWATER IMPOUNDMENT FACILITY, THE SITE SHALL BE CLOSED AND RESTORED TO A PRE-CONSTRUCTION CONDITION. THE LINER SYSTEM SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED RECYCLING OR WASTE DISPOSAL FACILITY. ALL PIPING FOR THE GROUNDWATER DEWATERING SYSTEM, WATER LINES, AND ASSOCIATED STRUCTURES SHALL BE REMOVED. ALL EXISTING BMP'S SHOWN SHALL BE INSPECTED FOR DAMAGE AND REPLACED AS NECESSARY BEFORE RECLAMATION CAN BEGIN. THE SITE SHALL BE REGRADED AS INDICATED ON THE PLANS TO PRE-CONSTRUCTION GRADES. UPON COMPLETION OF THE GRADING, THE SITE SHALL BE SEEDED AND MULCHED PER THE REVEGETATION DETAILS. A NOTICE OF TERMINATION MUST BE FILED WITH THE DEP WHEN THE SITE REACHES FINAL STABILIZATION. FINAL STABILIZATION MEANS THAT ALL SOIL-DISTURBING ACTIVITIES ARE COMPLETED, AND THAT EITHER A PERMANENT VEGETATIVE COVER WITH A DENSITY OF 70% OR GREATER HAS BEEN ESTABLISHED OR THAT THE SURFACE HAS BEEN STABILIZED BY HARD COVER SUCH AS GRAVEL AND PAVEMENT ACCESS ROADS OR BUILDINGS. IT SHOULD BE NOTED THAT THE 70% REQUIREMENT REFERS TO THE TOTAL AREA VEGETATED AND NOT JUST A PERCENT OF THE SITE.

NOTE:

- ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 9" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.



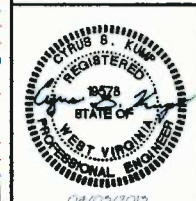
LEGEND

EX. INDEX CONTOUR	---	700	PROP. INDEX CONTOUR	---	700
EX. INTERMEDIATE CONTOUR	---	700	PROP. INTERMEDIATE CONTOUR	---	700
EX. PROPERTY LINE	---	700	PROP. PROPERTY LINE	---	700
EX. ROAD EDGE OF GRAVEL/DIRT	---	700	PROP. INTERMEDIATE CTR (ROAD)	---	700
EX. ROAD EDGE OF PAVEMENT	---	700	PROP. LIMITS OF DISTURBANCE	---	700
EX. ROAD CENTERLINE	---	700	PROP. WELL HEAD	---	700
EX. DITCHLINE	---	700	PROP. PERIMETER SAFETY FENCE	---	700
EX. CULVERT	---	700	PROP. ACCESS GATE WITH EMERGENCY LIPELINE	---	700
EX. FENCELINE	---	700	PROP. ROAD EDGE OF GRAVEL	---	700
EX. OVERHEAD UTILITY	---	700	PROP. ROAD CENTERLINE	---	700
EX. POWER POLE/GUY WIRE	---	700	PROP. V-DITCH W/ CHECK DAMS	---	700
EX. GASLINE	---	700	PROP. CULVERT W/ RIP-RAP	---	700
EX. TREELINE	---	700	PROP. COMPOST FILTER SOCK	---	700
EX. DELINEATED STREAM	---	700	PROP. SUPER SILT FENCE	---	700
EX. DELINEATED WETLAND	---	700	MATCHLINE	---	700
EX. BUILDING	---	700	BRUSH PILE SEDIMENT BARRIER	---	700
100' WETLAND/STREAM BUFFER DELINEATION STUDY AREA	---	700			

DATE	REVISION
04/11/2013	REVISED PER UPDATED WETLANDS

ANTERO RESOURCES
THIS DOCUMENT
WAS PREPARED
FOR:
ANTERO RESOURCES
APPALACHIAN CORP.

RECLAMATION PLAN
LAKE
CENTRALIZED FRESHWATER IMPOUNDMENT
GREENBRIER DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 04/03/2013

SCALE: 1" = 50'

SHEET 21 OF 21

Engineering
Survey
Environmental
GIS

NAVITUS
ENGINEERING INC.

151 Windy Hill Lane
Winchester, Virginia 22602
Phone: (540) 333-1155
www.navituseng.com

**ANTERO RESOURCES APPALACHIAN CORPORATION
SCHEDULE OF QUANTITIES**

CLEARING & GRUBBING; EROSION & SEDIMENT CONTROLS				
	QUANTITY	UNIT		
MOBILIZATION	1.0	EA	\$16,000.00	\$16,000.00
CONSTRUCTION ENTRANCE	1.0	EA	\$4,035.00	\$4,035.00
CLEARING & GRUBBING (OPEN FIELD)	0.8	AC	\$2,200.00	\$1,760.00
CLEARING & GRUBBING (TREE REMOVAL)	16.5	AC	\$4,335.00	\$71,527.50
8" COMPOST FILTER SOCK	0.0	LF		\$0.00
12" COMPOST FILTER SOCK	3149.1	LF	\$4.30	\$13,541.13
18" COMPOST FILTER SOCK	0.0	LF	\$7.60	\$0.00
24" COMPOST FILTER SOCK	0.0	LF	\$9.80	\$0.00
32" COMPOST FILTER SOCK	1101.6	LF	\$14.50	\$15,973.20
SUPER SILT FENCE	0.0	LF	\$8.10	\$0.00
9" STRAW WATTLES	0.0	LF		\$0.00
TOTAL				\$122,836.83
SITE				
	QUANTITY	UNIT		
DRILL PAD EXCAVATION	0.0	CY		\$0.00
ACCESS ROADS EXCAVATION	19666.7	CY	\$3.50	\$68,833.45
TURNAROUND PAD and/or CENTRALIZED IMPOUNDMENT EXCAVATION	81395.6	CY	\$3.50	\$284,884.60
TOPSOIL	7795.6	CY	\$3.30	\$25,725.48
DIVERSION DITCH	0.0	LF	\$2.00	\$0.00
ROADSIDE DITCH	2667.8	LF	\$3.70	\$9,870.86
TOTAL				\$389,314.39
SUMP(S) PER ANTERO RESOURCES STANDARD DETAIL				
	QUANTITY	UNIT		
INSTALL 102" x 78" x 44" PRE CAST SUMP - SEE ANTERO RESOURCES SUMP DETAIL	0.0	EA		\$0.00
VALVE BOX HDPE PIPE (MINIMUM 12" DIAMETER x 48" HEIGHT)	0.0	EA		\$0.00
4" PVC CONNECTIVE PIPE (ANTERO SUMP DRAIN DETAIL)	0.0	LF		\$0.00
TOTAL				\$0.00
AGGREGATE SURFACING - SPREADING, COMPACTION, and/or INSTALLATION				
	QUANTITY	UNIT		
DRILL PAD AASHTO #1 (8" THICK)	0.0	TON		\$0.00
DRILL PAD 1 1/2" or 3/4" CRUSHER RUN STONE (2" THICK)	0.0	TON		\$0.00
DRILL PAD GEOTEXTILE FABRIC (US 200)	0.0	SY		\$0.00
ACCESS ROADS 6" OR 4" MINUS CRUSHER RUN AGGREGATE (6" THICK)	1332.3	TON	\$9.40	\$12,523.62
ACCESS ROADS GEOTEXTILE FABRIC (US 200)	5329.1	SY	\$0.90	\$4,796.19
*INSTALL TENSAR TX190 GEOGRID or EQUIVALENT	0.0	SY	\$2.50	\$0.00
TURNAROUND PAD 6" OR 4" MINUS CRUSHER RUN AGGREGATE (6" THICK)	950.1	TON	\$9.40	\$8,930.94
TURNAROUND PAD GEOTEXTILE FABRIC (US 200)	2360.2	SY	\$0.90	\$2,124.18
*INSTALL TENSAR TX190 GEOGRID or EQUIVALENT	0.0	SY	\$2.50	\$0.00
TOTAL				\$28,374.93

**ANTERO RESOURCES APPALACHIAN CORPORATION
SCHEDULE OF QUANTITIES**

ROAD CULVERTS	QUANTITY	UNIT		
15" HDPE	366.0	LF	\$24.30	\$8,893.80
18" HDPE	0.0	LF		\$0.00
24" HDPE	0.0	LF		\$0.00
30" HDPE	0.0	LF		\$0.00
36" HDPE	0.0	LF		\$0.00
42" HDPE	0.0	LF		\$0.00
48" HDPE	0.0	LF		\$0.00
60" HDPE	0.0	LF		\$0.00
R4 RIP RAP (INLETS/OUTLETS)	110.4	TON	\$9.00	\$993.60
AASHTO #1 STONE (DITCH CHECKS)	14.6	TON	\$48.30	\$705.18
DITCH LINING - (ACCESS ROAD) SYNTHETIC MATTING (TRM)	182.3	SY	\$7.00	\$1,276.10
DITCH LINING - (ACCESS ROAD)	0.0	SY		\$0.00
DITCH LINING - (ACCESS ROAD) R4 RIP-RAP	450.9	sy	\$21.67	\$9,771.00
TOTAL				\$21,639.68
LINER SYSTEM*				
	QUANTITY	UNIT		
60 MIL TEXTURED PRIMARY LINER	9998.9	SY		\$0.00
16 OZ. NON-WOVEN GEOTEXTILE FABRIC CUSHION	9998.9	SY		\$0.00
TOTAL				\$0.00
*THE SQUARE YARDAGE FOR THE LINER SYSTEM DOES NOT ACCOUNT FOR MATERIAL OVERLAP AND WASTE.				
FENCING/GATES				
	QUANTITY	UNIT		
4 FT WOVEN WIRE FARM FENCE w/MINIMUM 10 FT POST SPACING (WOODEN and/or "T" POST	1303.9	LF	\$16.80	\$21,905.52
16 FT DOUBLE GATE	1.0	EA	\$650.00	\$650.00
TOTAL				\$22,555.52
SEEDING				
	QUANTITY	UNIT		
SITE SEEDING (LIME, FERTILIZER, SEEDING, AND HYDRO-MULCH w/TACK (HYC-2 OR EQUAL))	16.2	AC	\$3,400.00	\$55,080.00
TOTAL				\$55,080.00
UNFORESEEN SITE CONDITIONS				
	QUANTITY	UNIT		
*ROCK CLAUSE - BLASTING	0.0	CY	\$5.20	\$0.00
*ROCK CLAUSE - HOE RAMMING	0.0	CY	\$75.80	\$0.00
*FRENCH DRAINS	0.0	FT	\$10.00	\$0.00
*PHASE 1 FENCING - STEEL CORRUGATED PANELS w/"T" POST (10 FT CENTERS) - WETLAND PROTECTION	0.0	LF	\$9.40	\$0.00
*PHASE 2 FENCING - SILT FENCE AND OR FILTER SOCK OUTSIDE OF PHASE 3 FENCING - WETLAND PROTECTION	0.0	LF	\$9.50	\$0.00
*PHASE 3 FENCING - ORANGE SAFETY FENCE w/"T" POST (10FT CENTERS) - WETLAND PROTECTION	0.0	LF	\$4.00	\$0.00
*SILT FENCE	0.0	LF	\$668.70	\$0.00
*TEMPORARY SEEDING	7.0	AC	\$1,900.00	\$13,300.00
*CONSTRUCTION STAKEOUT	0.0	HOUR	\$171.00	\$0.00
*JUTE MATTING - SLOPE MATTING	48462.5	SY	\$1.60	\$77,540.00
TOTAL				\$90,840.00
	GRAND TOTAL			\$730,641.35

ACCESS ROAD AGREEMENT

This ACCESS ROAD AGREEMENT ("Agreement") is made and entered into this 4th day of **March, 2013** by and between, **Big Isaac United Methodist Church**, (the "Grantor" whether one or more), having an address of **4038 Big Isaac Road, Salem, WV 26426** and **ANTERO RESOURCES APPALACHIAN CORPORATION**, a Delaware corporation, (the "Grantee") having an address of **1625 17th Street, Denver, Colorado 80202** (collectively, the "Parties").

BACKGROUND

Grantor is the owner of the surface of that certain tract or parcel of land located in **Greenbrier District, Doddridge County, West Virginia**, identified on **Tax Map 12**, as **Parcel No. 9**, comprised of **.27** acres, more or less and being the same tract or parcel of land conveyed to the Grantor herein as recorded in the Office of the Clerk of the County Commission of **Doddridge**, in **Deed Book 4**, at **Page 227** (the "Premises").

NOW, THEREFORE, for and in the consideration of Ten-Dollars (\$10.00) and other good and valuable consideration the receipt and sufficiency of which is hereby acknowledged, Grantor hereby grants and conveys unto Grantee a permanent and non-exclusive right-of-way and easement to construct, maintain and repair an access road on the Premises for the purpose of accessing Grantee's operations on the Premises or adjacent properties. The Parties agree as follows:

1. **Access Road Plans.** Grantor hereby grants and conveys unto Grantee a permanent, right-of-way and easement to construct, maintain and repair an access road(s) on the above described property as shown on Exhibit A attached hereto and by this reference made a part hereof. The actual and defined location of said access road(s) shall be surveyed prior to construction and a copy of the survey(s) shall be attached hereto as Exhibit B. Said right-of-way and easement shall be for the limited purpose of providing access to and from Grantee's operations on the Premises or adjacent properties.
2. **Term.** This Agreement is for a term of **five (5) years** from the date hereof and as long thereafter as the access road(s) is/are utilized for the purposes of access to and from Grantee's operations on the Premises or adjacent properties. In the event the access road(s) is/are NOT built within five (5) years from the date hereof, this Agreement will become null and void.
3. **Payment.** Grantee shall pay Grantor an Initial Payment of **\$2,500.00** upon receipt of an executed copy of this Agreement, a Memorandum of Access Road Agreement, and IRS Form W-9. Upon commencing access road construction pursuant to a Final Site Plan, Grantee shall pay Grantor **\$ 17,500.00** ("balance of payment") as full and Final Payment and as final settlement of all damage claims resulting from the Grantee's use of the Premises, including, but not limited to, the market value of crops and timber damaged, destroyed, or prevented from reaching market. Grantee understands that the balance of payment shall only be paid upon the commencement of access road construction.

Provisions to Agreement

- a. Grantee agrees to keep area around access road free of litter and to maintain access road for as long as this Agreement is in effect.
- b. Grantee has the right to install and replace culverts as Grantee determines is needed and necessary.
- c. Grantee has the right to cut adjacent trees and brush to keep access road(s) in passable condition.
- d. Grantee may install gate(s), lock(s) and fencing on the access road(s) easement as Grantee determines is needed and necessary. Grantee will consult with Grantor as to placement of said gates and fencing.
- e. Grantee agrees to re-seed disturbed areas with a meadow mix or type of grass requested by Grantor.

- f. Grantee will gravel and maintain the staked parking area located across the street from the access road entrance, Grantee can use the parking area for a period of three years from the date of the ROW.
- g. Grantee shall also, at Grantor's request, remove from the Premises trees, stumps, and brush disturbed by the access road(s) construction.
- h. NO Firearms, alcohol, drugs, or other illegal substances will be allowed on property or construction areas by Grantee's contractors or their visitors.
- i. NO hunting or fishing allowed on the property by contractors or employees of Grantee.
- j. If it is determined the existing Septic Tank is damaged due to Grantee's operations the Grantee will be responsible to fix the septic system.

4. **Dispute Resolution.** In the event a dispute, claim, question, or disagreement arises pursuant to the terms of this Agreement, the Parties shall attempt to settle said dispute, claim, question, or disagreement, through utilization of a duly qualified mediator selected and approved by the Parties. In the event mediation fails to settle the Parties' dispute, the Parties may pursue any and all remedies at law or in equity.

5. **Indemnification.** The Grantee shall indemnify, save, hold harmless, and personally discharge and defend the Grantor against any and all claims, demands, actions, costs, judgments, product liability, or other liability, for personal injury, property damage, financial damage, and any other claims or liabilities caused directly or indirectly by the action or inaction of the Grantee's agents, employees, contractors, subcontractors, and invitees.

6. **Confidentiality.** The Parties shall keep the terms, conditions, and payments made pursuant to this Agreement strictly confidential, and shall execute a Memorandum of Access Road Agreement that shall be filed in the county property records. Under no circumstances shall this Agreement be placed of record in the county property records by either the Grantor or Grantee. In the event Grantee fails to utilize the Premises for access within the term of this Agreement, Grantee shall record a "Release of Memorandum of Access Road Agreement" in the county property records indicating its relinquishment of rights to the Premises.

7. **Notices and Further Assurances.** The Grantor and Grantee agree that they will comply with the notice provisions required by the West Virginia Department of Environmental Protection and/or by West Virginia Code Section 22-6A as necessary. The Grantor hereby acknowledges that they will execute any and all instruments, documents, acknowledgements, notices and/or waivers necessary to comply with the terms of this Agreement or the laws of the State of West Virginia and the West Virginia Department of Highways.

