



# Floodplain Development Permit

## Doddridge County, WV Floodplain Management

This permit gives approval for the development/ project listed that impacts the FEMA-designated floodplain and/or floodway of Doddridge County, WV, pursuant to the rules and regulations established by all applicable Federal, State and local laws and ordinances, including the Doddridge County Floodplain Ordinance. This permit must be posted at the site of work as to be clearly visible and must remain posted during entirety of development.

**Permit: #18-529**

**Date Approved: November 5, 2018**

**Expires: November 5, 2019**

**Issued to: Dominion Energy**

**POC: Jacqueline Kester**

**Company Address: 925 White Oaks Blvd. Bridgeport, WV 26330**

**Project Address: Robinson Fork**

**Firm: 54017C0155C**

**Lat/Long: 39.370189N, -80.601075W**

**Purpose of Development: Streambank Stabilization**

**Issued by: George C. Eidel, CFM, OEM Director/Doddridge County FPM (or designee)**

**Date: November 5, 2018**

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For additional information regarding this permit, please contact  
Doddridge County Floodplain Manager at 304.873.2631, or via email at  
doddridgecountyfpm@gmail.com  
118 East Court Street; West Union, WV 26456

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**SENDER: COMPLETE THIS SECTION**

- Complete items 1, 2, and 3.
- 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.

**Eric L. Glaspell**  
**6179 WV Rt. 23**  
**Salem, WV 26426**



9590 9402 3685 7335 7557 91

2. Article Number (Transfer from service label)

PS Form 3811, July 2015 PSN 7530-02-000-9053

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature  Agent  
 Addressee

B. Received by (Printed Name) Chad Huff C. Date of Delivery 10/11/18

D. Is delivery address different from item 1?  Yes  
 If YES, enter delivery address below:  No

3. Service Type

<input type="checkbox"/> Adult Signature	<input type="checkbox"/> Priority Mail Express®
<input type="checkbox"/> Adult Signature Restricted Delivery	<input type="checkbox"/> Registered Mail™
<input type="checkbox"/> Certified Mail®	<input type="checkbox"/> Registered Mail Restricted Delivery
<input type="checkbox"/> Certified Mail Restricted Delivery	<input type="checkbox"/> Return Receipt for Merchandise
<input type="checkbox"/> Collect on Delivery	<input type="checkbox"/> Signature Confirmation™
<input type="checkbox"/> Collect on Delivery Restricted Delivery	<input type="checkbox"/> Signature Confirmation Restricted Delivery
<input type="checkbox"/> Insured Mail	
<input type="checkbox"/> Insured Mail Restricted Delivery (over \$500)	

Domestic Return Receipt

**SENDER: COMPLETE THIS SECTION**

- Complete items 1, 2, and 3.
- 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.

**CNG Transmission Corp.**  
**25 Liberty AV Mail Drop 18-01**  
**Pittsburgh, PA 15221**



9590 9402 3685 7335 7557 84

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 If YES, enter delivery address below:  No

3. Service Type

<input type="checkbox"/> Adult Signature	<input type="checkbox"/> Priority Mail Express®
<input type="checkbox"/> Adult Signature Restricted Delivery	<input type="checkbox"/> Registered Mail™
<input type="checkbox"/> Certified Mail®	<input type="checkbox"/> Registered Mail Restricted Delivery
<input type="checkbox"/> Certified Mail Restricted Delivery	<input type="checkbox"/> Return Receipt for Merchandise
<input type="checkbox"/> Collect on Delivery	<input type="checkbox"/> Signature Confirmation™
<input type="checkbox"/> Collect on Delivery Restricted Delivery	<input type="checkbox"/> Signature Confirmation Restricted Delivery
<input type="checkbox"/> Insured Mail	
<input type="checkbox"/> Insured Mail Restricted Delivery (over \$500)	

Domestic Return Receipt

**U.S. Postal Service™**  
**CERTIFIED MAIL® RECEIPT**  
 Domestic Mail Only

For delivery information, visit our website at [www.usps.com](http://www.usps.com)

**OFFICIAL USE**

Certified Mail Fee \$ 3.45

Extra Services & Fees (check box, add fee as appropriate)

<input checked="" type="checkbox"/> Return Receipt (hardcopy)	\$ <u>2.75</u>
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$

Postage \$ .50

Total Postage and Fees \$ 6.70

Sent To CNG Transmission Corp.  
 Street and Apt. No., or PO Box No. 25 Liberty Av. mail Drop 18-01  
 City, State, ZIP+4® Pittsburgh PA 15221 18-529

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

**U.S. Postal Service™**  
**CERTIFIED MAIL® RECEIPT**  
 Domestic Mail Only

For delivery information, visit our website at [www.usps.com](http://www.usps.com)

**OFFICIAL USE**

Certified Mail Fee \$ 3.45

Extra Services & Fees (check box, add fee as appropriate)

<input checked="" type="checkbox"/> Return Receipt (hardcopy)	\$ <u>2.75</u>
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$

Postage \$ .50

Total Postage and Fees \$ 6.70

Sent To Eric L. Glaspell  
 Street and Apt. No., or PO Box No. 6179 WV Rt. 23  
 City, State, ZIP+4® Salem WV 26426 18-529

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7530 0200 3370 2847

7530 0200 3370 2847

143666

**CIVIL & ENVIRONMENTAL CONSULTANTS, INC.**

333 BALDWIN ROAD  
PITTSBURGH, PA 15206  
(412) 429-2824

PNC BANK, N.A.  
Pittsburgh, PA



8-9/430

CHECK DATE 9/24/2018

COPY COPY

PAY Two Hundred Fifty and 00/100 Dollars

COPY

TO Doddridge County Commission

AMOUNT 250.00

AUTHORIZED SIGNATURE

COPY

COPY COPY

⑈ 143666 ⑈ ⑆ 043000096 ⑆ 0002272405 ⑈

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.

COPY

143666

Check Date: 9/24/2018

Invoice Number	Date	Voucher	Amount	Discounts	Previous Pay	Net Amount
09242018	9/24/2018	000000321087	250.00			250.00
Doddridge County Commission			TOTAL			250.00
- Operating Account	1	11261				

COPY

FP # 18-529

OCT 5 18 3:03PM

COPY

COPY



Security features. Details on back.

Check Date: 9/24/2018

Invoice Number	Date	Voucher	Amount	Discounts	Previous Pay	Net Amount
09242018	9/24/2018	000000321087	250.00			250.00
Doddridge County Commission			TOTAL	250.00		250.00
- Operating Account	1	11261				

FP # 18-529

### Doddridge County, West Virginia

RECEIPT NO: 10962

DATE: 2018/10/09

FROM: CIVIL & ENVIRONMENTAL

AMOUNT: \$ 250.00

TWO HUNDRED FIFTY DOLLARS AND 00 CENTS

FOR: #18-529 PLOOD PLAIN

00000143666 FP-BUILDING PERMITS

020-318

TOTAL: \$250.00

MICHAEL HEADLEY

SHERIFF & TREASURER

MEC  
CLERK

Customer Copy





**Doddridge County Floodplain Application Fee Calculation**

Estimated Project Construction Cost = \$25,000

Total Application Fee = \$250

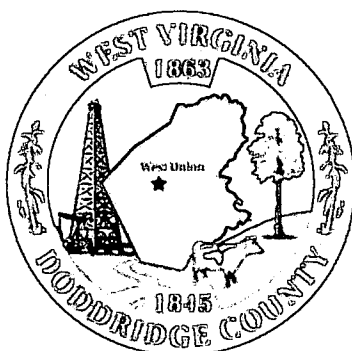
## FLOODPLAIN PERMIT #18-529

CEC/Dominion Energy Rt 23 Robinson Fork Streambank Stabilization 39.370189 N, -80.601075 W

<b>TASK</b>	<b>COMPLETE (DATE)</b>	<b>NOTES</b>
CHECK RECEIVED	10/5/2018	
US ARMY CORP. ENGINEERS (USACE)		
US FISH & WILDLIFE SERVICES (USFWS)		
WV DEPT. NATURAL RESOURCES (WVDNR)		
WV DEPT. ENVIROMENTAL PROTECTION (WVDEP)		
STATE HISTORIC & PRESERVATION OFFICE (SHPO)		
OFFICE of LAND & STREAM (OLS)		
DATE OF COMMISSION READING	10/16/2018	
DATE AVAILABLE TO BE GRANTED	11/5/2018	
PERMIT GRANTED		
COMPLETE		

7016 2070 0000 3170 2839

7016 2070 0000 3170 2822



## **Doddridge County Floodplain Permits**

**(Week of October 8, 2018)**

Please take notice that on the (5<sup>th</sup>) of (October), 2018, (CEC on behalf of Dominion Energy) filed an application for a Floodplain Permit (#18-529) to develop land located at or about (Route 23);

**Coordinates: 39.370189 N, -80.601075 W.** The Application is on file with the Floodplain Manager of the County and may be inspected or copied during regular business hours in accordance to WV Code Chapter 29B Freedom of Information, Article 1 Public Records and county policy and procedures. Any interested persons who desire to comment shall present the same in writing by **(November 5, 2018)** (20 calendar days after the announcement at the regularly scheduled Doddridge County Commission Meeting) delivered to the Floodplain Manager of the County at 105 Court Street, Suite #3, West Union,

WV 26456. **This project is for streambank Stabilization**

**GEORGE C. EIDEL, CFM**

Doddridge County Floodplain Manager



Permit# 18-529  
Project Name: ROBINSON FORK Streambank Stabilization  
Permittees Name: DOMINION Energy

OCT 5 18 3:03PM

# **Doddridge County, WV**

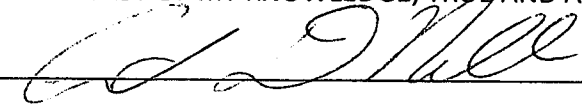
## **Floodplain Development**

### **Permit Application**

This document is to be used for projects that impact/potentially impact the FEMA---designated floodplain and/or floodway of Doddridge County, WV pursuant to the rules and regulations established by all applicable Federal, State and local laws and ordinances, including the Doddridge County Floodplain Ordinance.