8. **Assignments.** Grantee shall have the right to assign this Agreement in whole or part.

9. **Binding.** This Agreement shall be binding upon the Parties, their heirs, successors, and assigns.

GRANTOR:

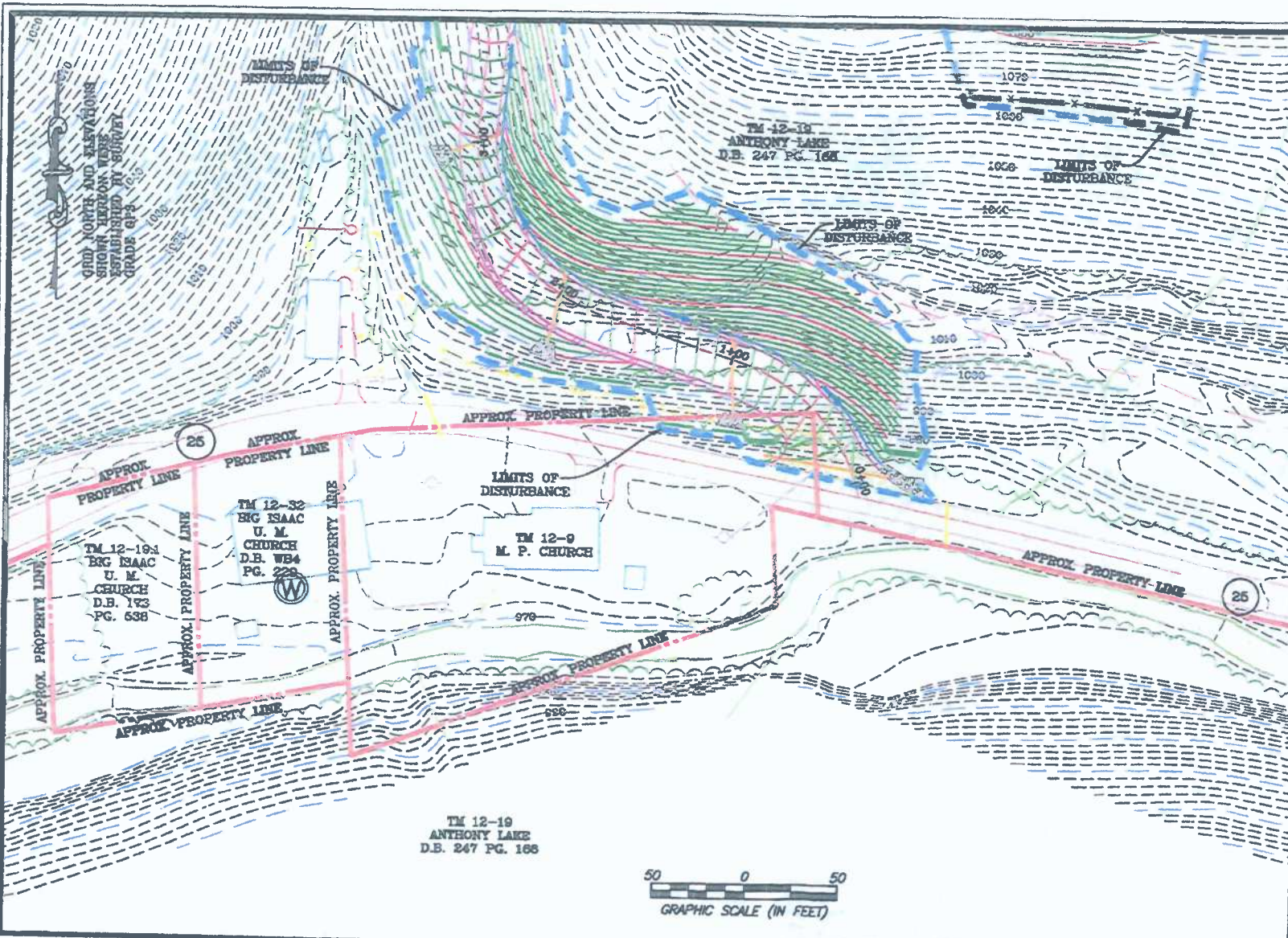
John K. Davis
 John K. Davis, President of Trustee's of Big Isaac
 United Methodist Church

Donald B. Corder
 Donald B. Corder, Vice-President of
 Trustee's of Big Isaac United Methodist
 Church

GRANTEE:

Antero Resources Appalachian Corporation

By Brian A. Kuhn
 Brian A. Kuhn
 Vice President of Land
 Antero Resources Appalachian Corporation



NAVITUS
ENGINEERING INC.

111 West Hillman
Martinsburg, Virginia 25401
Telephone: (540) 424-4115
www.navituseng.com

Engineering • Survey • Environmental • GIS

**PRELIMINARY
LAYOUT
NOT FOR
CONSTRUCTION**

AMTARO
RESOURCES

THIS DOCUMENT
WAS PREPARED
FOR:
AMTARO RESOURCES
APPALACHIAN CORP.

**ENTRANCE
EXHIBIT
LAKE**

GREENBRIER DISTRICT
DODDRIDGE COUNTY, WV

SCALE: 1" = 50'
LAKE
JOB NO. ANTO19
DATE: 12/13/2012



WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

Division of Highways

Earl Ray Tomblin
Governor

Office of the District Engineer/Manager
District Four

PO Box 4220 (EXIT 121, I-79) * Clarksburg, WV 26302 * 304-842-1550

June 7, 2013

Paul A. Mattox, Jr., P. E.
Secretary of Transportation /
Commissioner of Highways

ANTERO RESOURCES APPALACHIAN
CORPORATION
175 D ELK CREEK ROAD
MOUNT CLARE, WV 26408

Dear Applicant:

Your approved copy of Permit Number 04-2013-0393 for a DP - Drilling Permit
permit type is enclosed. A description of the work is on the permit.

Please contact the District Four office:

Denise Roncone 304-842-1575

at least 48 hours in advance of the date you plan to begin work so arrangements can be made to inspect the work authorized by the permit.

Failure to comply will result in cancellation of your permit.

A copy of this permit is to be available on the job at all times while the work is in progress for inspection by the West Virginia Division of Highways' personnel.

Sincerely,

District Engineer / District Manager

Denise Roncone

Permit Supervisor

Initials: TC

Attachments: Yes

Enclosure: No

cc:0409 Charleston Permits

PERMIT TO ENTER UPON, UNDER, OVER OR ACROSS THE STATE ROADS OF THE STATE OF WEST VIRGINIA, AS PROVIDED FOR IN SECTION 6, ARTICLE 16, CHAPTER 17; SECTION 9, ARTICLE 16, CHAPTER 17; SECTION 8, ARTICLE 4, CHAPTER 17, WEST VIRGINIA CODE, 1931, AS AMENDED.

THIS PERMIT, Made this 15th day of April 20 13, between the WEST VIRGINIA DEPARTMENT OF TRANSPORTATION, DIVISION OF HIGHWAYS, a statutory corporation hereinafter called DIVISION and Antero Resources Appalachian Corporation
Address: 1625 17th Street, Denver, CO 80202 Phone No: 303) 357-7310
hereinafter called APPLICANT.

WITNESSETH

In consideration of the hereinafter set out covenants and in accordance with Section 6, Article 16, Chapter 17; or Section 9, Article 16, Chapter 17; or Section 8, Article 4, Chapter 17, of the Official Code of West Virginia, 1931, as amended, and the rules and regulations promulgated thereunder, APPLICANT does hereby apply to enter

Route Type & No. SLS 25 DOH Project No. _____ (if applicable);

at .2 miles miles NE of the intersection of SLS 48/2 SLS 25 Mile Post 12.713

in Doddridge County, for the purposes hereinafter set forth and in accordance with the

plans and specifications which are attached hereto and made a part hereof: To construct and maintain a

existing heavy hauling approach for a Centralized Freshwater Impoundment. Located on the North

side of SLS 25 approximately .2 miles NE of the intersection of SLS 48/2 and SLS 25. Site distance

is approximately 500 feet to the East and 300 feet to the West. Lake Freshwater Impoundment

APPLICANT further agrees to accept the conditions hereinafter set forth:

1. APPLICANT shall deposit with DIVISION the sum of \$ 1,000,000 in the form of an official, certified or cashier's check, or executed bond with surety satisfactory to DIVISION to cover any damage and inspection costs DIVISION may sustain by reason of the granting of this permit, including any expense incurred in restoring said highway to its original condition or the proper repair of any and all damages that may result within one (1) year from the date of the completion of said work.
2. APPLICANT agrees to reimburse DIVISION for inspection costs as follows:
 - A. For any inspection costs incurred under this permit.
 - B. At \$ _____ per linear foot for _____ feet of water line installed under this permit
 - C. At \$ _____ per linear foot for _____ feet of sewer line installed under this permit
3. APPLICANT shall notify DIVISION at least 48 hours in advance of the date the work will begin. Failure to comply will be cause for cancellation of this permit.
4. APPLICANT agrees to protect its employees, equipment and users of the highway at all times in accordance with the current Division of Highways manual "Traffic Control For Street and Highway Construction and Maintenance Operations".
5. APPLICANT agrees to comply with all applicable state and federal laws in the performance of work under this permit.
6. Supplementary conditions cited on the reverse side of this permit are understood and agreed to be a part hereof.
7. The work authorized under this permit shall be completed on or before (Date): April 15, 2013

CHAPTER 17 WEST VIRGINIA CODE, 1931

§17-4-8. Use of roadbed by railroad, telephone company, etc.

No railroad or electric or other railway shall be constructed upon the roadbed of any state road, except to cross the same, nor shall any person, firm or corporation enter upon or construct any works in or upon such road, or lay or maintain thereon or thereunder any drainage, sewer or water pipes, gas pipes, electric conduits or other pipes, nor shall any telephone, telegraph or electric line or power pole, or any other structure whatsoever, be erected upon, in or over any portion of a state road, except under such restrictions, conditions and regulations as may be prescribed by the state road commissioner. Whenever any railroad or electric or other railway, heretofore or hereafter constructed, shall cross any state road, it shall be required to keep its own roadbed, and the bed of the road or highway at such crossing, in proper repair, or else to construct and maintain an overhead or undergrade crossing, subject to the approval of the state road commissioner; and the tracks of such railroad or railway at grade crossings shall be so constructed as to give a safe and easy approach to and across the same, and when the construction of such approaches is made necessary by a change in the railroad grade at the grade crossing, the cost shall be upon the railway company.

§17-16-6. Permit by commission or county court for openings in or structures on public roads; franchises and easements of oil, etc., transportation companies.

No opening shall be made in any state or county-district road or highway, nor shall any structure be placed therein or thereover, nor shall any structure, which has been so placed, be changed or removed, except in accordance with a permit from the state road commission or county court, as the case may be. No road or highway shall be dug up for laying or placing pipes, sewers, poles or wires, or for other purposes, and no trees shall be planted or removed or obstructions placed thereon, without the written permit of the commission or county court, or its duly authorized agent, and then only in accordance with the regulations of the commission or court. The work shall be done under the supervision and to the satisfaction of the commission or court; and the entire expense of replacing the highway in as good condition as before shall be paid by the persons to whom the permit was given, or by whom the work was done: **Provided, however,** That nothing herein contained shall be so construed as to prevent any oil or gas company or person having a proper permit or franchise from transporting oil or gasoline along any of the public highways of this State, nor to give such company a franchise without paying to the landowners through whose lands such road passes the usual and customary compensation paid or to be paid to the landowners for such right of way. Any grant or franchise when made shall be construed to give to such company or person only the right to use the easement in such public road.

A violation of any provision of this section shall be a misdemeanor, and the person or corporation violating the same shall, upon conviction thereof, be fined not less than twenty-five nor more than one hundred dollars for each offense.

§17-16-9. Private driveways or approaches to roads; obstruction of ditches.

The owner or tenant of land fronting on any state road shall construct and keep in repair all approaches or driveways to and from the same, under the direction of the state road commission, and, likewise, the owner or tenant of land fronting on any county-district road shall construct and keep in repair approaches or driveways to and from the same, under the direction of the county road engineer, and it shall be unlawful for such owner or tenant to fill up any ditch, or place any material of any kind or character in any ditch, so as in any manner to obstruct or interfere with the purposes for which it was made.

SUPPLEMENTARY CONDITIONS

1. The person, firm or corporation to whom a permit is issued agrees to hold the State of West Virginia and DIVISION harmless on account of any damages to persons or property which may arise during the process of the work authorized by this permit or by reason thereof.
2. Applications for permission to perform work within highway rights of way shall be made on DIVISION'S standard permit form and shall be signed by the authorized representative of the person, firm or corporation applying.
3. The APPLICANT shall give detailed information concerning the work to be performed and the application must include a sketch sufficient to show the nature of the work performed.
4. APPLICANT, his agents, successor, heirs or assigns, contractors or any other person, firm or corporation working under APPLICANT'S real or apparent authority, shall perform the work in a manner satisfactory to DIVISION. Damage to the road resulting at any time from work authorized under this permit shall be repaired by APPLICANT. Unsatisfactory repairs may be corrected by DIVISION or its authorized agent and the cost thereof paid by APPLICANT.
5. DIVISION assumes no liability for damage to the proposed work by reason of construction or maintenance work on the road.
6. This permit is granted subject to removal of the authorized installation by APPLICANT at no cost to DIVISION when required for improvement of the road, and subject to all regulations now or hereafter adopted by DIVISION.
7. Utility installation shall be in accordance with the regulations of the appropriate utility company.

Addendum to Permit 04-2013-0393

This addendum, made this 24th day of May 2013, between the West Virginia Department of Transportation, Division of Highways, a statutory company hereinafter called the Division and **Antero Resources**

Address: 1625 17th Street, Denver, CO 80202 Phone: 303 357-7310
hereinafter called APPLICANT.

The Applicant has filed with the DIVISION a written application for the following named route and location:

The following routes are utilized by Antero movements from one site to another.

Harrison County Route 29, Patterson Fork @ MP 0.00 to 2.58; SLS 50/73, Old US 50 @ MP 1.38 to 1.94; SLS 31, Jarvisville Road @ MP 0.00 to 3.10; SLS 29/2, Halls, Run @ MP 0.97; SLS 50/6, Raccoon Run. @ MP 0.00 to 0.40; SLS 28, Coburn Fork Rd @ MP 0.00 to 0.48; SLS 30, 0.00 to 0.51; Doddridge County Route SLS 15/7, @ MP 0.00 to 0.40; SLS 15, Long Run, @ MP 8.61 to 10.65; SLS 48, Big Isaac, @ MP 0.00 to 3.172; SLS 25, Meathouse Fork, @ 0.00 to 13.81; SLS 25/7, Snake Run, @ 0.00 to 2.21; SLS 27, Dry Fork, @ MP 0.05 to 1.58; SLS 25/13, Dry fork, 0.00 to 1.60; SLS 27, Dry Fork, @ MP 0.00 to 0.05;

- After completion of the project, a joint review of roads will be filmed and evaluated to assure roads have been repaired to existing condition or better.
- No travel on School Bus Routes during their traversing operational hours on above mentioned route on bi-directional roadways where the lane widths are less than 10 ft.
- Pilot Vehicle required for all Oversized Loads on covered roads.
- Ditch lines to be maintained by applicant. FDR or equivalent required to stabilize road to uphold increased traffic and heavy loads.
- Repairs that will include "Hot Mix Asphalt" will have the following testing requirement: The supplier will be responsible for testing at the plant; Compaction testing will be as per WV DOH specifications.
- The Division of Highways shall have the right at all times to inspect the work, and if such inspections should reveal that the work is not done according to specifications, upon being so advised by the Division, ANTERO Resources agrees to take immediate corrective actions.

Applicant shall properly repair and maintain any and all damages that may result to said bridges, highways, shoulders and ditches from hauling activities of Applicant, its agents, contractors and employees, to as good a condition prior to commencement of Applicant's operation or as when the permit was issued, as determined by the District Engineer/Manager of the DIVISION having jurisdiction over the work permitted, or pay damages therefore in the amount to sufficiently restore such bridges, roads, highways, shoulders and ditches to original condition; and shall reimburse the DIVISION for all inspection costs incurred by it in connection with said work and repairs of such damages and faithfully comply with all terms and conditions of said permits and save harmless the DIVISION and the State of West Virginia from all losses resulting from the conduct of said work and repairs; provided that all projects covered by this blanket bond have been restored to original or better condition; then this Bond shall be released; or otherwise will remain in full force and effect.

Bond Amount: \$1,000,000.00

Bond Number: LPM9062891 Date: 2/21/2012

-80.55175, 39.20361
Antero Resources
Hefflin North Pad

04-2013-0393
Lake Freshwater Impoundment
SLS 25 @ MP 12.713
-80.542306, 39.201076



Dist. Permit Number 0420180998

BOND Number LPM 9062891

OIL and GAS DATA INFORMATION SHEET

APPLICANT

Company Name ANTERO RESOURCES APPALCHIAN CORPORATION
 Address 1625 17TH STREET
 City DENVER ST CO Zip 80202

Contact Person Permit Burt Simcox Telephone (304) 282-9372
 24/7 Road Maintenance Contact Aaron Kunzler Telephone _____ Cell (405) 227-8344
 24/7 Backup Contact Dusty Wood Telephone _____ Cell (817) 771-1436

Drilling/Fracking will require _____ Less than 5000 Barrels of fluids 5000/+

Site Location

Site Name Lake Freshwater Impoundment Road Local Name Meathouse Fork Rte.# SLS 25

Approach location WGS 83 Decimal Format GPS 39.201076 W: 80.542306 County Doddridge

Location Description

On Route.# SLS 25 being .2 miles **NE** of Jct. of Rte.# SLS 25 and Rte.# SLS 48/2

DOH USE ONLY HAULING ROUTE From US or WV Route (Attach Map)

To Service Hefflin North Pad

Name & Rte.#	Beg MP	End MP	Surface Type	Condition
<i>HARRISON</i> <u>Patterson FK 29</u>	<u>0.00</u>	<u>2.58</u>	<u>HLBC</u>	<u>good</u> <i>PIPING CONCERN SLIPS</i>
<u>Opusville 31</u>	<u>0.00</u>	<u>3.10</u>	<u>HLBC</u>	<u>good</u>
<u>Nails Run 29/2</u>	<u>0.97</u>		<u>HLBC</u>	<u>good</u>
<u>Baccara 50/6</u>	<u>0.00</u>	<u>0.40</u>	<u>Hi</u>	<u>good</u>
<u>Calum Fork 28</u>	<u>0.00</u>	<u>0.48</u>	<u>ROCK</u>	<u>Good</u>
<u>30</u>	<u>0.00</u>	<u>0.51</u>	<u>HLBC</u>	<u>Fair</u>
<i>Doddridge</i> <u>15/17</u>	<u>0.00</u>	<u>0.40</u>	<u>H</u>	<u>good</u> <i>FAILED PILING</i>
<u>Lang Run 15</u>	<u>8.61</u>	<u>10.65</u>	<u>HLBC</u>	<u>good</u> <i>- SLIP ARE</i>
<u>48</u>	<u>0.00</u>	<u>3.172</u>	<u>STONE</u>	<u>good</u> <i>- FAILED PILING</i>
<u>MEATHOUSE 25</u>	<u>0.00</u>	<u>13.81</u>	<u>HLBC</u>	<u>good</u>
<u>SNAKE RUN 25/7</u>	<u>0.00</u>	<u>2.21</u>	<u>STONE</u>	<u>POOR</u>
<u>DRY FK 27</u>	<u>0.05</u>	<u>1.58</u>		
<u>25/13</u>	<u>0.00</u>	<u>1.60</u>		
<u>DRY FORK 27</u>	<u>0.00</u>	<u>0.05</u>		

Well location WGS 83 Decimal Format GPS

N: 39.20361

W: 80.55175

WV DEP Permit Number 47 - _____

STATE

COUNTY

PERMIT NUMBER

Permit: 2013-393

Addendum Continued
Conditions and Requirements

County: Harrison &

Applicant: Antero

Repairs/Upgrades Necessary for Maintenance Permit

Dodd
Well Pad: Various
Lake Water Pad

Route No.	Route Name	Mile Post	Perform Ditching	Patch Potholes	Clean Culverts	Repair Base Failures	Slip Repair	Overlay Asphalt	Overlay S&C	Stone/Stabilize Roadway	Stone/Repair Shoulders	Bridge Concerns	Ongoing Roadway Maintained	Other	Approach Coordinates:		Comments	
															N _____	W _____		
50/73	Harrison																Hubert 4-12-815	
29	}																Nimowice 4-12-903	
29/2																	Clearance 4-12-1042	
50/6																		Trent 4-12-1069
28																		John North 4-12-1081
31																		Howek 4-12-1082
30																		Helfin Pad 4-2013-0018
15	Dodd																	Dodd 25/7, 25/13 15/7
48																		4-2013-0393 Lake water
25																		
27																		

RECOMMENDATIONS: All Roads listed above will be used by Antero moving Fracking equipment Rigs & water from one location to another Drilling several wells on each site

Above routes reviewed for necessary repairs and upgraded required for Maintenance Permit/Agreement.

Eugene B. Sore

Applicant Representative

5/24/2013

Date

Kevin D. Cella

DOI Representative

5/24/13

Date

Permit: 4013-0393

Addendum Continued

5/24/13 & 29

County: Harrison

Applicant: Antero

Conditions and Requirements

1 of 2

Well Pad: Dodd Lake

Repairs/Upgrades Necessary for Maintenance Permit

Route No.	Route Name	Mile Post	Perform Ditching	Patch Potholes	Clean Culverts	Repair Base Failures	Slip Repair	Overlay Asphalt	Overlay S&C	Stone/Stabilize Roadway	Stone/Repair Shoulders	Bridge Concerns	Ongoing Roadway Maintained	Other	Approach Coordinates:	
															N _____	W _____
															Comments	
29	Patterson	0.48												Harr	Slip	
?	'	0.37													Slip	
		0.3		✓											}	
		0.24		✓												Start of Slip
		0.20														
		0.13														old Piling Job
		0.00														Dodd Co line

RECOMMENDATIONS: Repair all Slip areas. Repair all base failures, Ditch road, Place 4" of Base 1 Place 2" wearing, Place shoulder stone, or Repair slips & do F.D.R.

Above routes reviewed for necessary repairs and upgraded required for Maintenance Permit/Agreement.

Ernest B. Gidd
Applicant Representative

5/24/2013
Date

Roger D. [Signature]
DOH Representative

5/24/13 RC
12/21/12
Date

Permit: 4-2013-0393

Addendum Continued
Conditions and Requirements

50/13 & 29
2012

County: Harrison

Applicant: Antero

Repairs/Upgrades Necessary for Maintenance Permit

Well Pad: Dodg
Lake

Route No.	Route Name	Mile Post	Perform Ditching	Patch Potholes	Clean Culverts	Repair Base Failures	Slip Repair	Overlay Asphalt	Overlay S&C	Stone/Stabilize Roadway	Stone/Repair Shoulders	Bridge Concerns	Ongoing Roadway Maintained	Other	Approach Coordinates:		Comments
															N _____	W _____	
50/13	old US 50	1.94												Harr.			Salem Water Plant at Dog Run
	"	1.38												Harr.			Patched but Good Condition
29		2.53												Harr.			at B40-CSX RR Track
		2.49															Bridge
		1.40															Slip
		1.36															Slip repair
		1.19															Extend Pipe
		1.05															Check Pipe
		0.85															Bridge
		0.85															
		0.52															start of slip

RECOMMENDATIONS: Ditch all roads, FDR or equivalent to maintain Road

Above routes reviewed for necessary repairs and upgraded required for Maintenance Permit/Agreement.

Eugene B. Swain 5/24/2013
Applicant Representative Date

Roger [Signature] 5/24/13
DOH Representative Date

Applicant: Antero

Additional Conditions
 Conditions and Requirements
 Repairs/Upgrades Necessary for Maintenance Permit

Well Pad: 15000 ft. 4. 2010
Lake

Route No.	Route Name	Mile Post	Perform Ditching	Patch Potholes	Clean Culverts	Repair Base Failures	Slip Repair	Overlay Asphalt	Overlay S&C	Stone/Stabilize Roadway	Stone/Repair Shoulders	Bridge Concerns	Ongoing Roadway Maintained	Other	Approach Coordinates:		Comments
															N _____	W _____	
31	Jacobsite	3.10															Surface cracking
		3.03															Drainage structure
		2.92															Edge of road damaged due to ^{Heavy} traffic
		1.10															Intermittent slope, ^{caused by} Antero
		0.94 to 0.00															Piling job ^{has} not complete
																	Surface cracking
																	Road in bad condition

RECOMMENDATIONS: Ditch road. Repair road by F.D.R. or equivalent

Above routes reviewed for necessary repairs and upgraded required for Maintenance Permit/Agreement.

Cyril B. Siro
 Applicant Representative

5/24/2013
 Date

Regina O. Pitt
 DOH Representative

RC 5/24/13
12/21/12
 Date

Permit: 4-2013-393

Attachment Continued
Conditions and Requirements

County: Oldham

Applicant: Antoro

Repairs/Upgrades Necessary for Maintenance Permit

Well Pad: Laka

Route No.	Route Name	Mile Post	Perform Ditching	Patch Potholes	Clean Culverts	Repair Base Failures	Slip Repair	Overlay Asphalt	Overlay S&C	Stone/Stabilize Roadway	Stone/Repair Shoulders	Bridge Concerns	Ongoing Roadway Maintained	Other	Approach Coordinates:		Comments	
															N _____	W _____		
15	S 1000 E 25 line Hart Co line	10.65															Road in good condition	
		10.39																slip area slip starting
																		smooth but surface cracking
		10.22-10.18																Failing old piling job
		9.90																Clearance Pad failures
48		8.61															Road good condition some surface cracking	
		0.0																
		0.07																Small drainage structure
																		Road excellent condition Paved 2010
		1.12-1.15																Piling Failed
		1.29														John North Entrance		

RECOMMENDATIONS: Ditch Road repair Road by F&P or equivalent

Above routes reviewed for necessary repairs and upgraded required for Maintenance Permit/Agreement.

Eugene B. Swice

Applicant Representative

5/24/13

Date

Ray O. Cottrell

DOH Representative

5/24/13

Date

Permit: 2013-393

Addendum Continued
Conditions and Requirements

SIS 10473

County: Rock
Hill

Applicant: Antero

Repairs/Upgrades Necessary for Maintenance Permit

Well Pad: Lake

Route No.	Route Name	Mile Post	Perform Ditching	Patch Potholes	Clean Culverts	Repair Base Failures	Slip Repair	Overlay Asphalt	Overlay S&C	Stone/Stabilize Roadway	Stone/Repair Shoulders	Bridge Concerns	Ongoing Roadway Maintained	Other	Approach Coordinates:		Comments
															N _____	W _____	
48		1.29															John North Entrance Road in excellent condition ^{Paved} 2010
		3,172															Helim North Pad Intersect 25
																	SIS 48 in excellent condition at this time

RECOMMENDATIONS: Ditch Roads Repair by F.D.R or equivalent

Above routes reviewed for necessary repairs and upgraded required for Maintenance Permit/Agreement.

Eusebio Sosa 5/24/2013
Applicant Representative Date

DOH Representative Date

Permit: 1-2013-393

Addendum Continued
Conditions and Requirements

25

County: Dodder

Applicant: Antero

Repairs/Upgrades Necessary for Maintenance Permit

Well Pad: Lake

Route No.	Route Name	Mile Post	Perform Ditching	Patch Potholes	Clean Culverts	Repair Base Failures	Slip Repair	Overlay Asphalt	Overlay S&C	Stone/Stabilize Roadway	Stone/Repair Shoulders	Bridge Concerns	Ongoing Roadway Maintained	Other	Approach Coordinates:		Comments
															N	W	
3.08	Meathouse Fork																Bridge Road good condition
4.55					✓												Base Failure
4.1																	Swisher Fall
3.64																	Brushing Fork Rd Intersection
3.64	to 0.00																Road in Fair to good condition
2.57					✓												Road damage
1.26					✓												

RECOMMENDATIONS:

Road needs full width reconstruction to meet up to state standards
Proposed along CR 25 from WV 18 to county line

Above routes reviewed for necessary repairs and upgraded required for Maintenance Permit/Agreement.

Eugene S. Sisco

Applicant Representative

5/24/2013

Date

Roger Cottrell

DOH Representative

5/24/13

Date

Permit: 1-2013-393

Addendum Continued
Conditions and Requirements

County: Dodd
Harr.
Well Pad: Lake

Applicant: Antero

Repairs/Upgrades Necessary for Maintenance Permit

25/7

Route No.	Route Name	Mile Post	Perform Ditching	Patch Potholes	Clean Culverts	Repair Base Failures	Slip Repair	Overlay Asphalt	Overlay S&C	Stone/Stabilize Roadway	Stone/Repair Shoulders	Bridge Concerns	Ongoing Roadway Maintained	Other	Approach Coordinates:		Comments
															N _____	W _____	
25/7	Snake ^{Rem}	0.00															Rock base road in good condition
		1.268															upto MP 1.2
		1.30															Find truck
		1.38															Aerial Gas line
		1.58															Water in road no drainage
		2.21															Bottom of hill Rock material continues to Trent Pad
																	Agreement with Antero to up grade & use Double Camp for Trent & other Pads
																	25/7 in Bad Condition MP 1.2 to Double Camp

RECOMMENDATIONS: Roads need complete Rebuild to Well sites in this Area
Use Double Camp Pad being rebuilt under agreement

Above routes reviewed for necessary repairs and upgraded required for Maintenance Permit/Agreement.

Engel Siop
Applicant Representative

5/24/2013
Date

Ryan D. [Signature]
DOH Representative

5/24/13
Date

Permit: 4-2013-393

Addendum Continued 27
Conditions and Requirements
Repairs/Upgrades Necessary for Maintenance Permit

County: Dodd & Harris
Well Pad: Life

Applicant: Antero

Route No.	Route Name	Mile Post	Perform Ditching	Patch Potholes	Clean Culverts	Repair Base Failures	Slip Repair	Overlay Asphalt	Overlay S&C	Stone/Stabilize Roadway	Stone/Repair Shoulders	Bridge Concerns	Ongoing Roadway Maintained	Other	Approach Coordinates:		Comments
															N _____	W _____	
27	Dry Run	0.05															Bridge needs agreement
27																	Pot holes Not in good condition
27		0.22															Rock out creeping Narrow road
27		0.72															Entrance to Houck Pad
27		1.58															
25/13	Dry Run	1.6															
25/13		1.0															Road in good condition 1.0-1.6
25/13		0.0															Road in Bad condition 1.0-0.0
25		9.58															New road Road 2011 Excellent Shakes
25		7.718															Slip Long Edge of road
25		5.08															Road recently paved to Avon Good condition ^{MP} 5.08

RECOMMENDATIONS: Rebuild 27 along with bridge as in D.P. or equivalent

Above routes reviewed for necessary repairs and upgraded required for Maintenance Permit/Agreement.

Craig Sisk
Applicant Representative

5/24/2013
Date

Randy O. Carter
BOH Representative

5/24/13
Date

Permit: 4-2013-393

Addendum Continued
Conditions and Requirements

25 & 27

County: Dodd

Applicant: Antero

Repairs/Upgrades Necessary for Maintenance Permit

Well Pad: 24kr

Route No.	Route Name	Mile Post	Perform Ditching	Patch Potholes	Clean Culverts	Repair Base Failures	Slip Repair	Overlay Asphalt	Overlay S&C	Stone/Stabilize Roadway	Stone/Repair Shoulders	Bridge Concerns	Ongoing Roadway Maintained	Other	Approach Coordinates:		Comments
															N	W	
25	Meathouse ^{FP}	13.81													Dod! Line		Some serious cracking to 12.99 (Intermittent)
		13.35									✓						Drainage ste.
		12.99															Skip paving by DOH
		12.08															at 51548
		12.01									✓						Drainage ste New
		11.95															Slip starting
		11.1															Road in Good shape some surface cracking smooth Ride
		10.3															some patching good ride
		9.58															at 27
27		0.00															Dry Fork road Needs Agreement to work
		0.05															Potholes to Bridge

RECOMMENDATIONS: Ditch Roads & Rebuild on Fork or equivalent

Above routes reviewed for necessary repairs and upgraded required for Maintenance Permit/Agreement.

Euge B. Sisp
Applicant Representative

5/24/2013
Date

Regina [Signature]
DOH Representative

5/24/13
Date

Permit: 2013-393

Applicant: Antero

Addendum Continued
 Conditions and Requirements
 Repairs/Upgrades Necessary for Maintenance Permit

29/2 - 50/6
 28 & (15/7 Dodd)

County: Harrison
 Well Pad: Daddy Lake

Route No.	Route Name	Mile Post	Perform Ditching	Patch Potholes	Clean Culverts	Repair Base Failures	Slip Repair	Overlay Asphalt	Overlay S&C	Stone/Stabilize Roadway	Stone/Repair Shoulders	Bridge Concerns	Ongoing Roadway Maintained	Other	Approach Coordinates:		Comments
															N _____	W _____	
29/2	Halls Run	0.97															Road in good condition
																	Some Patching over all Good Cond.
50/6		0.0															
4		0.177															Hubert Pond
		0.4															
28	Harrico	0.48															Rock base road stoned with
		0.00															Potholes
15/7	Dodd Co	0.40															
		0.285															Numerous Potholes
15/7																	Good condition Rock base
	at 5/15	0.0															

RECOMMENDATIONS: Ditch all roads: F.D.R. or equivalent to maintain road

Above routes reviewed for necessary repairs and upgraded required for Maintenance Permit/Agreement.