#### **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. The permit will expire if no work is commenced within six months of issuance.
5. Applicant is hereby informed that other permits may be required to fulfill local, state, and federal requirements.
6. Applicant hereby gives consent to the Floodplain Administrator/Manager or his/her representative to make inspections to verify compliance.
7. 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 

DATE 10/3/18

Doddridge County Commercial/Industrial  
Floodplain Development Permit Application

**Applicant Information:**

*Please provide all pertinent data.*

<b>Applicant Information:</b>		
Responsible Company Name: <b>Dominion Energy Services, Inc.</b>		
Corporate Mailing Address: <b>5000 Dominion Blvd</b>		
City: <b>Glen Allen</b>	State: <b>VA</b>	Zip: <b>23060</b>
Corporate Point of Contact (POC):		
Corporate POC Title:		
Corporate POC Primary Phone:		
Corporate POC Primary Email:		
Corporate FEIN:	Corporate DUNS:	
Corporate Website: <a href="https://www.dominionenergy.com/">https://www.dominionenergy.com/</a>		
Local Mailing Address: <b>925 White Oaks Blvd</b>		
City: <b>Bridgeport</b>	State: <b>WV</b>	Zip: <b>26330</b>
Local Project Manager (PM):		
Local PM Primary Phone:		
Local PM Secondary Phone:		
Local PM Primary Email:		
Person Filing Application: <b>Stephanie Basinger Collins</b>		
Applicant Title: <b>Environmental Services-Power Delivery and Gas Infrastructure</b>		
Applicant Primary Phone: <b>(804) 273-3746</b>		
Applicant Secondary Phone: <b>(804) 337-9943</b>		
Applicant Primary Email: <a href="mailto:Stephanie.M.Collins@dominionenergy.com">Stephanie.M.Collins@dominionenergy.com</a>		



Doddridge County Commercial/Industrial  
Floodplain Development Permit Application

**Proposed Development:**

*Please check all elements of the proposed project that apply.*

**DESCRIPTION OF WORK (CHECK ALL APPLICABLE BOXES)**

**A. STRUCTURAL DEVELOPMENT**

<u>ACTIVITY</u>		<u>STRUCTURAL TYPE</u>	
<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:**

- Fill             Mining             Drilling             Pipelining
- Grading
- Excavation (except for STRUCTURAL DEVELOPMENT checked above)
- Watercourse Alteration (including dredging and channel modification)
- Drainage Improvements (including culvert work)
- Road, Street, or Bridge Construction
- Subdivision (including new expansion)
- Individual Water or Sewer System
- Other (please specify)

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Doddridge County Commercial/Industrial  
Floodplain Development Permit Application

**Development Site/Property Information:**

*Please provide physical description of the site/property, along with pertinent ownership (surface and mineral rights) data as applicable. Attach appropriate maps from the WV Flood Tool showing location of proposed development. Use additional copies of this page if development spans multiple property boundaries. Designate each property by number (i.e. Property 1 of 1, Property 2 of 7, etc.)*

**Property Designation:**   1   of   2  

<b>Site/Property Information:</b>		
<b>Legal Description:</b> 47 AC ROBINSON FK		
<b>Physical Address/911 Address:</b> ROUTE 23		
<b>Decimal Latitude/Longitude:</b> 39.370189° N, 80.601075° W		
<b>DMS Latitude/Longitude:</b> 39° 22' 12.70" N, 80° 36' 3.87" W		
<b>District:</b> 05	<b>Map:</b> 24	<b>Parcel:</b> 7.1
<b>Land Book Description:</b>		
<b>Deed Book Reference:</b> Deed Book 244, Page 176		
<b>Tax Map Reference:</b> 09-05-0024-0007-0001		
<b>Existing Buildings/Use of Property:</b> Wooded, oil and gas		

<b>Floodplain Location Data: (to be completed by Floodplain Manager or designee)</b>			
<b>Community:</b>	<b>Number:</b>	<b>Panel:</b>	<b>Suffix:</b>
<b>Location (Lat/Long):</b>		<b>Approximate Elevation:</b>	
		<b>Estimated BFE:</b>	
<b>Is the development in the floodway?</b>		<b>Is the development in the floodplain?</b>	
<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No <b>Zone:</b> _____	
<b>Notes:</b>			



Doddridge County Commercial/Industrial  
Floodplain Development Permit Application

**Development Site/Property Information:**

*Please provide physical description of the site/property, along with pertinent ownership (surface and mineral rights) data as applicable. Attach appropriate maps from the WV Flood Tool showing location of proposed development. Use additional copies of this page if development spans multiple property boundaries. Designate each property by number (i.e. Property 1 of 1, Property 2 of 7, etc.)*

Property Designation:   2   of   2  

<b>Site/Property Information:</b>		
Legal Description: ROBINSON 5.83 AC		
Physical Address/911 Address: ROUTE 23		
Decimal Latitude/Longitude: 39.369778° N, 80.599639° W		
DMS Latitude/Longitude: 39° 22' 11.20" N, 80° 35' 58.70" W		
District: 05	Map: 24	Parcel: 9
Land Book Description:		
Deed Book Reference: Deed Book 193, Page 387		
Tax Map Reference: 09-05-0024-0009-0000		
Existing Buildings/Use of Property: Oil and gas		

<b>Floodplain Location Data: (to be completed by Floodplain Manager or designee)</b>			
Community:	Number:	Panel:	Suffix:
Location (Lat/Long):		Approximate Elevation:	
		Estimated BFE:	
Is the development in the floodway? <input type="checkbox"/> Yes <input type="checkbox"/> No		Is the development in the floodplain? <input type="checkbox"/> Yes <input type="checkbox"/> No    Zone: _____	
Notes:			

Doddridge County Commercial/Industrial  
Floodplain Development Permit Application

**Property Owner Data:**

*Please provide data on current site/property landowner(s), both surface and mineral rights (as applicable). Use additional copies of this page as needed. Designate each page in relation to each property listed above.*

Property Designation:   1   of   2  

<b>Property Owner Data:</b>		
Name of Primary Owner (PO): Eric L. Glaspell		
PO Address: 6179 WV RT 23		
City: Salem	State: WV	Zip: 26426
PO Primary Phone:		
PO Secondary Phone:		
PO Primary Email:		

<b>Surface Rights Owner Data:</b>		
Name of Primary Owner (PO):		
PO Address:		
City:	State:	Zip:
PO Primary Phone:		
PO Secondary Phone:		
PO Primary Email:		

<b>Mineral Rights Owner Data: (As Applicable)</b>		
Name of Primary Owner (PO):		
PO Address:		
City:	State:	Zip:
PO Primary Phone:		
PO Secondary Phone:		
PO Primary Email:		

Doddridge County Commercial/Industrial  
Floodplain Development Permit Application

**Property Owner Data:**

*Please provide data on current site/property landowner(s), both surface and mineral rights (as applicable). Use additional copies of this page as needed. Designate each page in relation to each property listed above.*

Property Designation:   2   of   2  

<b>Property Owner Data:</b>		
Name of Primary Owner (PO): C N G Transmission Corp		
PO Address: 625 LIBERTY AV MAIL DROP 18-01		
City: Pittsburgh	State: PA	Zip: 15221
PO Primary Phone:		
PO Secondary Phone:		
PO Primary Email:		

<b>Surface Rights Owner Data:</b>		
Name of Primary Owner (PO):		
PO Address:		
City:	State:	Zip:
PO Primary Phone:		
PO Secondary Phone:		
PO Primary Email:		

<b>Mineral Rights Owner Data: (As Applicable)</b>		
Name of Primary Owner (PO):		
PO Address:		
City:	State:	Zip:
PO Primary Phone:		
PO Secondary Phone:		
PO Primary Email:		

Doddridge County Commercial/Industrial  
Floodplain Development Permit Application

**Contractor Data:**

*Please provide all pertinent data for contractors and sub---contractors that may be participating in this project. Use additional copies of this page as needed. Designate each page in relation to each property listed above.*

**Property Designation:** \_\_\_ of \_\_\_

<b>Contractor/Sub-Contractor (C/SC) Information:</b>		
C/SC Company Name:		
C/SC WV License Number:		
C/SC FEIN:	C/SC DUNS:	
Local C/SC Point of Contact (POC):		
Local C/SC POC Title:		
C/SC Mailing Address:		
City:	State:	Zip-Code:
Local C/SC Office Phone:		
Local C/SC POC Phone:		
Local C/SC POC E-Mail:		

<b>Engineer Firm Information:</b>		
Engineer Firm Name:		
Engineer WV License Number:		
Engineer Firm FEIN:	Engineer Firm DUNS:	
Engineer Firm Primary Point of Contact (POC):		
Engineer Firm Primary POC Title:		
Engineer Firm Mailing Address:		
City:	State:	Zip-Code:
Engineer Firm Office Phone:		
Engineer Firm Primary POC Phone:		
Engineer Firm Primary POC E-Mail:		

## Adjacent and/or Affected Landowners Data

Please provide data for all adjacent and/or affected surface owners (both up and down stream) whose property may be impacted by proposed development as demonstrated by a floodplain study or survey. Use additional copies of this page as needed.

<b>Adjacent Property Owner Data: Upstream</b>		
Name of Primary Owner (PO): Dominion Transmission, Inc.		
Physical Address: PO Box 27026		
City: Richmond	State: VA	Zip: 23261
PO Primary Phone:		
PO Secondary Phone:		
PO Primary Email:		

<b>Adjacent Property Owner Data: Upstream</b>		
Name of Primary Owner (PO): Manufacturer's Light and Heat		
Physical Address: PO Box 18496		
City: Oklahoma City	State: OK	Zip: 73154
PO Primary Phone:		
PO Secondary Phone:		
PO Primary Email:		

<b>Adjacent Property Owner Data: Downstream</b>		
Name of Primary Owner (PO): Eric L. Glaspell		
Physical Address: 6179 WV RT 23		
City: Salem	State: WV	Zip: 26426
PO Primary Phone:		
PO Secondary Phone:		
PO Primary Email:		

<b>Adjacent Property Owner Data: Downstream</b>		
Name of Primary Owner (PO):		
Physical Address:		
City:	State:	Zip:
PO Primary Phone:		
PO Secondary Phone:		
PO Primary Email:		

## Site Plan

**A Site Plan is an accurate and detailed map of the proposed development for this project.** It shows the size, shape, location and special features of the project property, and the size and location of any development planned to the property, especially as that development will impact the floodplain and/or floodway. Site plans show what currently exists on the project property, and any changes or improvements you are proposing to make. **A certified and licensed engineering firm should complete site plans.**

### **A SITE PLAN MUST CONTAIN THE FOLLOWING INFORMATION:**

1. Legal description of the parcel, north arrow and scale
2. All property lines and their dimensions
3. Names of adjacent roads, location of driveways
4. Location of sloughs, tributaries, streams, rivers, wetlands, ponds, and lakes, with setbacks indicated, and including FEMA floodplain data based on most updated FIRM.
5. Location, size, shape of all buildings, existing and proposed, with elevation of lowest floor indicated.
6. Location and dimensions of existing or proposed on-site sewage systems.
7. Location of all propane tanks, fuel tanks or other liquid storage tanks whether above ground or below ground level.
8. Location and dimensions of any proposed pipeline placement(s) into floodplain/floodway.
9. Location and dimensions of any roadway development into floodplain/floodway. *(Includes initial development access roads)*
10. Location and dimensions of any bridge and/or culvert development into floodplain/floodway.
11. Location and dimensions of any storage yard or facility into the floodplain/floodway.
12. Location of any existing utilities and/or proposed utility placement and/or displacement.
13. Location, dimensions and depth of any existing or proposed fill on site.
14. A survey showing the **existing ground elevations** of at least location on the building site. **ELEVATION NOTE:** All vertical datum will reference either NGVD 29 or NAVD 88. Assumed datum will not be acceptable unless the property is located in an area where vertical datum has not been published. For those areas where vertical datum has not been established, a site plan with contours, elevations using assumed datum, high water marks and existing water levels of sloughs, rivers, lakes or streams and proposed lowest floor elevation.