Engle Sirey
 Applicant Representative

5/24/2013
 Date

Regan [Signature]
 DOH Representative

5/24/13
 Date

Permit: 7-2013-393

Applicant: Antero

Addendum Continued
Conditions and Requirements

Repairs/Upgrades Necessary for Maintenance Permit

15/5 Dodd
30 Harrison

County: Harrison #
Dodd Co

Well Pad: h&k

Route No.	Route Name	Mile Post	Perform Ditching	Patch Potholes	Clean Culverts	Repair Base Failures	Slip Repair	Overlay Asphalt	Overlay S&C	Stone/Stabilize Roadway	Stone/Repair Shoulders	Bridge Concerns	Ongoing Roadway Maintained	Other	Approach Coordinates:		Comments
															N _____	W _____	
15/5	Trough Follow		✓														Paved road Extensive Patching in Potholes
			✓														
			✓														
15/5	Dodd Co	1.84															
30	Harr Co	0.100															Good condition
		0.57															Excellent Condition Recently paved
30	-																Strip Paved by Antero
30	at S/531 Harr. Co																

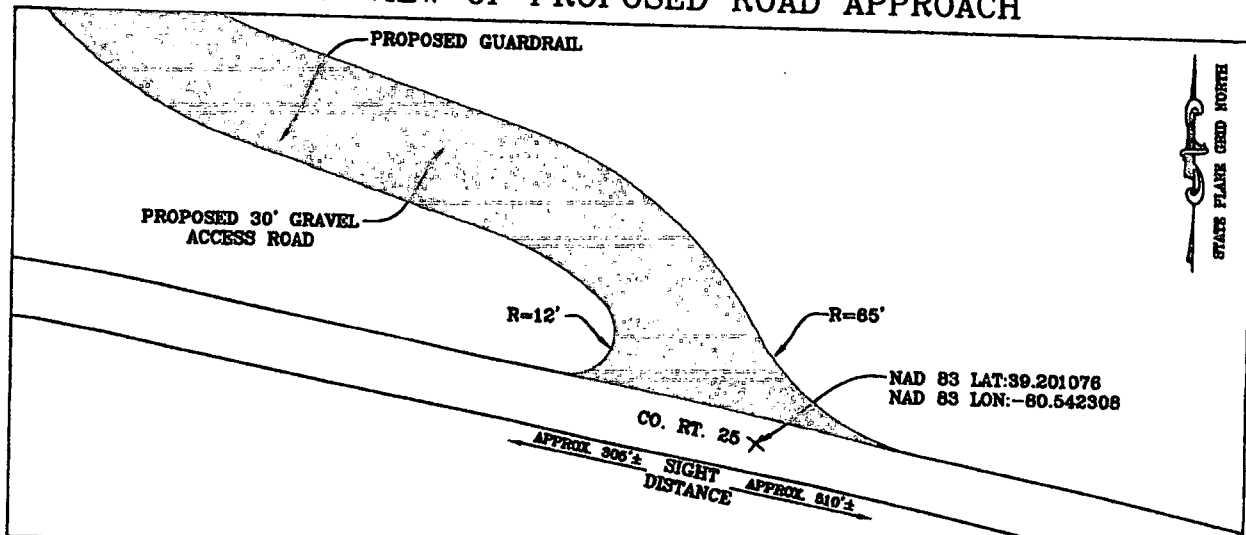
RECOMMENDATIONS: Ditch all roads, F.D.R. or equivalent to maintain roads

Above routes reviewed for necessary repairs and upgraded required for Maintenance Permit/Agreement.

Engel Sincor 5/24/2013
Applicant Representative Date

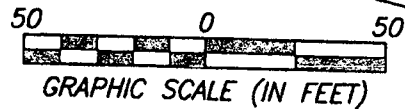
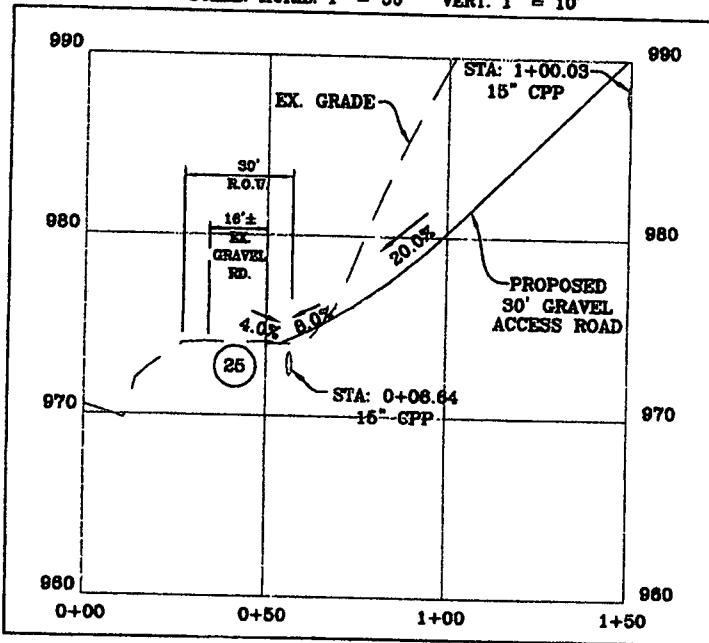
Ryan [Signature] 5/24/13
DOH Representative Date

PLAN VIEW OF PROPOSED ROAD APPROACH



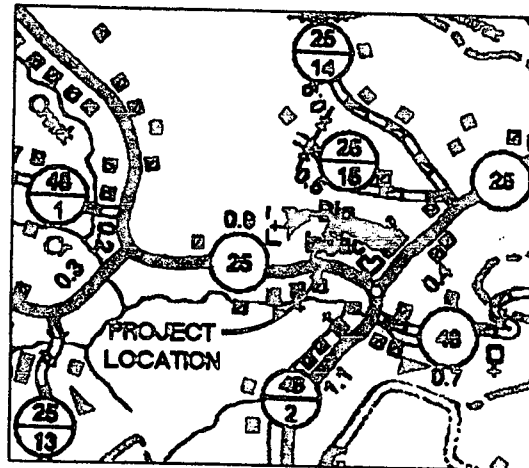
APPROACH PROFILE

SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



VICINITY MAP

N.T.S.

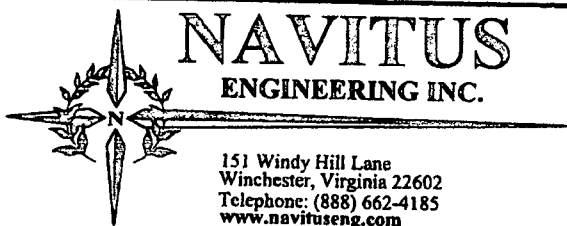


NOTES:

ALL SPECIFICATIONS AS SET FORTH IN THE "RULES AND REGULATIONS FOR CONSTRUCTION OF DRIVEWAYS ON STATE HIGHWAY RIGHT-OF-WAY" WHICH ARE APPLICABLE WILL BE CARRIED OUT IN FULL.

LOCATION:

PROPOSAL TO CONSTRUCT AND MAINTAIN A PROPOSED 30 FT. COMMERCIAL APPROACH ON THE NORTH SIDE OF CO. RT. 25, 0.2 MILES NORTHEAST OF THE INTERSECTION OF CO. RT. 48/2 & CO. RT. 25 IN GREENBRIER DISTRICT, DODDRIDGE COUNTY, WEST VIRGINIA.



151 Windy Hill Lane
Winchester, Virginia 22602
Telephone: (888) 662-4185
www.navituseng.com

Engineering ◊ Survey ◊ Environmental ◊ GIS

PREPARED FOR:

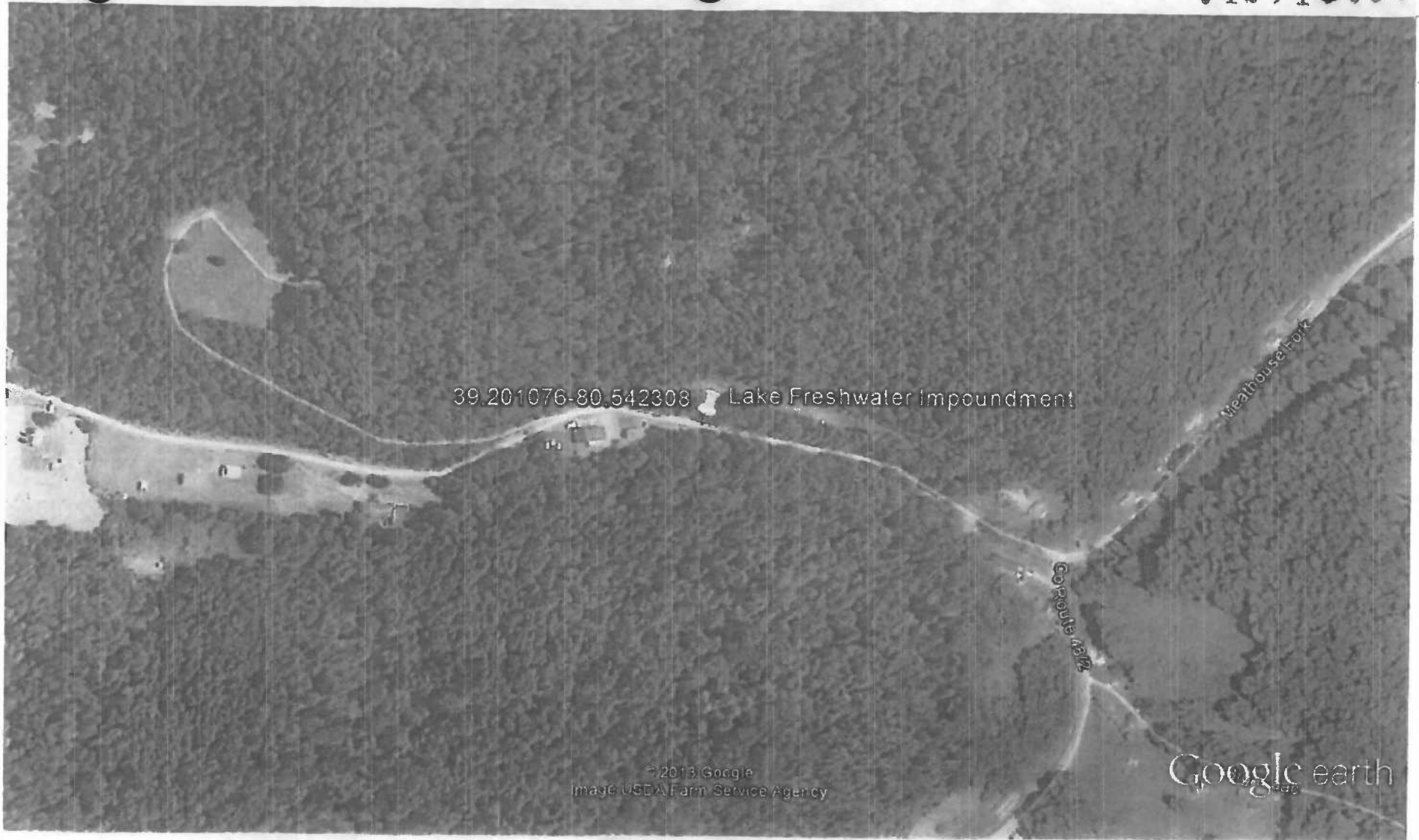
ANTERO RESOURCES
981 EAST WASHINGTON AVENUE
ELLENBORO, WV 26346

LAKE CENTRALIZED FRESHWATER IMPOUNDMENT
DODDRIDGE COUNTY, WEST VIRGINIA

DESIGNED BY: CSK/TVF DATE: 03/11/2013

FILE NO: ANTO19 SCALE: AS SHOWN

0420130393



39.201076-80.542303 Lake Freshwater Impoundment

Meathouse Fork

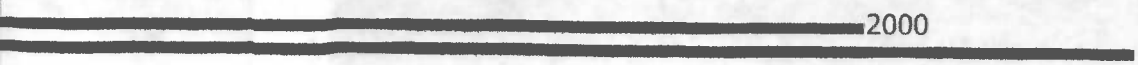
Copper River

© 2013 Google
Image USDA Farm Service Agency

Google earth

Google earth

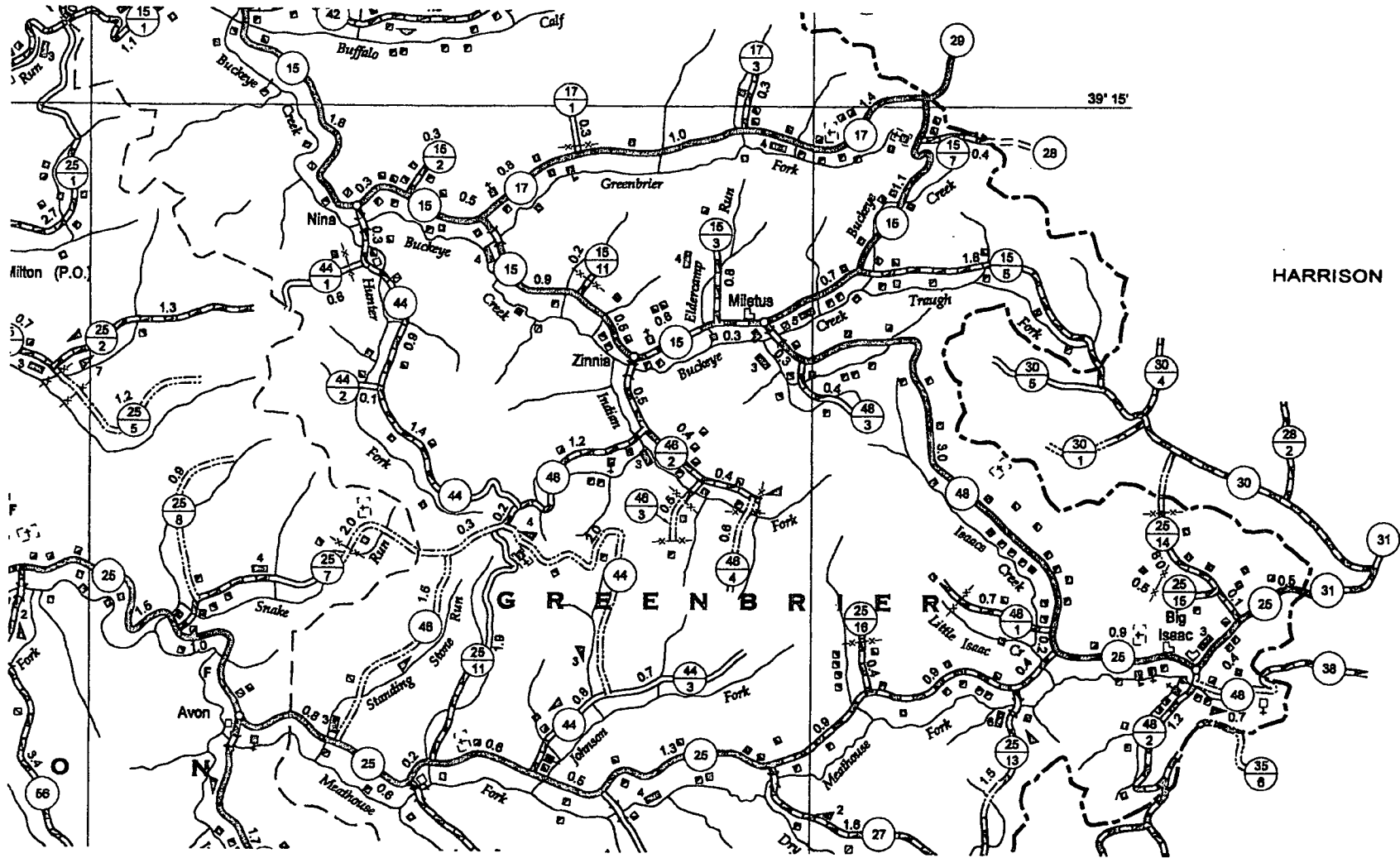
feet
meters



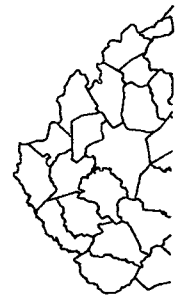
2000

800





HARRISON COUNTY



KEY

SHEET 1

SHEET 2



0420180333



U
P
T
C
S
S



0420180800



U4AUL0V0000



west virginia department of environmental protection

Office of Oil and Gas
601 57th Street SE
Charleston, WV 25304
Telephone: (304) 926-0499
Fax: (304) 926-0456

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

Date May 30, 2013
**CERTIFICATE OF APPROVAL
CENTRALIZED FRESHWATER IMPOUNDMENT**

This certificate of approval, number 17-FWC-00007, issued to **Antero Resources for the Lake Centralized Freshwater Impoundment**, is evidence of permission granted to construct a centralized freshwater impoundment pursuant to conditions described in W.Va Code §22-6A. The term of certificate of approval is for one year. The certificate of approval may be extended annually with the submission of an annual registration fee, provided the Office of Oil and Gas has on file an up-to-date inspection report, monitoring and emergency plan, maintenance plan, and no outstanding violations of certificate requirements exist. Construction of the impoundment will be located as described in the application. Design, construction, inspection and as-built certification will be the responsibility of, and under the supervision of, a professional engineer, registered in West Virginia.

Please be advised that notification to the landowner is required per W.Va Code §22-6A-10(h) within 7 days but no less than 2 days prior to commencement of construction. The Office of Oil and Gas as well as the oil and gas inspector must be notified. The filling of the impoundment with waters of the state will be subject to conditions of an approved Water Management Plan. Any deviation from conditions of the Water Management Plan will require prior approval from the Division of Water and Waste Management. Only freshwater may be stored in this impoundment. Addition of any wastewater will be in violation of the terms of this approval and may result in revocation of the certificate of approval. Any plans to enlarge, alter, repair, remove or abandon this structure will require a Certificate of Approval from the Office of Oil and Gas. An as built certification (IMP-3) must be submitted and received by the Office of Oil Gas prior to placing any fluids in this structure. Additional conditions as provide for in West Virginia Code §22-6A-9(h) are attached.



James Martin
Chief

Promoting a healthy environment.

Certificate of Approval CONDITIONS

West Virginia Code § 22-6A-9(h) allows the Office of Oil and Gas to place specific conditions upon this Certificate of Approval and have the same effect as law. Failure to adhere to the specified conditions may result in enforcement action.

CONDITIONS

1. The impoundment/pit shall be monitored continuously during the initial filling operation.
2. Impoundment/pit will be inspected every two weeks for the life of the structure and within 24 hours of a rainfall of two inches or greater in a six hour period. The attached form shall be used to document all inspections performed on the structure.



Water Management Plan:
Primary Water Sources



W:AP-01208

API/ID Number: 017-FWC-00007

Operator:

Antero Resources

Lake Centralized Freshwater Impoundment

Important:

For each proposed primary water source (including source intakes for purchased water sources) identified in your water management plan, and summarized herein, DEP has made an evaluation concerning water availability over the specified date range. DEP's assessment is based on the following considerations:

- Statistical analysis of historical USGS stream gauge data (transferred to un-gauged locations as necessary);
- Identification of sensitive aquatic life (endangered species, mussels, etc.);
- Quantification of known existing demands on the water supply (Large Quantity Users);
- Minimum flows required by the Army Corps of Engineers; and
- Designated stream uses.

Based on these factors, DEP has provided, for each intake location (and origination point for purchased water), a reference gauge location and discharge flow reading which must be surpassed prior to withdrawals. Additionally, DEP has established a minimum passby flow at the withdrawal location which must also be surpassed prior to withdrawals. These thresholds are considered terms of the permit and are enforceable as such.

DEP is aware that some intake points will be used for multiple wells and well sites. In these cases, the thresholds set by the Water Management Plan are to be interpreted as total withdrawal limits for each location over the specified date range regardless of how many wells are supported by that intake.

For all purchased water intakes, determinations of water availability are made at the original source intake location. It is the responsibility of the Oil and Gas Operator, not the seller, to cease withdrawal of water from the seller when flows are less than the minimum gauge reading at the stream gauge referenced by the Water Management Plan in order to protect stream uses.

Note that the determinations made herein are based on the best available data, but it is impossible to predict water availability in the future. While the DEP has carefully established these minimum withdrawal thresholds, it remains the operator's responsibility to protect aquatic life at all times. Approval to withdrawal is contingent upon permission from the land owner. It is the responsibility of the operator to secure and maintain permission prior to any withdrawals.

The operator is reminded that 24-48 hours prior to withdrawing (or purchasing) water, DEP must be notified by email at DEP.water.use@wv.gov.

APPROVED JUN 03 2013

Source Summary

WMP 01208

API Number: 017-FWC-00007

Operator:

Antero Resources

Lake Centralized Freshwater Impoundment

Stream/River

Source: **Ohio River @ Ben's Run Withdrawal Site** Owner: **Ben's Run Land Company Limited Partnership**

Start Date	End Date	Total Volume (gal)	Max. daily purchase (gal)	Intake Latitude	Intake Longitude
6/3/2013	6/3/2015			39.46593	-81.110781

Regulated Stream? **Ohio River Min. Flow** Ref. Gauge ID: **9999999** Ohio River Station: **Willow Island Lock & Dam**

Max. Pump rate (gpm): **3,360** Min. Gauge Reading (cfs): **6,468.00** Min. Passby (cfs)

DEP Comments: Refer to the specified station on the National Weather Service's Ohio River forecast website: <http://www.erh.noaa.gov/ohrfc//flows.shtml>

Source: **West Fork River @ JCP Withdrawal** Owner: **James & Brenda Raines**

Start Date	End Date	Total Volume (gal)	Max. daily purchase (gal)	Intake Latitude	Intake Longitude
6/3/2013	6/3/2015			39.320913	-80.337572

Regulated Stream? **Stonewall Jackson Dam** Ref. Gauge ID: **3061000** WEST FORK RIVER AT ENTERPRISE, WV

Max. Pump rate (gpm): **2,000** Min. Gauge Reading (cfs): **175.00** Min. Passby (cfs): **146.25**

DEP Comments:

Source: **West Fork River @ McDonald Withdrawal** Owner: **David Shrieves**

Start Date	End Date	Total Volume (gal)	Max. daily purchase (gal)	Intake Latitude	Intake Longitude
6/3/2013	6/3/2015			39.16761	-80.45069

Regulated Stream? **Stonewall Jackson Dam** Ref. Gauge ID: **3061000** WEST FORK RIVER AT ENTERPRISE, WV

Max. Pump rate (gpm): **3,000** Min. Gauge Reading (cfs): **175.00** Min. Passby (cfs): **106.30**

DEP Comments:

Source: **West Fork River @ GAL Withdrawal**

Owner: **David Shriveles**

Start Date	End Date	Total Volume (gal)	Max. Daily purchase (gal)	Intake Latitude	Intake Longitude
6/3/2013	6/3/2015			39.16422	-80.45173

Regulated Stream? **Stonewall Jackson Dam** Ref. Gauge ID: **3061000** **WEST FORK RIVER AT ENTERPRISE, WV**

Max. Pump rate (gpm): **2,000** Min. Gauge Reading (cfs): **175.00** Min. Passby (cfs) **106.30**

DEP Comments:

Source: **Middle Island Creek @ Dawson Withdrawal**

Owner: **Gary D. and Rella A. Dawson**

Start Date	End Date	Total Volume (gal)	Max. Daily purchase (gal)	Intake Latitude	Intake Longitude
6/3/2013	6/3/2015			39.37922	-80.867803

Regulated Stream? Ref. Gauge ID: **3114500** **MIDDLE ISLAND CREEK AT LITTLE, WV**

Max. Pump rate (gpm): **3,000** Min. Gauge Reading (cfs): **76.03** Min. Passby (cfs) **28.83**

DEP Comments:

Source: **McElroy Creek @ Forest Withdrawal**

Owner: **Forest C. & Brenda L. Moore**

Start Date	End Date	Total Volume (gal)	Max. Daily purchase (gal)	Intake Latitude	Intake Longitude
6/3/2013	6/3/2015			39.39675	-80.738197

Regulated Stream? Ref. Gauge ID: **3114500** **MIDDLE ISLAND CREEK AT LITTLE, WV**

Max. Pump rate (gpm): **1,000** Min. Gauge Reading (cfs): **74.77** Min. Passby (cfs) **13.10**

DEP Comments:

Source: **McElroy Creek @ Sweeney Withdrawal**

Owner:

Bill Sweeney

Start Date: **6/3/2013** End Date: **6/3/2015** Total Volume (gal): Max. daily purchase (gal): Intake Latitude: **39.398123** Intake Longitude: **-80.656808**

Regulated Stream? Ref. Gauge ID: **3114500** **MIDDLE ISLAND CREEK AT LITTLE, WV**

Max. Pump rate (gpm): **1,000** Min. Gauge Reading (cfs): **69.73** Min. Passby (cfs): **6.66**

DEP Comments:

Source: **Meathouse Fork @ Gagnon Withdrawal**

Owner:

**George L. Gagnon and
Susan C. Gagnon**

Start Date: **6/3/2013** End Date: **6/3/2015** Total Volume (gal): Max. daily purchase (gal): Intake Latitude: **39.26054** Intake Longitude: **-80.720998**

Regulated Stream? Ref. Gauge ID: **3114500** **MIDDLE ISLAND CREEK AT LITTLE, WV**

Max. Pump rate (gpm): **1,000** Min. Gauge Reading (cfs): **71.96** Min. Passby (cfs): **11.74**

DEP Comments:

Source: **Meathouse Fork @ Whitehair Withdrawal**

Owner:

Elton Whitehair

Start Date: **6/3/2013** End Date: **6/3/2015** Total Volume (gal): Max. daily purchase (gal): Intake Latitude: **39.211317** Intake Longitude: **-80.679592**

Regulated Stream? Ref. Gauge ID: **3114500** **MIDDLE ISLAND CREEK AT LITTLE, WV**

Max. Pump rate (gpm): **1,000** Min. Gauge Reading (cfs): **69.73** Min. Passby (cfs): **7.28**

DEP Comments:

Source: **Tom's Fork @ Erwin Withdrawal**

Owner: **John F. Erwin and Sandra E. Erwin**

Start Date: **6/3/2013** End Date: **6/3/2015**
Total Volume (gal): Max. daily purchase (gal):

Intake Latitude: **39.174306** Intake Longitude: **-80.702992**

Regulated Stream?

Ref. Gauge ID: **3114500**

MIDDLE ISLAND CREEK AT LITTLE, WV

Max. Pump rate (gpm): **1,000**

Min. Gauge Reading (cfs): **69.73**

Min. Passby (cfs): **0.59**

DEP Comments:

Source: **Arnold Creek @ Davis Withdrawal**

Owner: **Jonathon Davis**

Start Date: **6/3/2013** End Date: **6/3/2015**
Total Volume (gal): Max. daily purchase (gal):

Intake Latitude: **39.302006** Intake Longitude: **-80.824561**

Regulated Stream?

Ref. Gauge ID: **3114500**

MIDDLE ISLAND CREEK AT LITTLE, WV

Max. Pump rate (gpm): **1,000**

Min. Gauge Reading (cfs): **69.73**

Min. Passby (cfs): **3.08**

DEP Comments:

Source: **Buckeye Creek @ Powell Withdrawal**

Owner: **Dennis Powell**

Start Date: **6/3/2013** End Date: **6/3/2015**
Total Volume (gal): Max. daily purchase (gal):

Intake Latitude: **39.277142** Intake Longitude: **-80.690386**

Regulated Stream?

Ref. Gauge ID: **3114500**

MIDDLE ISLAND CREEK AT LITTLE, WV

Max. Pump rate (gpm): **1,000**

Min. Gauge Reading (cfs): **69.73**

Min. Passby (cfs): **4.59**

DEP Comments:

Source **South Fork of Hughes River @ Knight Withdrawal**

Owner **Tracy C. Knight & Stephanie C. Knight**

Start Date **6/3/2013** End Date **6/3/2015**

Total Volume (gal) Max. daily purchase (gal)

Intake Latitude: **39.198369** Intake Longitude: **-80.870969**

Regulated Stream?

Ref. Gauge ID: **3155220**

SOUTH FORK HUGHES RIVER BELOW MACFARLAN, WV

Max. Pump rate (gpm): **3,000**

Min. Gauge Reading (cfs): **39.80**

Min. Passby (cfs) **1.95**

DEP Comments:

Source **North Fork of Hughes River @ Davis Withdrawal**

Owner **Lewis P. Davis and Norma J. Davis**

Start Date **6/3/2013** End Date **6/3/2015**

Total Volume (gal) Max. daily purchase (gal)

Intake Latitude: **39.322363** Intake Longitude: **-80.936771**

Regulated Stream?

Ref. Gauge ID: **3155220**

SOUTH FORK HUGHES RIVER BELOW MACFARLAN, WV

Max. Pump rate (gpm): **1,000**

Min. Gauge Reading (cfs): **35.23**

Min. Passby (cfs) **2.19**

DEP Comments:

Source Summary

WMP: 01208

API Number:

017-FWC-00007

Operator:

Antero Resources

Lake Centralized Freshwater Impoundment

Purchased Water

Source: **Middle Island Creek @ Solo Construction** Owner: **Solo Construction, LLC**

Start Date: **6/3/2013** End Date: **6/3/2015** Total Volume (gal): Max. Daily purchase (gal): Intake Latitude: Intake Longitude:
1,000,000 **39.399094** **-81.185548**

Regulated Stream? **Ohio River Min. Flow** Ref. Gauge ID: **9999999** Ohio River Station: **Willow Island Lock & Dam**

Max. Pump rate (gpm): Min. Gauge Reading (cfs): **6,468.00** Min. Passby (cfs):

DEP Comments: **Elevation analysis indicates that this location has the same elevation as Middle Island Creek's pour point into the Ohio River. As such, it is deemed that water flow at this location is heavily influenced by the Ohio River.**

Source: **Sun Valley Public Service District** Owner: **Sun Valley PSD**

Start Date: **6/3/2013** End Date: **6/3/2015** Total Volume (gal): Max. Daily purchase (gal): Intake Latitude: Intake Longitude:
200,000

Regulated Stream? **Stonewall Jackson Dam** Ref. Gauge ID: **3061000** **WEST FORK RIVER AT ENTERPRISE, WV**

Max. Pump rate (gpm): Min. Gauge Reading (cfs): **171.48** Min. Passby (cfs):

DEP Comments:

Source Detail

WMP 01208

API/ID Number: 017-FWC-00007

Operator: Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17424 Source Name Middle Island Creek @ Solo Construction
Solo Construction, LLC

Source Latitude: 39.399094
Source Longitude: -81.185548

HUC-8 Code: 5030201

Drainage Area (sq. mi.): 25000 County: Pleasants

Anticipated withdrawal start date: 6/3/2013
Anticipated withdrawal end date: 6/3/2015

- Endangered Species? Mussel Stream?
- Trout Stream? Tier 3?
- Regulated Stream? Ohio River Min. Flow
- Proximate PSD? City of St. Marys
- Gauged Stream?

Total Volume from Source (gal):

Max. Pump rate (gpm):

Max. Simultaneous Trucks:

Max. Truck pump rate (gpm) 0

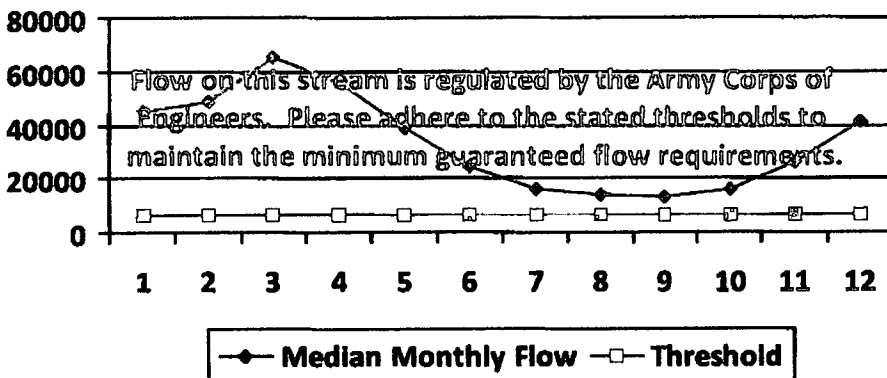
Reference Gaug 9999999 Ohio River Station: Willow Island Lock & Dam

Drainage Area (sq. mi.) 25,000.00

Gauge Threshold (cfs): 6468

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	45,700.00	-	-
2	49,200.00	-	-
3	65,700.00	-	-
4	56,100.00	-	-
5	38,700.00	-	-
6	24,300.00	-	-
7	16,000.00	-	-
8	13,400.00	-	-
9	12,800.00	-	-
10	15,500.00	-	-
11	26,300.00	-	-
12	41,300.00	-	-

Water Availability Profile



Water Availability Assessment of Location

Base Threshold (cfs):	-
Upstream Demand (cfs):	0.00
Downstream Demand (cfs):	0.00
Pump rate (cfs):	-
Headwater Safety (cfs):	0.00
Ungauged Stream Safety (cfs):	0.00
Min. Gauge Reading (cfs):	-
Passby at Location (cfs):	-

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP: 01208

API/ID Number: 017-FWC-00007

Operator: Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17425 Source Name: Sun Valley Public Service District
Sun Valley PSD

Source Latitude:
Source Longitude:

HUC-8 Code: 5020002
Drainage Area (sq. mi.): 391.85 County: Harrison

Anticipated withdrawal start date: 6/3/2013
Anticipated withdrawal end date: 6/3/2015