## Applicant

Please read print name, sign and date below:

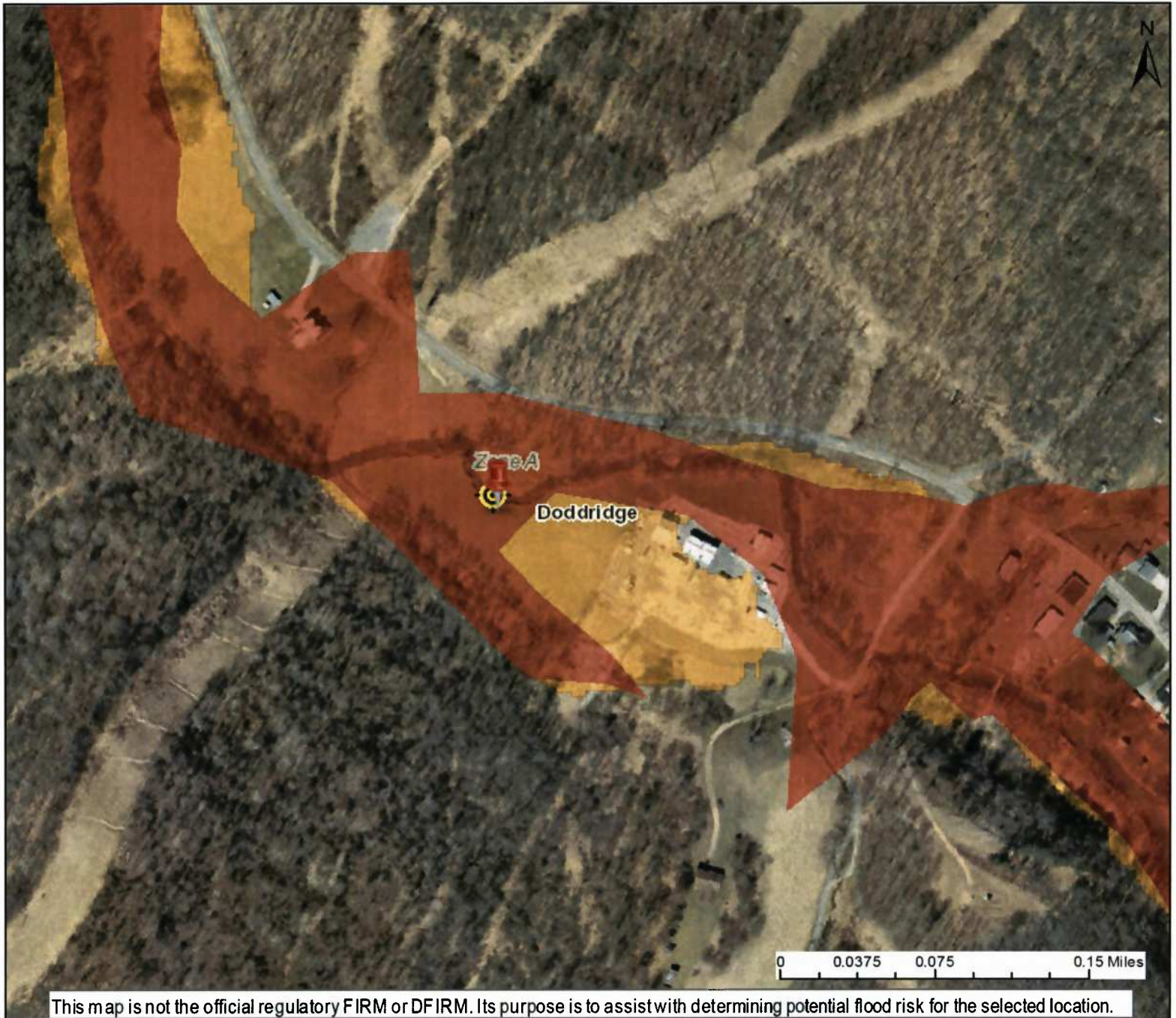
- I certify that I am authorized to submit this application for the primary project developer.
- I certify that the information included in this application is to the best of my knowledge true and complete.
- I certify that all required Federal, State, and local permits required by law and/or ordinance for the above described development of this project have will be properly attained, are current and valid, and must be presented prior to a Doddridge County Floodplain Permit being issued.
- I understand that if in the course of the development project additional permits become required that were not needed during the initial proposal, the primary developer must notify the Doddridge County Floodplain Manager within 48 hours of such need, and that a "Stop Work" order may be issued for all project work directly impacting the floodplain or floodway, until such time the required additional permits are acquired.
- I understand that once the floodplain permit is submitted, the application will be entered into official public record at the next regularly scheduled Doddridge County Commission meeting after the date of submittal.
- I understand that from the date of submittal of the fully completed permit application, the Doddridge County Floodplain Manager has ninety (90) days to make a determination to either grant or deny said permit application. During this approval period, the Doddridge County Floodplain Manager may, at his or her discretion, conduct a review and/or additional study of provided documentation by means of an independent engineering firm. All costs associated with said review and/or study must be reimbursed to the County before issuance of approved permit.
- I understand that during the approval period, the Doddridge County Floodplain Manager or designee may at his or her discretion conduct site visits and document conditions of proposed development pursuant to the permit application.
- I understand that once the Floodplain Permit is granted, the permit will be entered into official public record. Appeals to the permit may be made no later than twenty (20) days after said issuance. If a valid appeal is submitted, as determined by the Doddridge County Floodplain Manager, a "Stop Work" order will be issued for all project development directly involving the floodplain or floodway. A public hearing by the Doddridge County Appeals Board will be scheduled no less than ten (10) days after the next regularly scheduled Doddridge County Commission meeting.
- I understand that all decisions of the Doddridge County Appeals Board shall be final.
- **I understand issuance of a Floodplain Permit authorizes me to proceed with construction as proposed.**
- In signing this application, the primary developer hereby grants the Doddridge County Floodplain Manager or designee the right to enter onto the above---described location to inspect the development work proposed, in progress, and/or completed.
- I understand that if I do not follow exactly the site---plan submitted and approved by this permit that a "Stop Work" order may be issued by the Doddridge County Floodplain Manager and that I must stop all construction immediately until discrepancies of actual work vs. proposed work is resolved.

Applicant Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Applicant Printed Name: \_\_\_\_\_

# TL-283 Flood Map



This map is not the official regulatory FIRM or DFIRM. Its purpose is to assist with determining potential flood risk for the selected location.

Map created on 8/22/2018

Flood Info Location

User Notes:

### FEMA Effective Floodplain

- Floodway
- Flood Hazard Zone
- Advisory Zone A or Updated Zone AE

### Disclaimer:

The online map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. Refer to the official Flood Insurance Study (FIS) for detailed flood elevation data in flood profiles and data tables. WV Flood Tool (<https://www.MapWV.gov/flood>) is supported by FEMA, WV NFIP Office, and WV GIS Technical Center.

### Flood Hazard Area:

Location is **WITHIN** the FEMA 100-year floodplain.  
Advisory Flood Heights available.

**Flood Hazard Zone:** A (Advisory A)

**Stream:** Big Run

**Watershed (HUC8):** Little Musringum-Middle Island (50

**FEMA Flood Map:** 54017C0155C **EFF:** 10/4/2011

**Elevation:** About 829 ft (Source: SAMS 2003)

**Community Name:** Doddridge County

**Community ID:** 540024

**Location (long, lat):** (-80.601090, 39.370217)

**Parcel ID:** 09-05-0024-0007-0001

**Address:** N/A



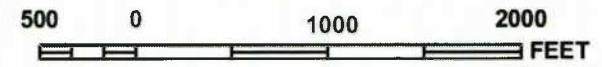
JOINS PANEL 0065



**DODDRIDGE COUNTY  
UNINCORPORATED AREAS  
540024**



MAP SCALE 1" = 1000'



PANEL 0155C

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

PANEL 155 OF 325  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	540024	0155	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  
54017C0155C  
MAP REVISED  
OCTOBER 4, 2011**

Federal Emergency Management Agency

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](http://www.msc.fema.gov)









**EROSION & SEDIMENT CONTROL PROGRAM**

A COPY OF THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) SHALL BE KEPT ON SITE AT ALL TIMES DURING WORKING HOURS AND SHALL BE STRICTLY ADHERED TO.

EROSION & SEDIMENT CONTROL SHALL BE MAXIMIZED THROUGH RAPID STABILIZATION OF THE DISTURBED AREAS AND BY THE INSTALLATION OF BEST MANAGEMENT PRACTICES (BMPs), AS SHOWN ON THE CONSTRUCTION PLANS.

**VEGETATIVE PRACTICES**

FERTILIZING, SEEDING, AND MULCH SHALL BE APPLIED WITHIN 4 DAYS TO ALL DISTURBED AREAS WHERE CONSTRUCTION IS NOT TO BE CONDUCTED FOR A PERIOD OF 14 DAYS OR MORE AND TO ALL AREAS WHERE FINAL GRADE HAS BEEN REACHED. WHERE CONSTRUCTION ACTIVITY WILL RESUME ON A PORTION OF THE SITE WITHIN 14 DAYS FROM WHEN ACTIVITIES CEASED, THE STABILIZATION MEASURES DO NOT HAVE TO BE INITIATED ON THAT PORTION OF THE SITE BY THE 4TH DAY AFTER CONSTRUCTION ACTIVITIES HAVE TEMPORARILY CEASED. REVEGETATION ACTIVITIES SHALL BE PERFORMED IN AN AGGRESSIVE MANNER THROUGHOUT THE CONSTRUCTION PROCESS.