- Endangered Species?
- Trout Stream?
- Regulated Stream?
- Proximate PSD?
- Gauged Stream?
- Mussel Stream?
- Tier 3?
- Stonewall Jackson Dam

Total Volume from Source (gal):
Max. Pump rate (gpm):
Max. Simultaneous Trucks:
Max. Truck pump rate (gpm)

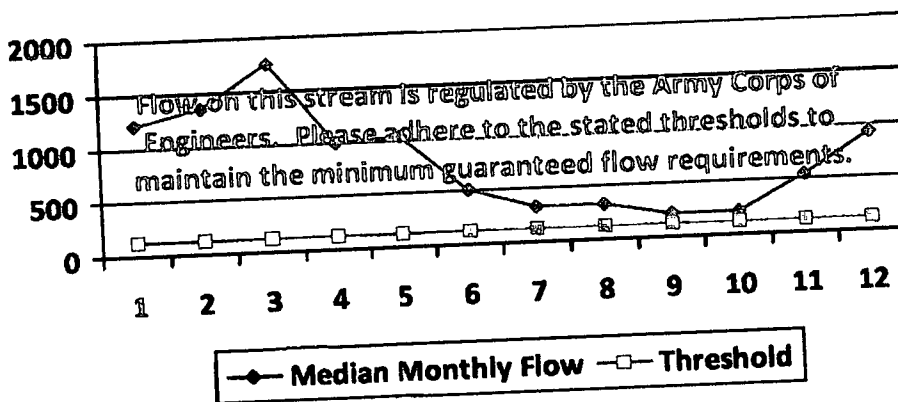
Reference Gaug: 3061000 WEST FORK RIVER AT ENTERPRISE, WV
Drainage Area (sq. mi.): 759.00

Gauge Threshold (cfs): 234

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	1,200.75		
2	1,351.92		
3	1,741.33		
4	995.89		
5	1,022.23		
6	512.21		
7	331.86		
8	316.87		
9	220.48		
10	216.17		
11	542.45		
12	926.12		

Water Availability Profile

Water Availability Assessment of Location



Base Threshold (cfs): -
Upstream Demand (cfs): -
Downstream Demand (cfs): -
Pump rate (cfs): -
Headwater Safety (cfs): 0.00
Ungauged Stream Safety (cfs): 0.00
Min. Gauge Reading (cfs): -
Passby at Location (cfs): -

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP 01208

API/ID Number: 017-FWC-00007

Operator: Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17410 Source Name Ohio River @ Ben's Run Withdrawal Site
Ben's Run Land Company Limited Partnership

Source Latitude: 39.46593
Source Longitude: -81.110781

HUC-8 Code: 5030201
Drainage Area (sq. mi.): 25000 County: Tyler

Anticipated withdrawal start date: 6/3/2013
Anticipated withdrawal end date: 6/3/2015

- Endangered Species?
- Trout Stream?
- Regulated Stream?
- Proximate PSD?
- Gauged Stream?
- Mussel Stream?
- Tier 3?
- Ohio River Min. Flow

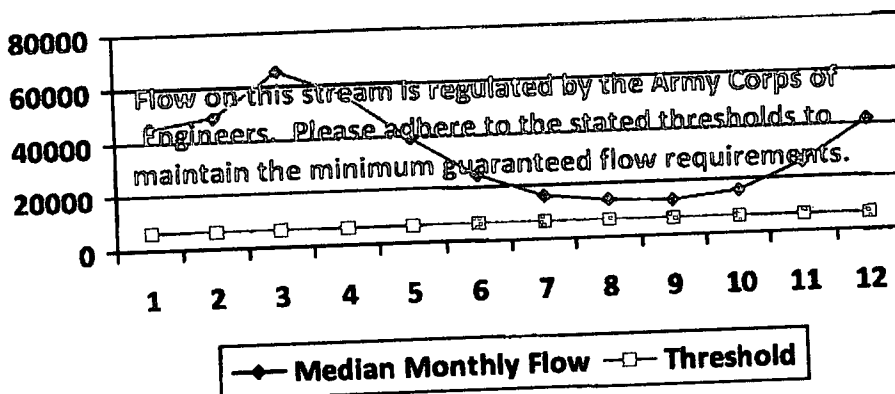
Total Volume from Source (gal):
Max. Pump rate (gpm): 3,360
Max. Simultaneous Trucks: 0
Max. Truck pump rate (gpm): 0

Reference Gaug 9999999 Ohio River Station: Willow Island Lock & Dam
Drainage Area (sq. mi.) 25,000.00

Gauge Threshold (cfs): 6468

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	45,700.00		
2	49,200.00		
3	65,700.00		
4	56,100.00		
5	38,700.00		
6	24,300.00		
7	16,000.00		
8	13,400.00		
9	12,800.00		
10	15,500.00		
11	26,300.00		
12	41,300.00		

Water Availability Profile



Water Availability Assessment of Location

Base Threshold (cfs): -
Upstream Demand (cfs): 0.00
Downstream Demand (cfs): 0.00
Pump rate (cfs): 7.49
Headwater Safety (cfs): 0.00
Ungauged Stream Safety (cfs): 0.00
Min. Gauge Reading (cfs): -
Passby at Location (cfs): -

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP 01208

API/ID Number: 017-FWC-00007

Operator: Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17411 Source Name: West Fork River @ JCP Withdrawal
James & Brenda Raines

Source Latitude: 39.320913
Source Longitude: -80.337572

HUC-8 Code: 5020002
Drainage Area (sq. mi.): 532.2 County: Harrison

Anticipated withdrawal start date: 6/3/2013
Anticipated withdrawal end date: 6/3/2015

- Endangered Species? Mussel Stream?
- Trout Stream? Tier 3?
- Regulated Stream? Stonewall Jackson Dam
- Proximate PSD?
- Gauged Stream?

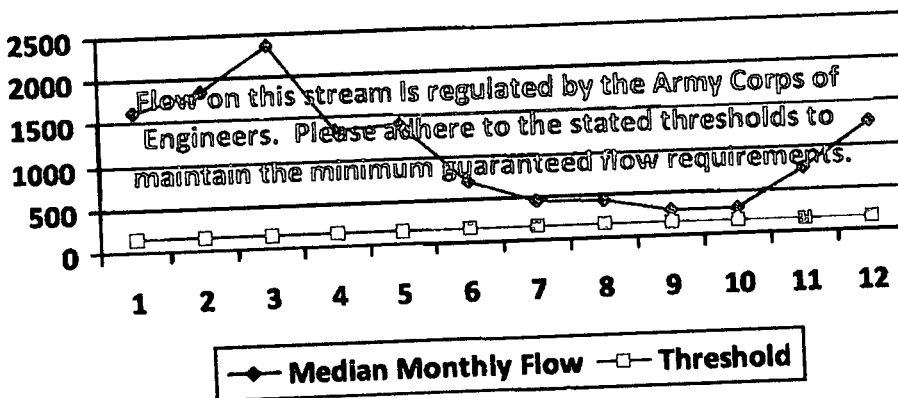
Total Volume from Source (gal):
Max. Pump rate (gpm): 2,000
Max. Simultaneous Trucks: 1
Max. Truck pump rate (gpm): 0

Reference Gaug: 3061000 WEST FORK RIVER AT ENTERPRISE, WV
Drainage Area (sq. mi.): 759.00

Gauge Threshold (cfs): 234

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	1,630.82		
2	1,836.14		
3	2,365.03		
4	1,352.59		
5	1,388.37		
6	695.67		
7	450.73		
8	430.37		
9	299.45		
10	293.59		
11	736.74		
12	1,257.84		

Water Availability Profile



Water Availability Assessment of Location

Base Threshold (cfs): -
Upstream Demand (cfs): 24.29
Downstream Demand (cfs): 0.00
Pump rate (cfs): 4.46
Headwater Safety (cfs): 0.00
Ungauged Stream Safety (cfs): 0.00

Min. Gauge Reading (cfs): -
Passby at Location (cfs): -

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP: 01208

API/ID Number: 017-FWC-00007

Operator:

Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17412 Source Name: West Fork River @ McDonald Withdrawal
David Shrieves

Source Latitude: 39.16761
Source Longitude: -80.45069

HUC-8 Code: 5020002

Drainage Area (sq. mi.): 314.91 County: Harrison

Anticipated withdrawal start date: 6/3/2013
Anticipated withdrawal end date: 6/3/2015

- Endangered Species? Mussel Stream?
- Trout Stream? Tier 3?
- Regulated Stream? Stonewall Jackson Dam
- Proximate PSD?
- Gauged Stream?

Total Volume from Source (gal):

Max. Pump rate (gpm): 3,000
Max. Simultaneous Trucks: 0
Max. Truck pump rate (gpm): 0

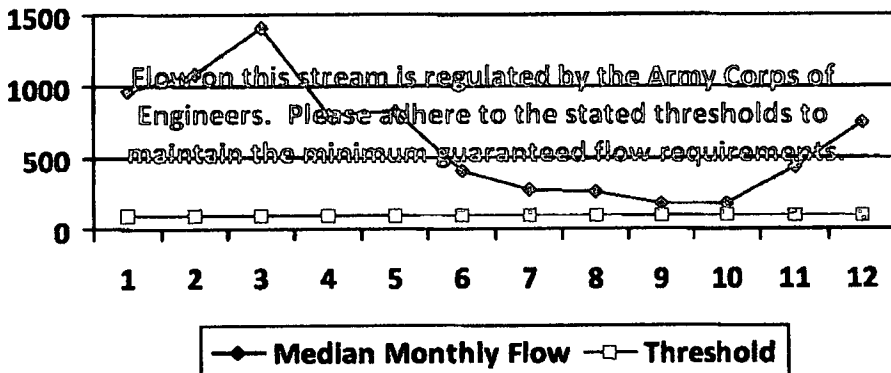
Reference Gaug: 3061000 WEST FORK RIVER AT ENTERPRISE, WV

Drainage Area (sq. mi.): 759.00

Gauge Threshold (cfs): 234

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	964.98		
2	1,086.47		
3	1,399.42		
4	800.34		
5	821.52		
6	411.64		
7	266.70		
8	254.66		
9	177.19		
10	173.72		
11	435.94		
12	744.28		

Water Availability Profile



Water Availability Assessment of Location

Base Threshold (cfs): -
Upstream Demand (cfs): 24.29
Downstream Demand (cfs): 0.00
Pump rate (cfs): 6.68
Headwater Safety (cfs): 24.27
Ungauged Stream Safety (cfs): 0.00

Min. Gauge Reading (cfs): -
Passby at Location (cfs): -

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP: 01208

API/ID Number: 017-FWC-00007

Operator: Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17413 Source Name: West Fork River @ GAL Withdrawal
David Shrieves

Source Latitude: 39.16422
Source Longitude: -80.45173

HUC-8 Code: 5020002

Drainage Area (sq. mi.): 313.67 County: Harrison

Anticipated withdrawal start date: 6/3/2013

Anticipated withdrawal end date: 6/3/2015

- Endangered Species? Mussel Stream?
- Trout Stream? Tier 3?
- Regulated Stream? Stonewall Jackson Dam
- Proximate PSD?
- Gauged Stream?

Total Volume from Source (gal):

Max. Pump rate (gpm): 2,000

Max. Simultaneous Trucks: 0

Max. Truck pump rate (gpm): 0

Reference Gaug: 3061000 WEST FORK RIVER AT ENTERPRISE, WV

Drainage Area (sq. mi.): 759.00

Gauge Threshold (cfs): 234

Month	<u>Median monthly flow</u> (cfs)	<u>Threshold</u> (+ pump)	<u>Estimated Available</u> <u>water</u> (cfs)
1	961.18	-	-
2	1,082.19	-	-
3	1,393.91	-	-
4	797.19	-	-
5	818.28	-	-
6	410.02	-	-
7	265.65	-	-
8	253.65	-	-
9	176.49	-	-
10	173.04	-	-
11	434.22	-	-
12	741.35	-	-

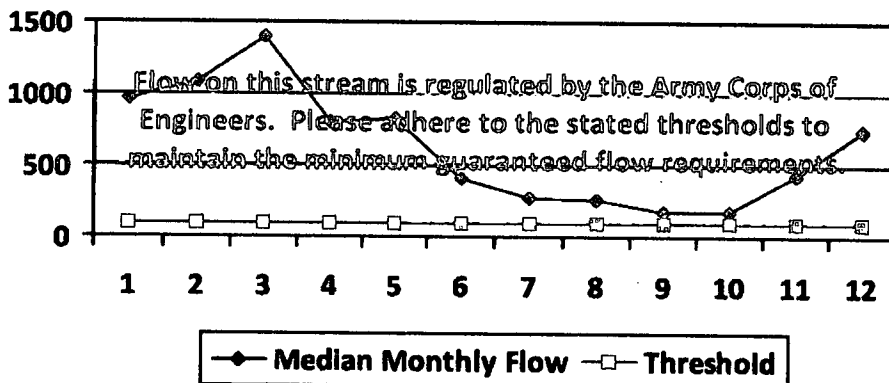
Water Availability Profile

Water Availability Assessment of Location

Base Threshold (cfs):	-
Upstream Demand (cfs):	24.29
Downstream Demand (cfs):	0.00
Pump rate (cfs):	4.46
Headwater Safety (cfs):	24.18
Ungauged Stream Safety (cfs):	0.00

Min. Gauge Reading (cfs): -

Passby at Location (cfs): -



"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP-01208

API/ID Number: 017-FWC-00007

Operator: Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17414 Source Name: Middle Island Creek @ Dawson Withdrawal
Gary D. and Rella A. Dawson

Source Latitude: 39.379292
Source Longitude: -80.867803

HUC-8 Code: 5030201

Anticipated withdrawal start date: 6/3/2013

Drainage Area (sq. mi.): 181.34 County: Tyler

Anticipated withdrawal end date: 6/3/2015

- Endangered Species?
- Trout Stream?
- Regulated Stream?
- Proximate PSD?
- Gauged Stream?
- Mussel Stream?
- Tier 3?

Total Volume from Source (gal):

Max. Pump rate (gpm): 3,000
Max. Simultaneous Trucks: 0
Max. Truck pump rate (gpm): 0

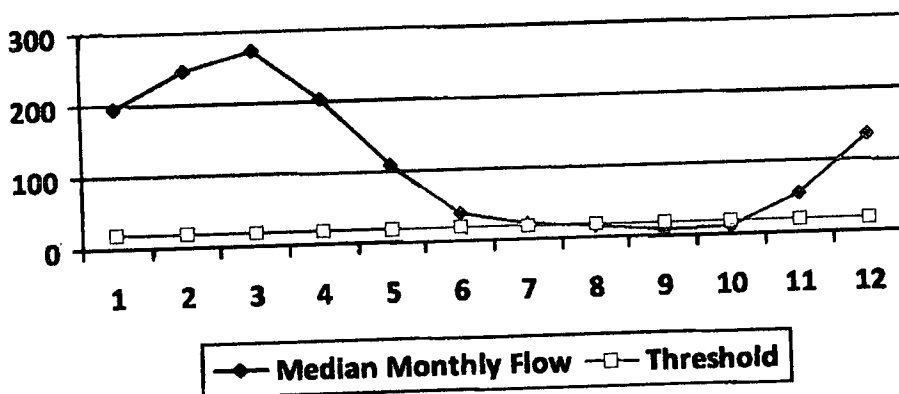
Reference Gaug: 3114500 MIDDLE ISLAND CREEK AT LITTLE, WV

Drainage Area (sq. mi.): 458.00

Gauge Threshold (cfs): 45

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	194.47	42.06	152.68
2	244.62	42.06	202.83
3	273.72	42.06	231.93
4	203.26	42.06	161.47
5	107.22	42.06	65.43
6	37.44	42.06	-4.35
7	21.19	42.06	-20.60
8	17.45	42.06	-24.34
9	8.94	42.06	-32.85
10	11.23	42.06	-30.56
11	54.82	42.06	13.04
12	133.96	42.06	92.17

Water Availability Profile



Water Availability Assessment of Location

Base Threshold (cfs): 17.82
Upstream Demand (cfs): 13.10
Downstream Demand (cfs): 6.55
Pump rate (cfs): 6.68
Headwater Safety (cfs): 4.45
Ungauged Stream Safety (cfs): 0.00

Min. Gauge Reading (cfs): 76.03
Passby at Location (cfs): 28.82

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP: 01208

API/ID Number: 017-FWC-00007

Operator: Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17415 Source Name: McElroy Creek @ Forest Withdrawal
Forest C. & Brenda L. Moore

Source Latitude: 39.39675
Source Longitude: -80.738197

HUC-8 Code: 5030201

Drainage Area (sq. mi.): 88.85 County: Tyler

Anticipated withdrawal start date: 6/3/2013

Anticipated withdrawal end date: 6/3/2015

- Endangered Species? Mussel Stream?
- Trout Stream? Tler 3?
- Regulated Stream?
- Proximate PSD?
- Gauged Stream?

Total Volume from Source (gal):

Max. Pump rate (gpm): 1,000

(Max. Simultaneous Trucks: 0

Max. Truck pump rate (gpm) 0

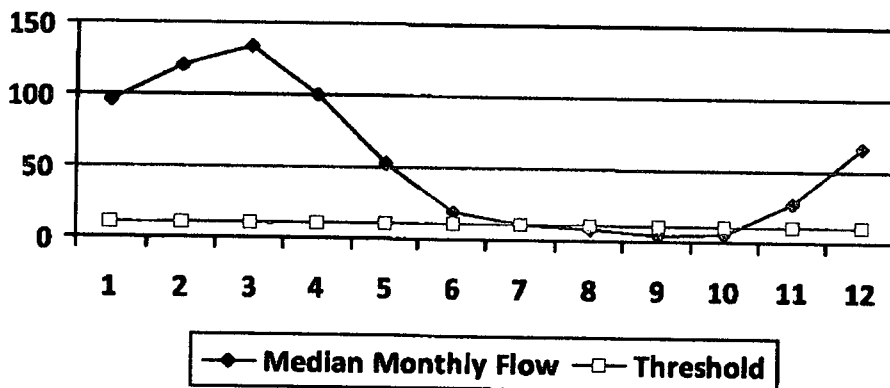
Reference Gaug 3114500 MIDDLE ISLAND CREEK AT LITTLE, WV

Drainage Area (sq. mi.) 458.00

Gauge Threshold (cfs): 45

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	95.28	19.78	75.68
2	119.86	19.78	100.25
3	134.11	19.78	114.51
4	99.59	19.78	79.99
5	52.54	19.78	32.93
6	18.35	19.78	-1.26
7	10.38	19.78	-9.22
8	8.55	19.78	-11.05
9	4.38	19.78	-15.23
10	5.50	19.78	-14.10
11	26.86	19.78	7.26
12	65.63	19.78	46.03

Water Availability Profile



Water Availability Assessment of Location

Base Threshold (cfs):	8.73
Upstream Demand (cfs):	4.46
Downstream Demand (cfs):	0.00
Pump rate (cfs):	2.23
Headwater Safety (cfs):	2.18
Ungauged Stream Safety (cfs):	2.18
Min. Gauge Reading (cfs):	74.19
Passby at Location (cfs):	13.09

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP: 01208

API/ID Number: 017-FWC-00007

Operator: Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17416 Source Name McElroy Creek @ Sweeney Withdrawal
Bill Sweeney

Source Latitude: 39.398123
Source Longitude: -80.656808

HUC-8 Code: 5030201

Drainage Area (sq. mi.): 45.16 County: Doddridge

Anticipated withdrawal start date: 6/3/2013

Anticipated withdrawal end date: 6/3/2015

- Endangered Species? Mussel Stream?
- Trout Stream? Tier 3?
- Regulated Stream?
- Proximate PSD?
- Gauged Stream?

Total Volume from Source (gal):

Max. Pump rate (gpm): 1,000

Max. Simultaneous Trucks: 0

Max. Truck pump rate (gpm) 0

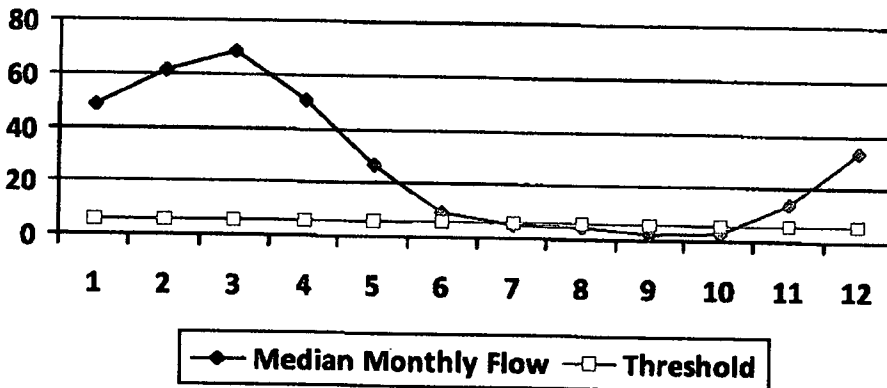
Reference Gaug 3114500 MIDDLE ISLAND CREEK AT LITTLE, WV

Drainage Area (sq. mi.) 458.00

Gauge Threshold (cfs): 45

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	48.43	8.88	39.93
2	60.92	8.88	52.42
3	68.17	8.88	59.67
4	50.62	8.88	42.12
5	26.70	8.88	18.21
6	9.32	8.88	0.83
7	5.28	8.88	-3.22
8	4.34	8.88	-4.15
9	2.23	8.88	-6.27
10	2.80	8.88	-5.70
11	13.65	8.88	5.16
12	33.36	8.88	24.86

Water Availability Profile



Water Availability Assessment of Location

Base Threshold (cfs):	4.44
Upstream Demand (cfs):	0.00
Downstream Demand (cfs):	0.00
Pump rate (cfs):	2.23
Headwater Safety (cfs):	1.11
Ungauged Stream Safety (cfs):	1.11
Min. Gauge Reading (cfs):	69.73
Passby at Location (cfs):	6.66

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP 01208

API/ID Number: 017-FWC-00007

Operator:

Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17417 Source Name: Meathouse Fork @ Gagnon Withdrawal
George L. Gagnon and Susan C. Gagnon

Source Latitude: 39.26054
Source Longitude: -80.720998

HUC-8 Code: 5030201

Drainage Area (sq. mi.): 60.6 County: Doddridge

Anticipated withdrawal start date: 6/3/2013

Anticipated withdrawal end date: 6/3/2015

- Endangered Species? Mussel Stream?
- Trout Stream? Tier 3?
- Regulated Stream?
- Proximate PSD?
- Gauged Stream?

Total Volume from Source (gal):

Max. Pump rate (gpm): 1,000

Max. Simultaneous Trucks: 0

Max. Truck pump rate (gpm): 0

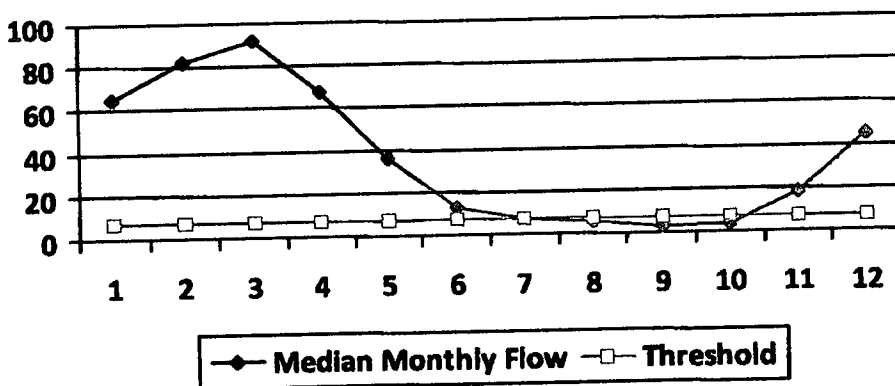
Reference Gaug: 3114500 MIDDLE ISLAND CREEK AT LITTLE, WV

Drainage Area (sq. mi.): 458.00

Gauge Threshold (cfs): 45

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	64.99	13.39	51.70
2	81.75	13.39	68.46
3	91.47	13.39	78.19
4	67.93	13.39	54.64
5	35.83	13.39	22.55
6	12.51	13.39	-0.77
7	7.08	13.39	-6.20
8	5.83	13.39	-7.45
9	2.99	13.39	-10.30
10	3.75	13.39	-9.53
11	18.32	13.39	5.04
12	44.76	13.39	31.48

Water Availability Profile



Water Availability Assessment of Location

Base Threshold (cfs):	5.95
Upstream Demand (cfs):	2.23
Downstream Demand (cfs):	2.81
Pump rate (cfs):	2.23
Headwater Safety (cfs):	1.49
Ungauged Stream Safety (cfs):	1.49
Min. Gauge Reading (cfs):	71.96
Passby at Location (cfs):	11.74

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

V/MP 01208

API/ID Number:

017-FWC-00007

Operator:

Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17418 Source Name: Meathouse Fork @ Whitehair Withdrawal
Elton Whitehair

Source Latitude: 39.211317
Source Longitude: -80.679592

HUC-8 Code: 5030201

Drainage Area (sq. mi.): 30.37 County: Doddridge

Anticipated withdrawal start date: 6/3/2013
Anticipated withdrawal end date: 6/3/2015

- Endangered Species? Mussel Stream?
- Trout Stream? Tier 3?
- Regulated Stream?
- Proximate PSD?
- Gauged Stream?

Total Volume from Source (gal):

Max. Pump rate (gpm): 1,000

Max. Simultaneous Trucks: 0

Max. Truck pump rate (gpm): 0

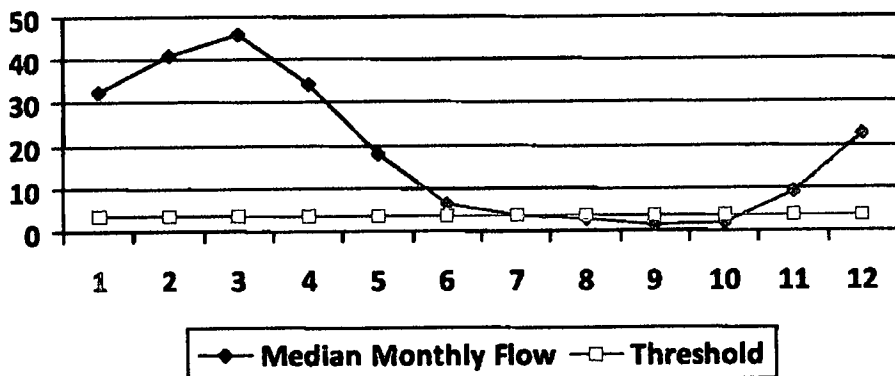
Reference Gaug: 3114500 MIDDLE ISLAND CREEK AT LITTLE, WV

Drainage Area (sq. mi.): 458.00

Gauge Threshold (cfs): 45

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	32.57	6.70	26.15
2	40.97	6.70	34.55
3	45.84	6.70	39.42
4	34.04	6.70	27.62
5	17.96	6.70	11.54
6	6.27	6.70	-0.15
7	3.55	6.70	-2.87
8	2.92	6.70	-3.50
9	1.50	6.70	-4.92
10	1.88	6.70	-4.54
11	9.18	6.70	2.76
12	22.43	6.70	16.01

Water Availability Profile



Water Availability Assessment of Location

Base Threshold (cfs):	2.98
Upstream Demand (cfs):	0.00
Downstream Demand (cfs):	2.81
Pump rate (cfs):	2.23
Headwater Safety (cfs):	0.75
Ungauged Stream Safety (cfs):	0.75
<hr/>	
Min. Gauge Reading (cfs):	69.73
Passby at Location (cfs):	7.29

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP 01208

API/ID Number: 017-FWC-00007

Operator:

Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17419 Source Name: Tom's Fork @ Erwin Withdrawal
 John F. Erwin and Sandra E. Erwin

Source Latitude: 39.174306
 Source Longitude: -80.702992

HUC-8 Code: 5030201

Drainage Area (sq. mi.): 4.01 County: Doddridge

Anticipated withdrawal start date: 6/3/2013
 Anticipated withdrawal end date: 6/3/2015

- Endangered Species? Mussel Stream?
- Trout Stream? Tier 3?
- Regulated Stream?
- Proximate PSD?
- Gauged Stream?

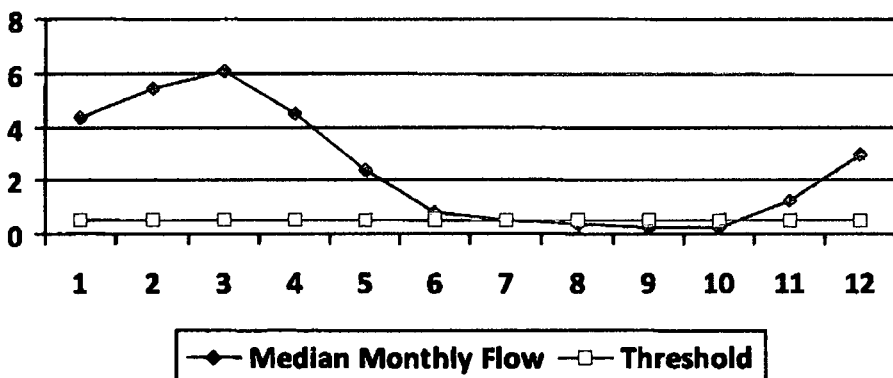
Total Volume from Source (gal):
 Max. Pump rate (gpm): 1,000
 Max. Simultaneous Trucks: 0
 Max. Truck pump rate (gpm): 0

Reference Gaug: 3114500 MIDDLE ISLAND CREEK AT LITTLE, WV
 Drainage Area (sq. mi.): 458.00

Gauge Threshold (cfs): 45

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	4.30	2.82	1.88
2	5.41	2.82	2.98
3	6.05	2.82	3.63
4	4.49	2.82	2.07
5	2.37	2.82	-0.05
6	0.83	2.82	-1.60
7	0.47	2.82	-1.96
8	0.39	2.82	-2.04
9	0.20	2.82	-2.23
10	0.25	2.82	-2.18
11	1.21	2.82	-1.21
12	2.96	2.82	0.54

Water Availability Profile



Water Availability Assessment of Location

Base Threshold (cfs): 0.39
 Upstream Demand (cfs): 0.00
 Downstream Demand (cfs): 0.00
 Pump rate (cfs): 2.23
 Headwater Safety (cfs): 0.10
 Ungauged Stream Safety (cfs): 0.10
 Min. Gauge Reading (cfs): 69.73
 Passby at Location (cfs): 0.59

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP 01208

API/ID Number: 017-FWC-00007

Operator:

Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17420 Source Name: Arnold Creek @ Davis Withdrawal
Jonathon Davis

Source Latitude: 39.302006
Source Longitude: -80.824561

HUC-8 Code: 5030201

Drainage Area (sq. mi.): 20.83 County: Doddridge

Anticipated withdrawal start date: 6/3/2013
Anticipated withdrawal end date: 6/3/2015

- Endangered Species? Mussel Stream?
- Trout Stream? Tier 3?
- Regulated Stream?
- Proximate PSD?
- Gauged Stream?

Total Volume from Source (gal):

Max. Pump rate (gpm): 1,000
Max. Simultaneous Trucks: 0
Max. Truck pump rate (gpm): 0

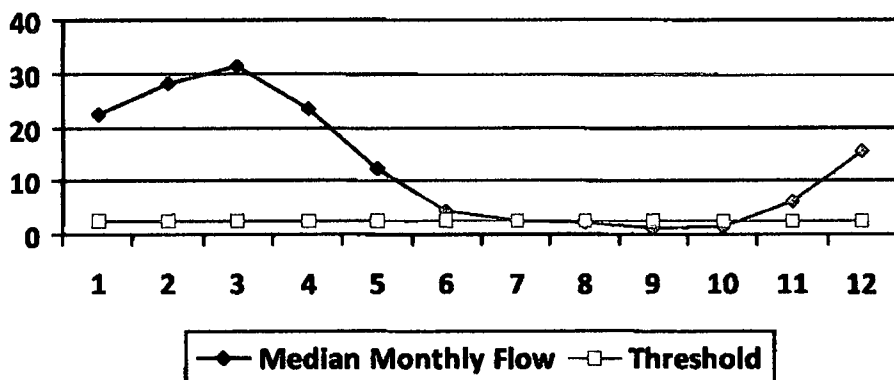
Reference Gaug 3114500 MIDDLE ISLAND CREEK AT LITTLE, WV

Drainage Area (sq. mi.) 458.00

Gauge Threshold (cfs): 45

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	22.34	5.30	17.29
2	28.10	5.30	23.05
3	31.44	5.30	26.39
4	23.35	5.30	18.30
5	12.32	5.30	7.26
6	4.30	5.30	-0.75
7	2.43	5.30	-2.62
8	2.00	5.30	-3.05
9	1.03	5.30	-4.03
10	1.29	5.30	-3.76
11	6.30	5.30	1.25
12	15.39	5.30	10.34

Water Availability Profile



Water Availability Assessment of Location

Base Threshold (cfs): 2.05
 Upstream Demand (cfs): 0.00
 Downstream Demand (cfs): 0.00
 Pump rate (cfs): 2.23
 Headwater Safety (cfs): 0.51
 Ungauged Stream Safety (cfs): 0.51

Min. Gauge Reading (cfs): 69.73
 Passby at Location (cfs): 3.07

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP 01208

API/ID Number: 017-FWC-00007

Operator:

Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17421 Source Name Buckeye Creek @ Powell Withdrawal
Dennis Powell

Source Latitude: 39.277142
Source Longitude: -80.690386

HUC-8 Code: 5030201

Drainage Area (sq. mi.): 31.15 County: Doddridge

Anticipated withdrawal start date: 6/3/2013

Anticipated withdrawal end date: 6/3/2015

- Endangered Species? Mussel Stream?
- Trout Stream? Tier 3?
- Regulated Stream?
- Proximate PSD?
- Gauged Stream?