1. SURFACE ROUGHENING - AREAS TO BE SEEDING SHALL BE LIGHTLY ROUGHENED AND LOOSE TO A DEPTH OF 2" TO 4" PRIOR TO SEEDING. AREAS, WHICH HAVE BEEN GRADED AND WILL NOT BE STABILIZED IMMEDIATELY, MAY BE ROUGHENED TO REDUCE VELOCITY UNTIL SEEDING TAKES PLACE.
2. TOP SOILING (STOCKPILE) - TOPSOIL WILL BE STRIPPED FROM AREAS TO BE GRADED AND STOCKPILED FOR LATER USE. STOCKPILE LOCATION SHALL BE LOCATED ON-SITE IN A DESIGNATED AREA AND SHALL BE STABILIZED WITH TEMPORARY VEGETATION. ONCE THE AREAS OF STOCKPILE HAVE BEEN REMOVED, THE AREAS SHALL BE GRADED/RESTORED & PERMANENTLY SEEDING.
3. TEMPORARY SEEDING & MULCHING - SELECTION OF THE SEED MIXTURE WILL DEPEND ON THE TIME OF THE YEAR IT IS APPLIED AND SHALL BE DONE WITH TEMPORARY SEEDING MEASURES SPECIFIED IN THE SWPPP (AS RECOMMENDED BY THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION). MULCHING SHALL BE APPLIED AT A RATE OF TWO TONS OF STRAW PER FREE HAY PER ACRE. FERTILIZER SHALL BE APPLIED AT A RATE OF 800 LBS/ACRE. LIME SHALL BE APPLIED AT 1.5 TON/ACRE.

**PERMANENT STABILIZATION**

EXCEPT AS NOTED BELOW, STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS PRACTICABLE IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED, BUT IN NO CASE MORE THAN 4 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS PERMANENTLY CEASED. WHERE THE INITIATION OF STABILIZATION MEASURES BY THE 4TH DAY AFTER CONSTRUCTION ACTIVITY TEMPORARILY OR PERMANENTLY CEASES IS PRECLUDED BY SNOW COVER, STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS CONDITIONS ALLOW. WHERE CONSTRUCTION ACTIVITY WILL RESUME ON A PORTION OF THE SITE WITHIN 14 DAYS FROM WHEN ACTIVITIES CEASED, (E.G., THE TOTAL TIME PERIOD THAT CONSTRUCTION ACTIVITY IS TEMPORARILY HALTED IS LESS THAN 14 DAYS) THEN STABILIZATION MEASURES DO NOT HAVE TO BE INITIATED ON THAT PORTION OF THE SITE BY THE 4TH DAY AFTER CONSTRUCTION ACTIVITIES HAVE TEMPORARILY CEASED. AREAS WHERE THE SEED HAS FAILED TO GERMINATE ADEQUATELY (UNIFORM PERENNIAL VEGETATIVE COVER WITH A DENSITY OF 70%) WITHIN 30 DAYS AFTER SEEDING AND MULCHING MUST BE RESEEDING IMMEDIATELY, OR AS SOON AS WEATHER CONDITIONS ALLOW.

**GENERAL NOTES**

1. PERMANENT VEGETATION SHALL NOT BE CONSIDERED ESTABLISHED UNTIL A GROUND COVER IS ACHIEVED THAT IS UNIFORM, MATURE ENOUGH TO SURVIVE, AND WILL INHIBIT EROSION. 70% VEGETATIVE COVER SHALL BE CONSIDERED STABILIZED.
2. ALL TEMPORARY SEDIMENT CONTROL MEASURES SHALL REMAIN IN PLACE UNTIL VEGETATION IS WELL ESTABLISHED ON ALL AREAS TO WHICH THE STRUCTURE IS BEING UTILIZED. ALL CONTROLS SHALL STRICTLY ADHERE TO REQUIREMENTS SET FORTH BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.
3. PROPERTIES AND WATERWAYS DOWNSTREAM FROM DEVELOPMENT SITES SHALL BE PROTECTED FROM SEDIMENT DEPOSITION, EROSION AND DAMAGE DUE TO INCREASES IN VOLUME, VELOCITY AND PEAK FLOW RATE OF STORMWATER RUNOFF.
4. ALL MEASURES USED TO PROTECT PROPERTIES AND WATERWAYS SHALL BE EMPLOYED IN A MANNER WHICH MINIMIZES IMPACTS ON THE PHYSICAL, CHEMICAL, AND BIOLOGICAL INTEGRITY OF RIVERS, STREAMS, AND OTHER WATERS OF THE STATE.
5. STABILIZATION MEASURES SHALL BE APPLIED IMMEDIATELY TO ALL AREAS UPON REACHING FINAL GRADE.

**MAINTENANCE PROGRAM**

ALL PERSONNEL MEETINGS AND MAINTENANCE INSPECTIONS SHALL BE DOCUMENTED IN WRITTEN FORMAT AND MAINTAINED ON SITE AS PART OF THE REQUIREMENTS OF THIS PERMIT. A COPY OF THE BMP INSPECTION CHECKLIST IS INCLUDED IN THE SWPPP FOR THE CONTRACTOR TO USE AS A GUIDELINE FOR INSPECTION REQUIREMENTS.

ALL PERSONNEL INVOLVED IN THE INSTALLATION OF THE TEMPORARY EROSION AND SEDIMENT CONTROL STRUCTURES SHALL BE PROPERLY INSTRUCTED ON THE CORRECT INSTALLMENT PROCEDURES OF EACH MEASURE. ON-THE-JOB TRAINING SHALL BE CONDUCTED TO ENSURE THOSE PERSONNEL PERFORMING CONSTRUCTION ACTIVITIES ON THE PROJECT SITE ARE AWARE OF THE COMPONENTS, METHODS, AND EXPECTED PERFORMANCE OF THE EROSION & SEDIMENT CONTROL PLAN.

AT A MINIMUM, ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE EVERY SEVEN CALENDAR DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT OF GREATER THAN 0.25 INCHES OF RAIN PER 24 HOUR PERIOD.

ALL STRUCTURES ARE TO BE REPAIRED OR REPLACED IMMEDIATELY UPON THE FINDING OF ANY DEFICIENCY.

ONCE THE CAPACITY OF A STRUCTURE HAS BEEN REDUCED BY 50 PERCENT (50%), THE ACCUMULATED SEDIMENT IS TO BE REMOVED AND DISPOSED OF PROPERLY BY THE CONTRACTOR.

PERMANENT SEEDING: SEEDING AREAS SHALL BE CHECKED REGULARLY TO ENSURE A GOOD STAND OF GRASS IS BEING MAINTAINED. AREAS THAT FAIL TO ESTABLISH VEGETATIVE COVER ADEQUATE TO PREVENT RILL EROSION SHALL BE RE-SEEDING AS SOON AS THEY ARE IDENTIFIED.

DEVICES SHOWN ARE TO BE CONSIDERED AS MINIMUM EROSION AND SEDIMENTATION CONTROLS. ADDITIONAL CONTROLS MAY BE NECESSARY DUE TO CONTRACTOR'S PHASING OR OTHER UNANTICIPATED CONDITIONS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ADDITIONAL DEVICES AS NECESSARY IN ORDER TO CONTROL EROSION AND SEDIMENTATION. EROSION AND SEDIMENTATION MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE POLICIES AND REQUIREMENTS OF THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP) BEST MANAGEMENT PRACTICES MANUAL. CONTROLS MAY BE REMOVED AFTER THE AREAS ABOVE THEM HAVE BEEN STABILIZED.

**CONSTRUCTION SEQUENCE**

1. INSTALL PERIMETER SEDIMENT CONTROL BMPs AS INDICATED PRIOR TO PERFORMING WORK THAT WILL RESULT IN GROUND DISTURBANCE.
2. PERFORM CLEARING AND GRUBBING OPERATIONS.
3. INSTALL STABILIZED CONSTRUCTION ENTRANCE, ACCESS ROAD, AND TEMPORARY WORKSPACE.
4. INSTALL PUMP AROUND.
5. INSTALL GABION BASKET WALL.
6. REMOVE PUMP AROUND AND RECLAIM TEMPORARY WORKSPACE AND ACCESS ROAD.
7. REMOVE EROSION AND SEDIMENT CONTROL STRUCTURES AFTER WORK IS COMPLETED AND SITE STABILIZATION HAS OCCURRED. THE SITE WILL NOT BE CONSIDERED STABILIZED UNTIL A 70 PERCENT UNIFORM COVER OF PERENNIAL VEGETATION IS ACHIEVED OR THE SITE IS STABILIZED WITH STONE.

**TEMPORARY AND PERMANENT SEED MIXTURES:**

Variety of Seed	Type B	Type C		Type D	Type L
	Medians, Shoulders (Ditch Slope), Waterways, and Movable Areas of Interchange	C-1 Course Lawn Grass - For Use in Urban and Rest Area Locations	C-2 Fine Lawn Grass - For Use Where a Fine Lawn is Desired	Cut and Fill Slopes - (Including Benches and Bifurcated Median)*	All Areas
	Lb. per acre	Lb. per acre	Lb. per acre	Lb. per acre	Lb. per acre
Orchard Grass (Dactylis glomerata)	65	45		20	
Timothy (Phleum pratense)	20	20	20	20	41
Kentucky Bluegrass (Poa pratensis)		25	40		
Merion Bluegrass (Poa pratensis L. Cultivar: Merion)			30		
Perennial Rye (Lolium perenne)					63
White Dutch Clover (Trifolium repens)	3			20	
Annual Ryegrass (Lolium multiflorum)	7	7	7	7	12

\* AREAS WILL BE CONSIDERED MOWABLE WHEN SLOPES ARE 3 TO 1 OR FLATTER. TYPE C-1 AND C-2 SEED MIXTURES SHALL BE USED IN ALL URBAN, SUBURBAN, AND REST AREAS WHERE LAWN TYPE TURF IS DESIRED WITH MOWING MAINTENANCE INTENDED. C-2 LAWN MIXTURE SHALL BE USED ALONG SIDEWALKS, ADJACENT TO PRIVATE LAWNS.

NOTE: SEED MIXES SHALL NOT BE MODIFIED WITHOUT APPROVAL OF ENGINEER

REVISION RECORD

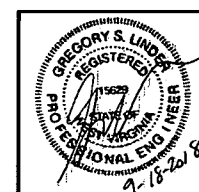
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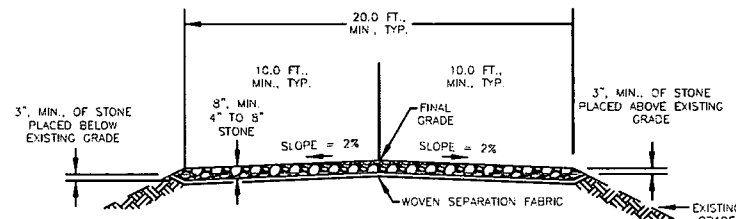
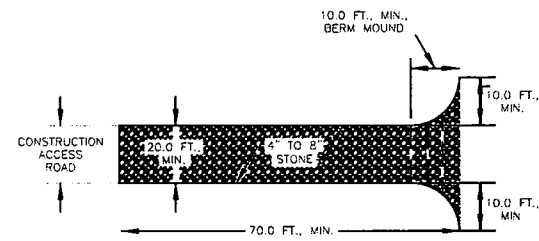
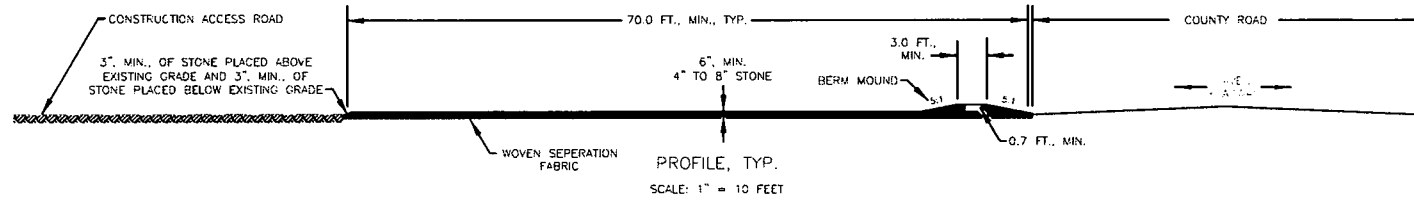
**Civil & Environmental Consultants, Inc.**  
 600 Marketplace Ave · Suite 200 · Bridgeport, WV 26330  
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**TL-283 PIPELINE EXPOSURE PROJECT**  
**DODDRIDGE COUNTY, WV**

**EROSION & SEDIMENT CONTROL NOTES**

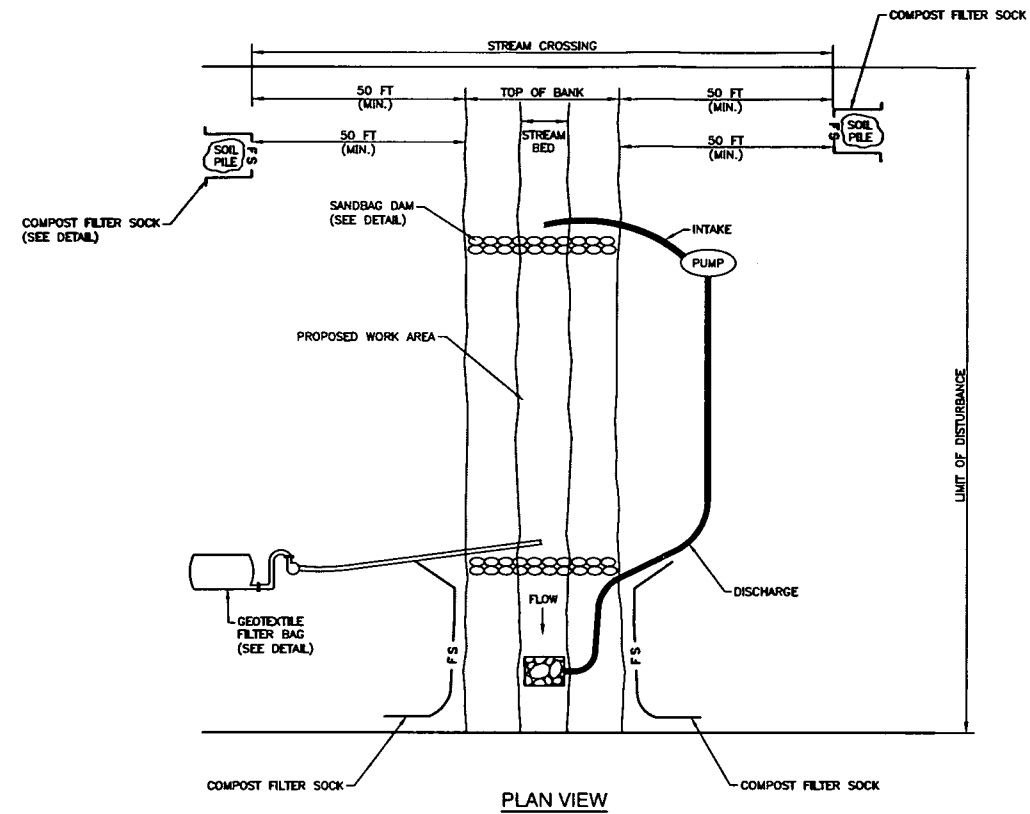
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 PROJECT NO: 183-700  
 APPROVED BY: GSK





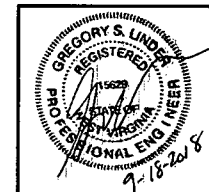
- NOTES:
- 4" to 8" STONE SHALL EXTEND THE FULL WIDTH OF THE ACCESS ROAD.
  - 4" to 8" STONE SHALL MEET THE GRADATION REQUIREMENTS FOR CLASS 7 AGGREGATE IN TABLE 704.6.2A OF THE WVDOH STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES.
  - A MOUNDED BERM MUST BE USED AT ALL STONE CONSTRUCTION ENTRANCES.
  - TURNOUTS ONTO PAVED ROADS FROM STONE CONSTRUCTION ENTRANCES SHALL BE A MINIMUM OF 10.0 FEET AS MEASURED ALONG THE PAVED ROAD, REGARDLESS OF THE ANGLE AT WHICH THE STONE CONSTRUCTION ENTRANCE ENCOUNTERS THE PAVED ROAD.

**DETAIL 1**  
**ROCK CONSTRUCTION ENTRANCE**  
NOT TO SCALE



- NOTES:
- ALL RUNOFF FROM DISTURBED UP SLOPE AREAS WITHIN LIMIT OF DISTURBANCE MUST BE TREATED FOR SEDIMENT BEFORE IT REACHES STREAM.
  - INSTALL COMPOST FILTER SOCK, PUMP, ENERGY DISSIPATER, AND DAMS BEFORE REPLACING EXISTING CULVERT.
  - PUMP MUST BE OF SUFFICIENT CAPACITY TO CONVEY NORMAL AND/OR EXISTING STREAM FLOW. A BACK-UP PUMP OF EQUAL CAPACITY MUST BE AVAILABLE ON-SITE DURING EXCAVATION.
  - PLACE SPOIL PILES A MINIMUM OF 50 FEET FROM TOP OF BANK.
  - INSTALL COMPOST FILTER SOCK ALONG STREAM BANKS.
  - PUMP INTAKE SHALL HAVE AN ANTI-AQUATIC IMPEDIMENT SCREEN.

**DETAIL 2**  
**INSTALLATION OF INSTREAM CULVERTS - PUMP AROUND**  
NOT TO SCALE



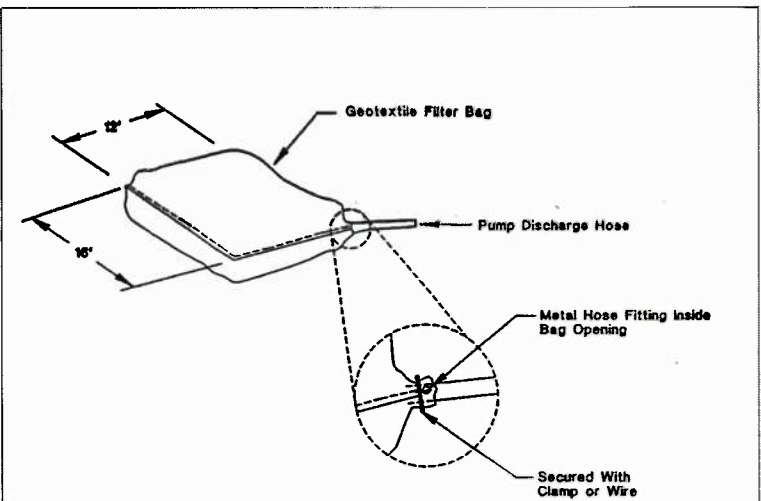
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**TL-283 PIPELINE EXPOSURE PROJECT**  
**DODDRIDGE COUNTY, WV**

EROSION & SEDIMENT CONTROL DETAILS	
DATE: SEPTEMBER 2018	APD: GSL
DWG SCALE: 1"=30'	GSL
PROJECT NO: 183-790	GSL
APPROVED BY:	GSL



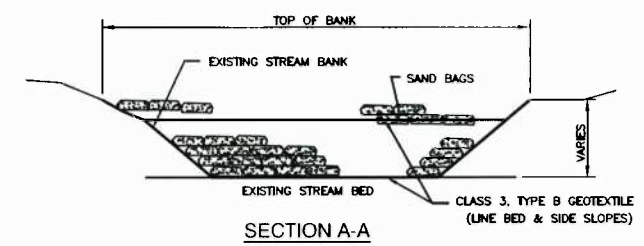


**GEOTEXTILE FILTER BAG**  
(NOT TO SCALE)

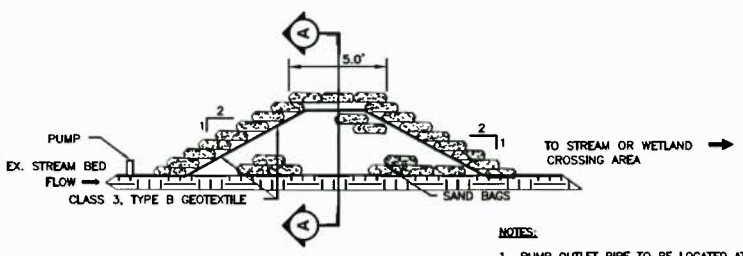
- NOTES**
1. Maximum flow rate for geotextile bag shall not exceed 600 g.p.m.
  2. Geotextile filter bag location shall be flagged so that bag can be removed.
  3. Sediment from filter bag must be disposed of on the right-of-way in an upland area.

	Dominion Transmission, Inc.	Scale: Not to scale	<b>DRAWING</b> <b>ESCP</b> <b>023</b>
	Geotextile Filter Bag	Created by: T. Carter Date: 09/15/08 File Name: Drawing ESCP-023	

**DETAIL 3**  
**GEOTEXTILE FILTER BAG**  
NOT TO SCALE

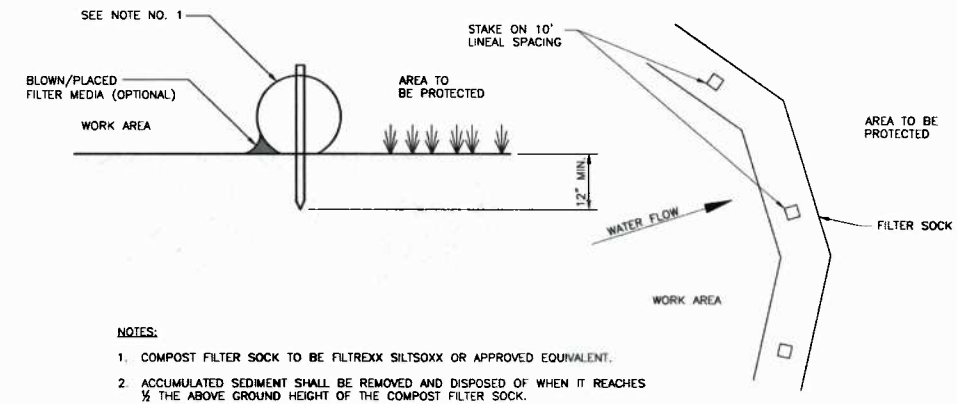
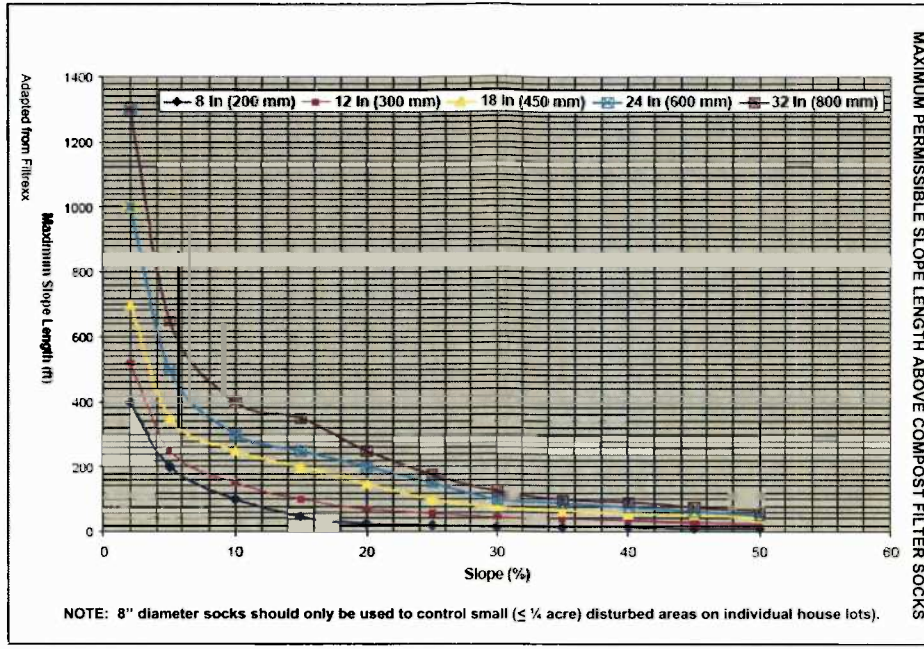


**SECTION A-A**



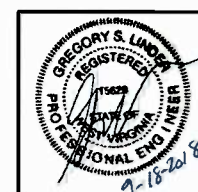
**DETAIL 4**  
**SANDBAG DAM**  
NOT TO SCALE

- NOTES:**
1. PUMP OUTLET PIPE TO BE LOCATED AT APPROXIMATE LOCATION SHOWN ON THE PLAN. R-2 STONE TO BE PLACED AT OUTLET.
  2. ADDITIONAL SAND BAGS SHALL BE PLACED AS NEEDED TO PREVENT LEAKAGE.



- NOTES:**
1. COMPOST FILTER SOCK TO BE FILTREXX SILTSOXX OR APPROVED EQUIVALENT.
  2. ACCUMULATED SEDIMENT SHALL BE REMOVED AND DISPOSED OF WHEN IT REACHES  $\frac{1}{2}$  THE ABOVE GROUND HEIGHT OF THE COMPOST FILTER SOCK.
  3. COMPOST FILTER SOCK SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED COMPOST FILTER SOCK SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
  4. COMPOST FILTER SOCK SHALL BE INSTALLED ON THE CONTOUR, PERPENDICULAR TO FLOW.

**DETAIL 5**  
**COMPOST FILTER SOCK**  
NOT TO SCALE



NO	DATE	DESCRIPTION

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**TL-283 PIPELINE EXPOSURE PROJECT**  
**DODDRIDGE COUNTY, WV**

<b>EROSION &amp; SEDIMENT CONTROL DETAILS</b>	
DATE: SEPTEMBER 2018	APD: [Signature]
DWG SCALE: 1"=30'	GSL: [Signature]
PROJECT NO: 183-790	APPROVED BY: [Signature]

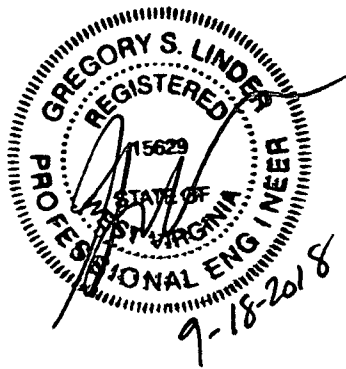
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# ***HYDRAULIC STUDY***

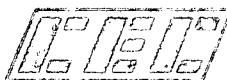
***TL-283 Pipeline Exposure Project  
Doddridge County, West Virginia***

*Prepared For:*

*Dominion Energy Services, Inc.  
Glen Allen, Virginia*



***September 2018***



**Civil & Environmental  
Consultants, Inc.**

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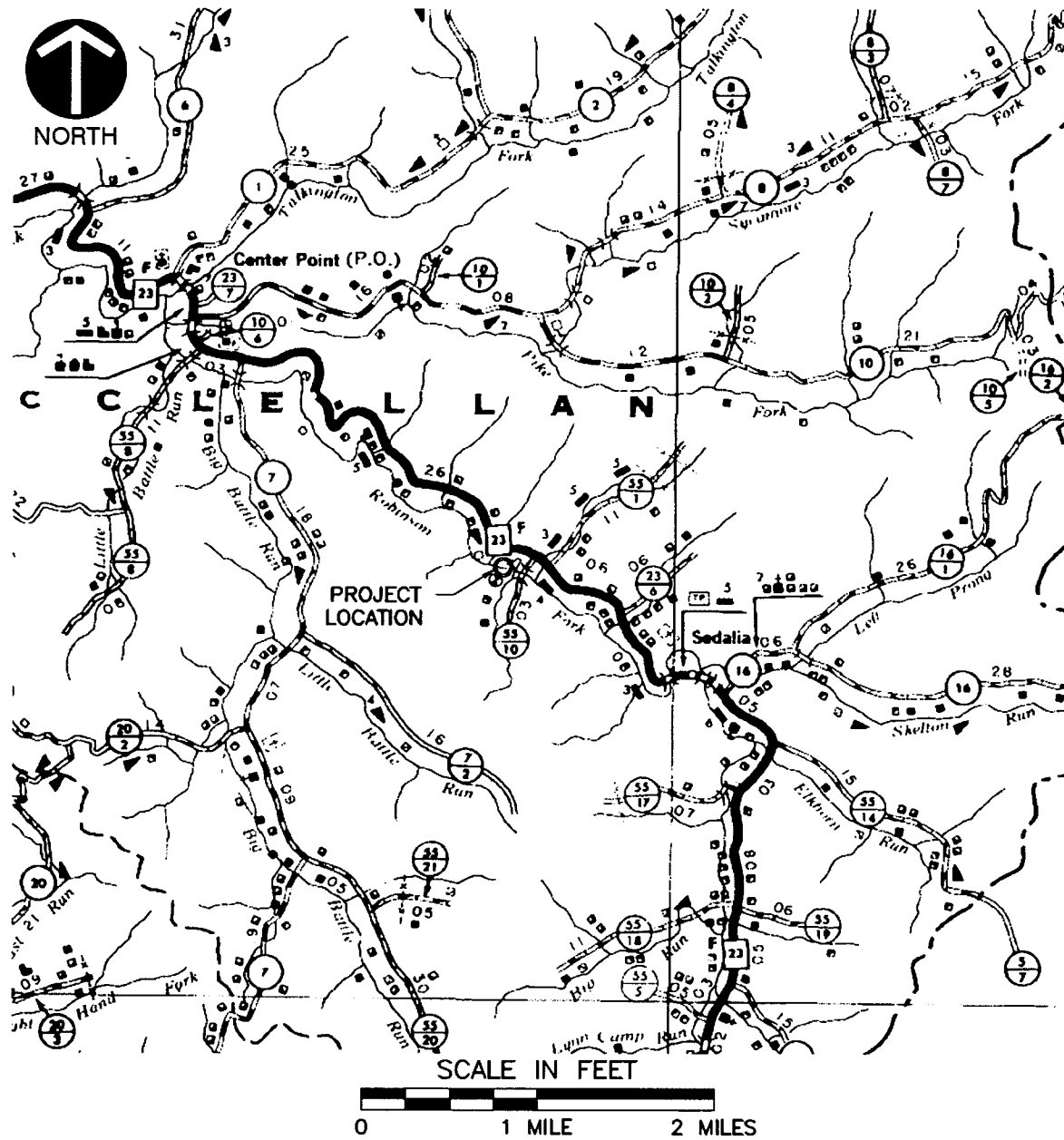
## **I. PROJECT DESCRIPTION**

### **A. Narrative**

The project site is located off of State Route 23, approximately 3.0 miles southeast of Center Point, WV. This hydraulic study is for a proposed streambank stabilization on Robinson Fork on behalf of Dominion Energy Services, Inc. The stream has undercut its southern bank, exposing a buried pipeline. The proposed project involves the installation of gabion baskets to protect the pipeline and stabilize the streambank of Robinson Fork, a tributary of McElroy Creek in Doddridge County, WV. According to the Federal Emergency Management Agency (FEMA), the site is located within the Robinson Fork Zone A Flood Hazard Area as designated on the Doddridge County Flood Insurance Rate Map (FIRM) Panel 54017C0155C with a map revised date of October 4, 2011. The purpose of this hydraulic study is not to investigate the existence or severity of flood hazards in the study area. The purpose of this hydraulic study is to determine the potential for adverse effects caused by the streambank stabilization and the potential impacts to the water level and floodplain of Robinson Fork.

## B. Location Maps

### 1. County Map



## 2. USGS Topographic Map

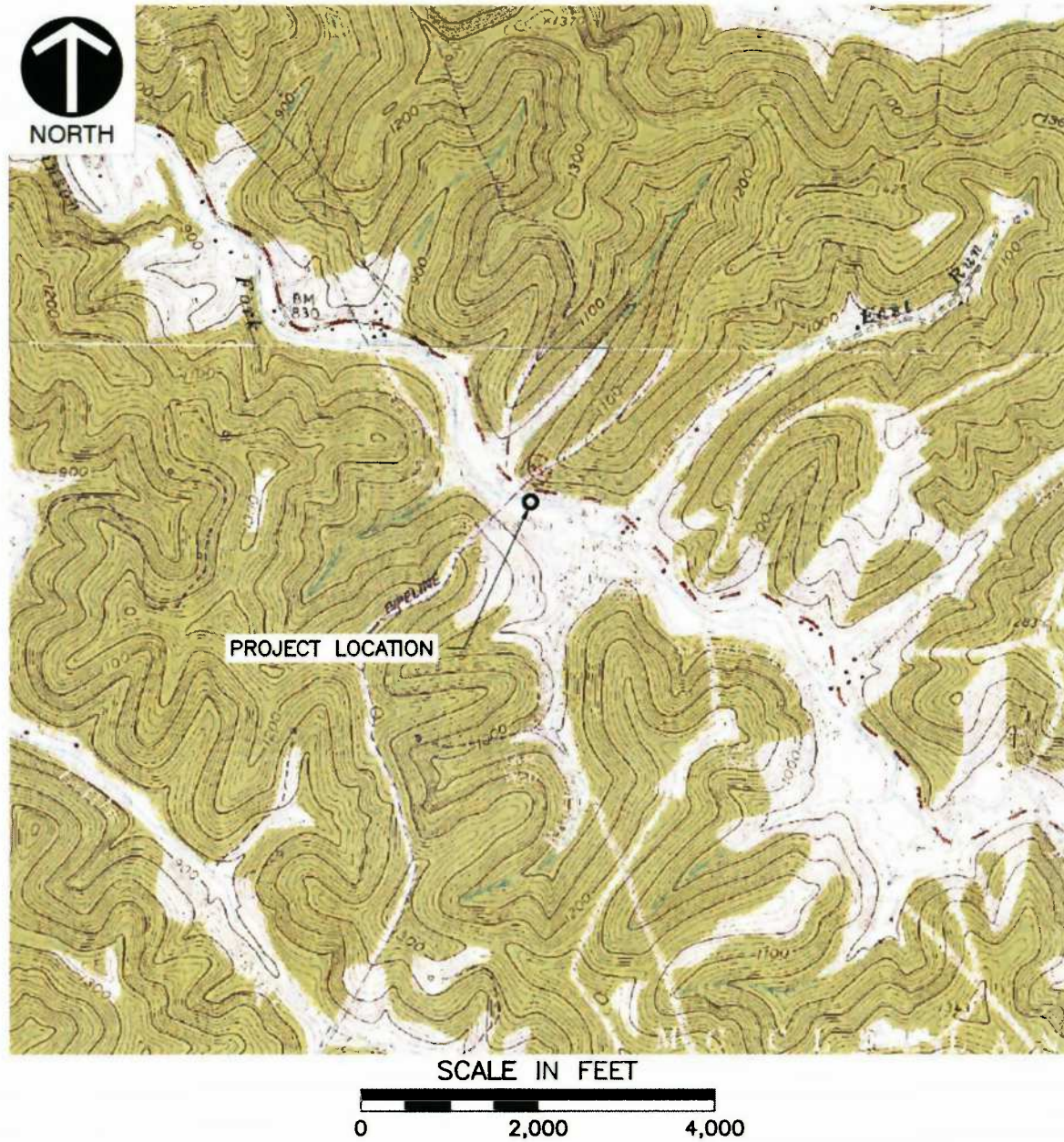


Figure: USGS 7<sup>1</sup>/<sub>2</sub> Minute Topographic Map – Folsom and Salem Quadrangles

## C. Field Observations

### 1. High Water Marks

There are no established landmarks in the project vicinity to determine a historic high water mark for Robinson Fork.

### 2. Verification of Manning's "n" Values

Manning's roughness coefficients were determined based on photographs and aerial images of the site. From Table 3.1 of the HEC-RAS Hydraulic Reference Manual:

#### a) Main Channel:

Clean, winding, some pools, and shoals: 'n' value 0.040

#### b) Floodplain:

Pasture, no brush, short grass: 'n' value 0.030

Pasture, no brush, high grass: 'n' value 0.035

Trees, heavy stand of timber, few down trees, little undergrowth, and flow below branches:

'n' value 0.100

The Manning's 'n' values assigned to the left overbank (LOB), channel, and right overbank (ROB) for each cross-section are shown in the following table.

<b>Cross-Section</b>	<b>Friction (n/K)</b>	<b>LOB</b>	<b>Channel</b>	<b>ROB</b>
1516.61	n	0.03	0.04	0.035
1310.94	n	0.03	0.04	0.035
1075.50	n	0.03	0.04	0.1
876.02	n	0.03	0.04	0.1
774.71	n	0.03	0.04	0.1
661.98	n	0.03	0.04	0.1
605.82	n	0.03	0.04	0.1
575.17	n	0.03	0.04	0.1
544.48	n	0.03	0.04	0.1
488.20	n	0.03	0.04	0.1
388.03	n	0.03	0.04	0.03
256.53	n	0.03	0.04	0.03
45.06	n	0.1	0.04	0.03



**D. Pictures**



**Streambank Stabilization Area – Looking East**



**Streambank Stabilization Area – Looking West**

## **II. SUMMARY OF RESULTS**

### **A. Analyses Performed**

Two analyses were performed in this study: an existing conditions analysis and a proposed conditions analysis. The existing conditions model was created using cross-sections based on existing topography along the centerline of Robinson Fork. The cross-sections of Robinson Fork were field-surveyed at specified locations within the study area in order to provide an accurate representation of the stream channel and floodplains.

In the proposed conditions model, an obstruction was added to the geometries of Cross-Sections 575.17 and 605.82 to model the proposed gabion basket wall. The proposed wall dimensions are 60 feet long, 4 feet wide, and 8 feet high. By comparing the results from the two analyses, the effects of the proposed gabion basket wall on the 100-year water levels of Robinson Fork were determined, as shown in the following table.



**B. Water Surface Elevation Table, Including Existing and Proposed Analyses**

<b>100-Year Rainfall Event (3,122 cfs)</b>			
<b>Cross-Section</b>	<b>Existing (ft)</b>	<b>Proposed (ft)</b>	<b>Difference (ft)</b>
1516.61	827.63	827.63	0.00
1310.94	827.21	827.21	0.00
1075.50	826.08	826.09	0.01
876.02	825.68	825.69	0.01
774.71	825.81	825.82	0.01
661.98	825.76	825.76	0.00
605.82	825.64	825.65	0.01
575.17	825.60	825.60	0.00
544.48	825.59	825.59	0.00
488.20	825.58	825.58	0.00
388.03	825.49	825.49	0.00
256.53	825.35	825.35	0.00
45.06	824.60	824.60	0.00

See Appendix D – HEC-RAS Profile Summary Tables.

### **C. Conclusions**

The results of the hydraulic study indicate that the construction of the gabion basket wall will increase the base flood elevation in Robinson Fork by a maximum of 0.01 feet upstream of the wall. According to FEMA, the allowable rise of the 100-year flood level is less than one foot. Thus, the project satisfies the FEMA criteria as well as that of the Doddridge County Floodplain Ordinance.

### **D. Recommendation**

The TL-283 Pipeline Exposure Project for Dominion Energy Services, Inc. involves construction within the floodplain established by FEMA. The results of the hydraulic study indicate that the construction of the gabion basket wall in Robinson Fork will not cause an increase in the 100-year water levels greater than the FEMA-allowable rise. Therefore, it is recommended that the site be constructed as designed.

### **E. Signature Block, Consultant, or In-House Designers**

1. Preparer

Andrew Darnell, E.I.T.

2. Reviewer

Gregory S. Linder, P.E. (West Virginia Registered Professional Engineer No. 15629)

3. Date

September 18, 2018

4. Engineer's Seal on Final Report

Gregory S. Linder, P.E. (West Virginia Registered Professional Engineer No. 15629)

### **III. AVAILABLE DATA**

#### **A. Flood Insurance Study**

The initial countywide Flood Insurance Study (FIS) for Doddridge County had an effective date of March 18, 1991. The final Consultation and Coordination Officer's meeting for the countywide revision to the FIS was held on April 29, 2010, which was attended by representatives of the Town of West Union and Doddridge County. Robinson Fork was included among the areas studied by approximate methods. Since no detailed hydraulic analyses were performed for Robinson Fork, no Base Flood Elevations (BFEs) or base flood depths are listed.

See Appendix B – FEMA FIRMette

#### **B. Existing Hydrologic Data**

No detailed hydrologic evaluation has been performed within the boundaries of this project site.

#### **C. Existing Hydraulic Model from FEMA, USACE, NRCS, others**

There is no existing hydraulic model for this project site.

#### IV. HYDROLOGY

##### A. Design Discharge Based on USGS Regression Equation

Since no detailed hydrology has been performed within the boundaries of this project, the design discharge of the 2-year, 10-year, 25-year, and 100-year storms were calculated using the United States Geological Survey (USGS) Regression Equations. The 100-year flood has been adopted by FEMA as the base flood for floodplain management purposes.

See Appendix C – Design Discharge Calculations.

Frequency	Discharge
2-year	834 cfs
10-year	1,745 cfs
25-year	2,271 cfs
100-year	3,122 cfs

##### B. Boundary Conditions

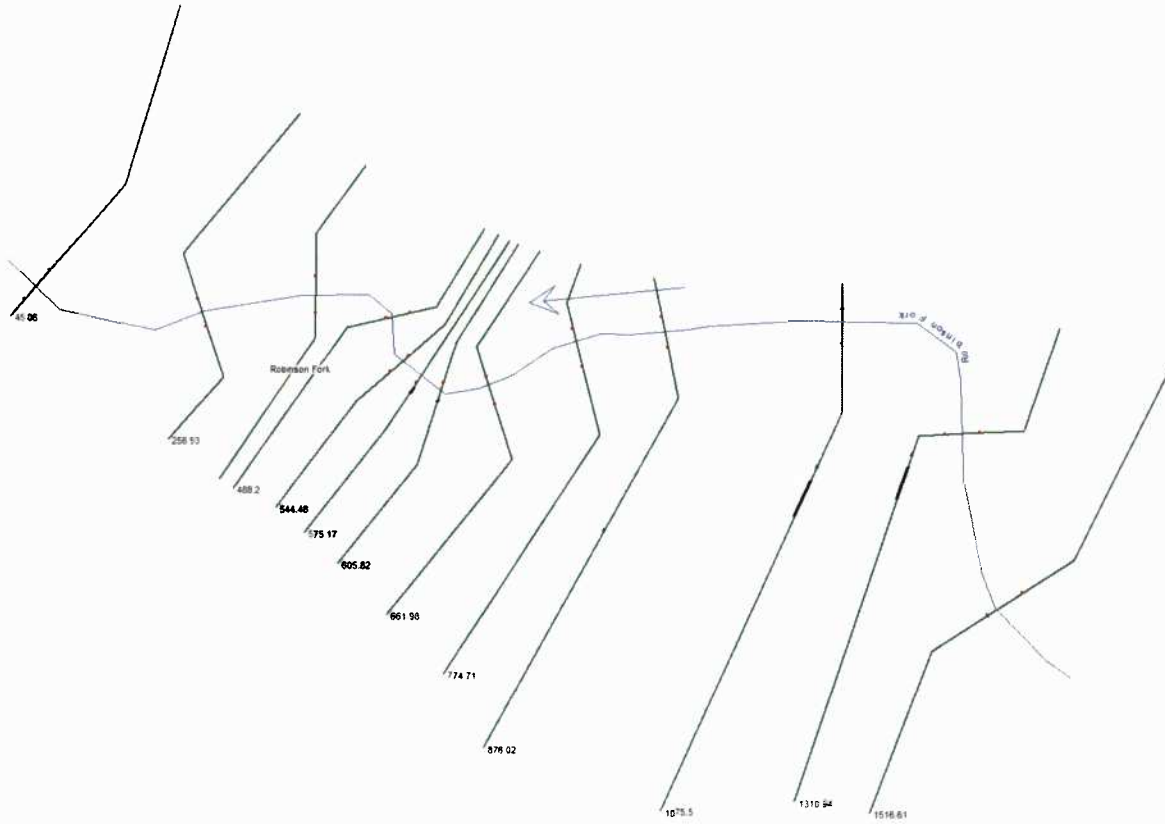
The boundary condition applicable to this hydraulic analysis is the Normal Depth slope at Cross-Section 45.06, which is approximately 0.0026 ft/ft.

#### V. HYDRAULIC MODELING

##### A. Source of Model

HEC-RAS Version 5.0.3 was used to perform a hydraulic analysis to determine if adverse effects will be caused by the proposed gabion basket wall relative to existing conditions, as well as the potential impacts to the water levels and floodplain of Robinson Fork.

## B. Site Map with Cross-Sections



## C. Explanation of Data and Methods

### 1. Manning's Values

Manning's roughness coefficients were determined based on photographs and aerial images of the project site. See Section I.C.2 for a detailed description of the Manning's values used.

### 2. Bridge Modeling Approach

The Bridge Modeling Approach used was Energy (Standard Step).

### 3. Ineffective Flow Areas

Ineffective flow areas were incorporated to account for areas in the cross-sectional geometry where ponded water will not be actively conveyed downstream.

### 4. Any Unusual Circumstances

There are no unusual circumstances specified in correlation with the hydraulic analysis of this project.

### 5. Table of HEC-RAS Plan Files

<b>Filename</b>	<b>Description</b>
183790 Existing Analysis	Existing Conditions Analysis
183790 Proposed Analysis	Proposed Conditions Analysis

See Appendix F - HEC-RAS Output Files

## **D. HEC-RAS Generated Tables**

### **1. Profile Summary of Existing and Proposed Conditions**

See Appendix D – HEC-RAS Profile Summary Tables

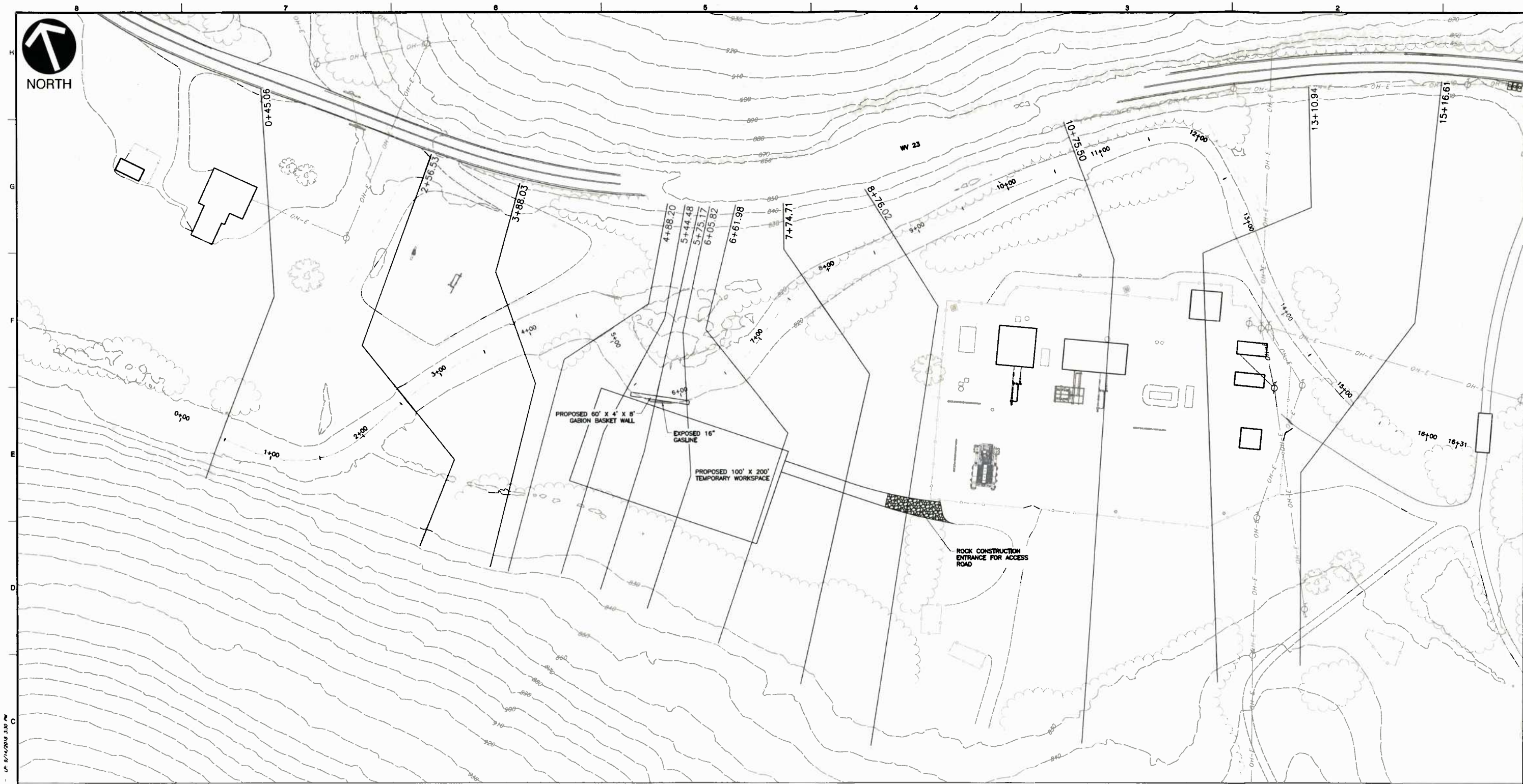
### **2. Detailed Output Tables**

See Appendix F – HEC-RAS Output Files

**APPENDIX A**

**Site Plan**

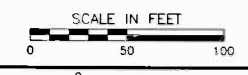




A:\2018\182-701-CADD\Drawings\182-701-05-Map.dwg (PLT) 15/09/18/2018 - 10:00:00 AM

**LEGEND**

	EXISTING INDEX CONTOUR
	EXISTING CONTOUR (INTER)
	EXISTING TREE LINE
	EXISTING FENCE
	EXISTING ROADS (PAVED)
	EXISTING ROADS (UNPAVED)
	EXISTING TREE
	EXISTING UTILITY POLE
	EXISTING OVERHEAD UTILITY
	EXISTING GASLINE



NO.	DATE	DESCRIPTION

**Civil & Environmental Consultants, Inc.**  
 600 Marketplace Ave · Suite 200 · Bridgeport, WV 26330  
 Ph: 304.933.3119 · 855.488.9539 · Fax: 304.933.3327  
 www.cecinc.com

**DOMINION ENERGY SERVICES, INC.**  
**TL-283 PIPELINE EXPOSURE PROJECT**  
 DODDRIDGE COUNTY, WV

<b>SITE PLAN WITH CROSS-SECTIONS</b>	
DATE	APD
SEPTEMBER 2018	APD
DWG SCALE	DRAFT
1" = 50'	183-790
PROJECT NO.	CHECKED BY:
183-790	
APPROVED BY:	DRAFT

**APPENDIX B**  
**FEMA FIRMette**



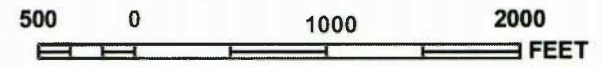
JOINS PANEL 0065



**DODDRIDGE COUNTY  
UNINCORPORATED AREAS  
540024**



MAP SCALE 1" = 1000'



**NFP  
NATIONAL FLOOD INSURANCE PROGRAM**

PANEL 0155C

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

PANEL 155 OF 325  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	540024	0155	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  
54017C0155C  
MAP REVISED  
OCTOBER 4, 2011**

Federal Emergency Management Agency

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](http://www.msc.fema.gov)

**APPENDIX C**

**Design Discharge Calculations**