Total Volume from Source (gal):

Max. Pump rate (gpm): 1,000

Max. Simultaneous Trucks: 0

Max. Truck pump rate (gpm) 0

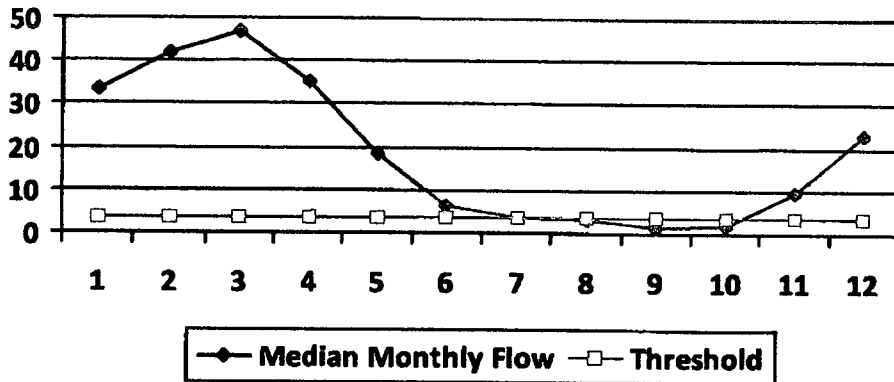
Reference Gaug 3114500 MIDDLE ISLAND CREEK AT LITTLE, WV

Drainage Area (sq. mi.) 458.00

Gauge Threshold (cfs): 45

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	33.41	6.82	26.95
2	42.02	6.82	35.56
3	47.02	6.82	40.56
4	34.92	6.82	28.46
5	18.42	6.82	11.96
6	6.43	6.82	-0.03
7	3.64	6.82	-2.82
8	3.00	6.82	-3.46
9	1.53	6.82	-4.92
10	1.93	6.82	-4.53
11	9.42	6.82	2.96
12	23.01	6.82	16.55

Water Availability Profile



Water Availability Assessment of Location

Base Threshold (cfs): 3.06
 Upstream Demand (cfs): 0.00
 Downstream Demand (cfs): 0.00
 Pump rate (cfs): 2.23
 Headwater Safety (cfs): 0.77
 Ungauged Stream Safety (cfs): 0.77

Min. Gauge Reading (cfs): 69.73
 Passby at Location (cfs): 4.59

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP 01208

API/ID Number: 017-FWC-00007

Operator: Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17422 Source Name: South Fork of Hughes River @ Knight Withdrawal
Tracy C. Knight & Stephanie C. Knight

Source Latitude: 39.198369
Source Longitude: -80.870969

HUC-8 Code: 5030203

Anticipated withdrawal start date: 6/3/2013

Drainage Area (sq. mi.): 16.26 County: Ritchie

Anticipated withdrawal end date: 6/3/2015

- Endangered Species?
- Trout Stream?
- Regulated Stream?
- Proximate PSD?
- Gauged Stream?
- Mussel Stream?
- Tier 3?

Total Volume from Source (gal):

Max. Pump rate (gpm): 3,000

Max. Simultaneous Trucks: 0

Max. Truck: pump rate (gpm) 0

Reference Gaug: 3155220 SOUTH FORK HUGHES RIVER BELOW MACFARLAN, WV

Drainage Area (sq. mi.): 229.00

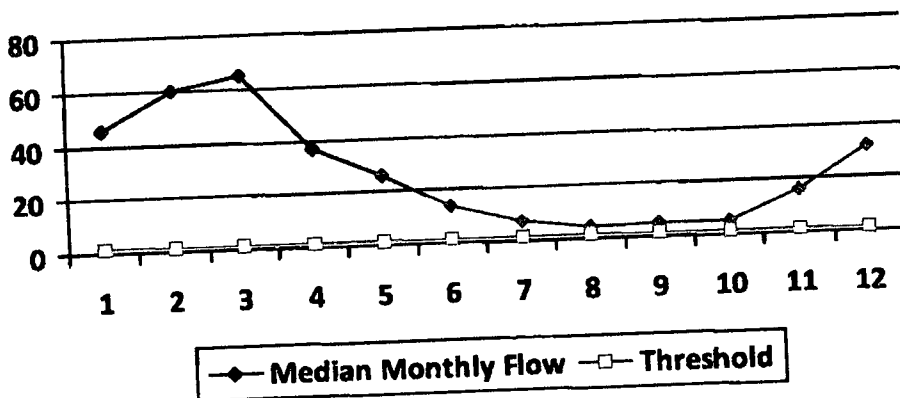
Gauge Threshold (cfs): 22

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	45.67	14.26	31.44
2	59.55	14.26	45.31
3	65.21	14.26	50.97
4	36.87	14.26	22.63
5	25.86	14.26	11.63
6	13.90	14.26	-0.33
7	6.89	14.26	-7.34
8	3.98	14.26	-10.25
9	4.79	14.26	-9.45
10	5.20	14.26	-9.04
11	15.54	14.26	1.30
12	32.06	14.26	17.82

Water Availability Assessment of Location

Base Threshold (cfs): 1.56
 Upstream Demand (cfs): 5.62
 Downstream Demand (cfs): 0.00
 Pump rate (cfs): 6.68
 Headwater Safety (cfs): 0.39
 Ungauged Stream Safety (cfs): 0.00
 Min. Gauge Reading (cfs): 39.80
 Passby at Location (cfs): 1.95

Water Availability Profile



"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.

Source Detail

WMP: 01208

API/ID Number: 017-FWC-00007

Operator:

Antero Resources

Lake Centralized Freshwater Impoundment

Source ID: 17423 Source Name: North Fork of Hughes River @ Davis Withdrawal
Lewis P. Davis and Norma J. Davis

Source Latitude: 39.322363
Source Longitude: -80.936771

HUC-8 Code: 5030203

Drainage Area (sq. mi.): 15.18 County: Ritchie

Anticipated withdrawal start date: 6/3/2013
Anticipated withdrawal end date: 6/3/2015

- Endangered Species? Mussel Stream?
- Trout Stream? Tier 3?
- Regulated Stream?
- Proximate PSD?
- Gauged Stream?

Total Volume from Source (gal):

Max. Pump rate (gpm): 1,000
Max. Simultaneous Trucks: 0
Max. Truck pump rate (gpm): 0

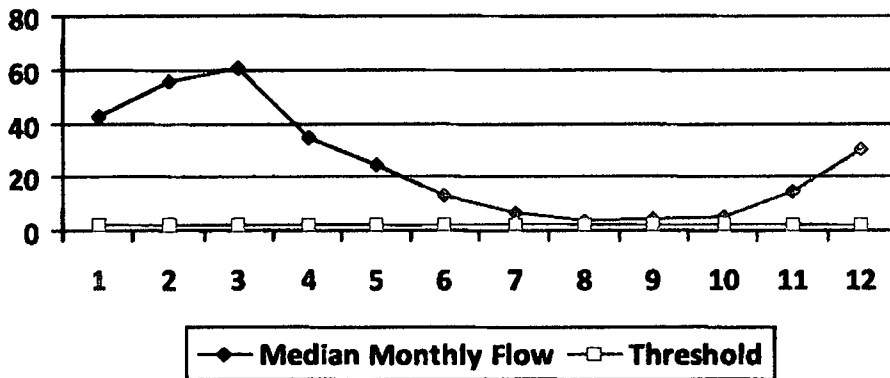
Reference Gaug: 3155220 SOUTH FORK HUGHES RIVER BELOW MACFARLAN, WV

Drainage Area (sq. mi.): 229.00

Gauge Threshold (cfs): 22

Month	Median monthly flow (cfs)	Threshold (+ pump)	Estimated Available water (cfs)
1	42.64	4.42	38.36
2	55.59	4.42	51.32
3	60.88	4.42	56.60
4	34.42	4.42	30.14
5	24.15	4.42	19.87
6	12.98	4.42	8.70
7	6.44	4.42	2.16
8	3.72	4.42	-0.56
9	4.47	4.42	0.19
10	4.85	4.42	0.57
11	14.50	4.42	10.23
12	29.93	4.42	25.65

Water Availability Profile



Water Availability Assessment of Location

Base Threshold (cfs): 1.46
 Upstream Demand (cfs): 0.00
 Downstream Demand (cfs): 0.00
 Pump rate (cfs): 2.23
 Headwater Safety (cfs): 0.36
 Ungauged Stream Safety (cfs): 0.36
 Min. Gauge Reading (cfs): 35.23
 Passby at Location (cfs): 2.19

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.



Water Management Plan:
Secondary Water Sources



WMP- 01208

API/ID Number 017-FWC-00007

Operator:

Antero Resources

Lake Centralized Freshwater Impoundment

Important:

For each proposed secondary water source identified in your water management plan (i.e., groundwater well, lake/reservoir, recycled frac water, multi-site impoundment, out-of-state source), DEP makes no estimation of the availability of water. These sources may prove to be unsuitable water supplies. Please review the following notes:

- For groundwater supply wells, DEP recommends that the operator contact the local health department prior to drilling any new well; and reminds the operator that all drinking water wells within 1,500 feet of a water supply well shall be flow- and quality-tested by the operator at the request of the drinking well owner prior to operation of the water supply well.
- For each proposed multi-site impoundment water source identified in your water management plan (if applicable), DEP will review the withdrawal limits established in the referenced Water Management Plan for current suitability and provide to the operator these limits for each identified intake. Note that withdrawal limits may be modified as necessary based on changing demands upon that water supply.

Lake/Reservoir

Source ID: 17426	Source Name	City of Salem Reservoir (Lower Dog Run)	Source start date:	6/3/2013	
		Public Water Provider	Source end date:	6/3/2015	
Source Lat:	39.28834	Source Long:	-80.54966	County	Harrison
Max. Daily Purchase (gal)	1,000,000	Total Volume from Source (gal):			

DEP Comments:

Lake Centralized Freshwater Impoundment

Important:

For each proposed secondary water source identified in your water management plan (i.e., groundwater well, lake/reservoir, recycled frac water, multi-site impoundment, out-of-state source), DEP makes no estimation of the availability of water. These sources may prove to be unsuitable water supplies. Please review the following notes:

- For groundwater supply wells, DEP recommends that the operator contact the local health department prior to drilling any new well; and reminds the operator that all drinking water wells within 1,500 feet of a water supply well shall be flow- and quality-tested by the operator at the request of the drinking well owner prior to operation of the water supply well.

- For each proposed multi-site impoundment water source identified in your water management plan (if applicable), DEP will review the withdrawal limits established in the referenced Water Management Plan for current suitability and provide to the operator these limits for each identified intake. Note that withdrawal limits may be modified as necessary based on changing demands upon that water supply.

Source ID: 17427	Source Name	Pennsboro Lake	Source start date:	6/3/2013
			Source end date:	6/3/2015
	Source Lat:	39.281689	Source Long:	-80.925526
			County	Ritchie
	Max. Daily Purchase (gal)		Total Volume from Source (gal):	

DEP Comments:

Source ID: 17428	Source Name	Powers Lake (Wilderness Water Park Dam)	Source start date:	6/3/2013
		Private Owner	Source end date:	6/3/2015
	Source Lat:	39.255752	Source Long:	-80.463262
			County	Harrison
	Max. Daily Purchase (gal)		Total Volume from Source (gal):	

DEP Comments:

WMP 01208

API/ID Number 017-FWC-00007

Operator:

Antero Resources

Lake Centralized Freshwater Impoundment

Important:

For each proposed secondary water source identified in your water management plan (i.e., groundwater well, lake/reservoir, recycled frac water, multi-site impoundment, out-of-state source), DEP makes no estimation of the availability of water. These sources may prove to be unsuitable water supplies. Please review the following notes:

•For groundwater supply wells, DEP recommends that the operator contact the local health department prior to drilling any new well; and reminds the operator that all drinking water wells within 1,500 feet of a water supply well shall be flow- and quality-tested by the operator at the request of the drinking well owner prior to operation of the water supply well.

•For each proposed multi-site impoundment water source identified in your water management plan (if applicable), DEP will review the withdrawal limits established in the referenced Water Management Plan for current suitability and provide to the operator these limits for each identified intake. Note that withdrawal limits may be modified as necessary based on changing demands upon that water supply.

Source ID: 17429 Source Name Powers Lake Two

Source start date: 6/3/2013

Source end date: 6/3/2015

Source Lat: 39.247604

Source Long: -80.466642

County Harrison

Max. Daily Purchase (gal)

Total Volume from Source (gal):

DEP Comments:

Lake Centralized Freshwater Impoundment

Important:

For each proposed secondary water source identified in your water management plan (i.e., groundwater well, lake/reservoir, recycled frac water, multi-site impoundment, out-of-state source), DEP makes no estimation of the availability of water. These sources may prove to be unsuitable water supplies. Please review the following notes:

•For groundwater supply wells, DEP recommends that the operator contact the local health department prior to drilling any new well; and reminds the operator that all drinking water wells within 1,500 feet of a water supply well shall be flow- and quality-tested by the operator at the request of the drinking well owner prior to operation of the water supply well.

•For each proposed multi-site impoundment water source identified in your water management plan (if applicable), DEP will review the withdrawal limits established in the referenced Water Management Plan for current suitability and provide to the operator these limits for each identified intake. Note that withdrawal limits may be modified as necessary based on changing demands upon that water supply.

Other

Source ID: 17430	Source Name	Poth Lake (Landowner Pond)	Source start date:	6/3/2013
		Private Owner	Source end date:	6/3/2015

Source Lat:	39.221306	Source Long:	-80.463028	County	Harrison
-------------	-----------	--------------	------------	--------	----------

Max. Daily Purchase (gal)	Total Volume from Source (gal):
---------------------------	---------------------------------

DEP Comments:

Source ID: 17431	Source Name	Williamson Pond (Landowner Pond)	Source start date:	6/3/2013
			Source end date:	6/3/2015

Source Lat:	39.19924	Source Long:	-80.886161	County	Ritchie
-------------	----------	--------------	------------	--------	---------

Max. Daily Purchase (gal)	Total Volume from Source (gal):
---------------------------	---------------------------------

DEP Comments:

Lake Centralized Freshwater Impoundment

Important:

For each proposed secondary water source identified in your water management plan (i.e., groundwater well, lake/reservoir, recycled frac water, multi-site impoundment, out-of-state source), DEP makes no estimation of the availability of water. These sources may prove to be unsuitable water supplies. Please review the following notes:

- For groundwater supply wells, DEP recommends that the operator contact the local health department prior to drilling any new well; and reminds the operator that all drinking water wells within 1,500 feet of a water supply well shall be flow- and quality-tested by the operator at the request of the drinking well owner prior to operation of the water supply well.

- For each proposed multi-site impoundment water source identified in your water management plan (if applicable), DEP will review the withdrawal limits established in the referenced Water Management Plan for current suitability and provide to the operator these limits for each identified intake. Note that withdrawal limits may be modified as necessary based on changing demands upon that water supply.

Source ID: 17432	Source Name	Eddy Pond (Landowner Pond)		Source start date:	6/3/2013
				Source end date:	6/3/2015
	Source Lat:	39.19924	Source Long:	-80.886161	County
					Ritchie
	Max. Daily Purchase (gal)			Total Volume from Source (gal):	

DEP Comments:

Source ID: 17433	Source Name	Hog Lick Quarry Industrial Facility		Source start date:	6/3/2013
				Source end date:	6/3/2015
	Source Lat:	39.419272	Source Long:	-80.217941	County
					Marion
	Max. Daily Purchase (gal)	1,000,000		Total Volume from Source (gal):	

DEP Comments:

Lake Centralized Freshwater Impoundment

Important:

For each proposed secondary water source identified in your water management plan (i.e., groundwater well, lake/reservoir, recycled frac water, multi-site impoundment, out-of-state source), DEP makes no estimation of the availability of water. These sources may prove to be unsuitable water supplies. Please review the following notes:

- For groundwater supply wells, DEP recommends that the operator contact the local health department prior to drilling any new well; and reminds the operator that all drinking water wells within 1,500 feet of a water supply well shall be flow- and quality-tested by the operator at the request of the drinking well owner prior to operation of the water supply well.

- For each proposed multi-site impoundment water source identified in your water management plan (if applicable), DEP will review the withdrawal limits established in the referenced Water Management Plan for current suitability and provide to the operator these limits for each identified intake. Note that withdrawal limits may be modified as necessary based on changing demands upon that water supply.

Source ID: 17434	Source Name	Glade Fork Mine Industrial Facility	Source start date:	6/3/2013
			Source end date:	6/3/2015
Source Lat:	38.965767	Source Long:	-80.299313	County
				Upshur
Max. Daily Purchase (gal)	1,000,000	Total Volume from Source (gal):		

DEP Comments: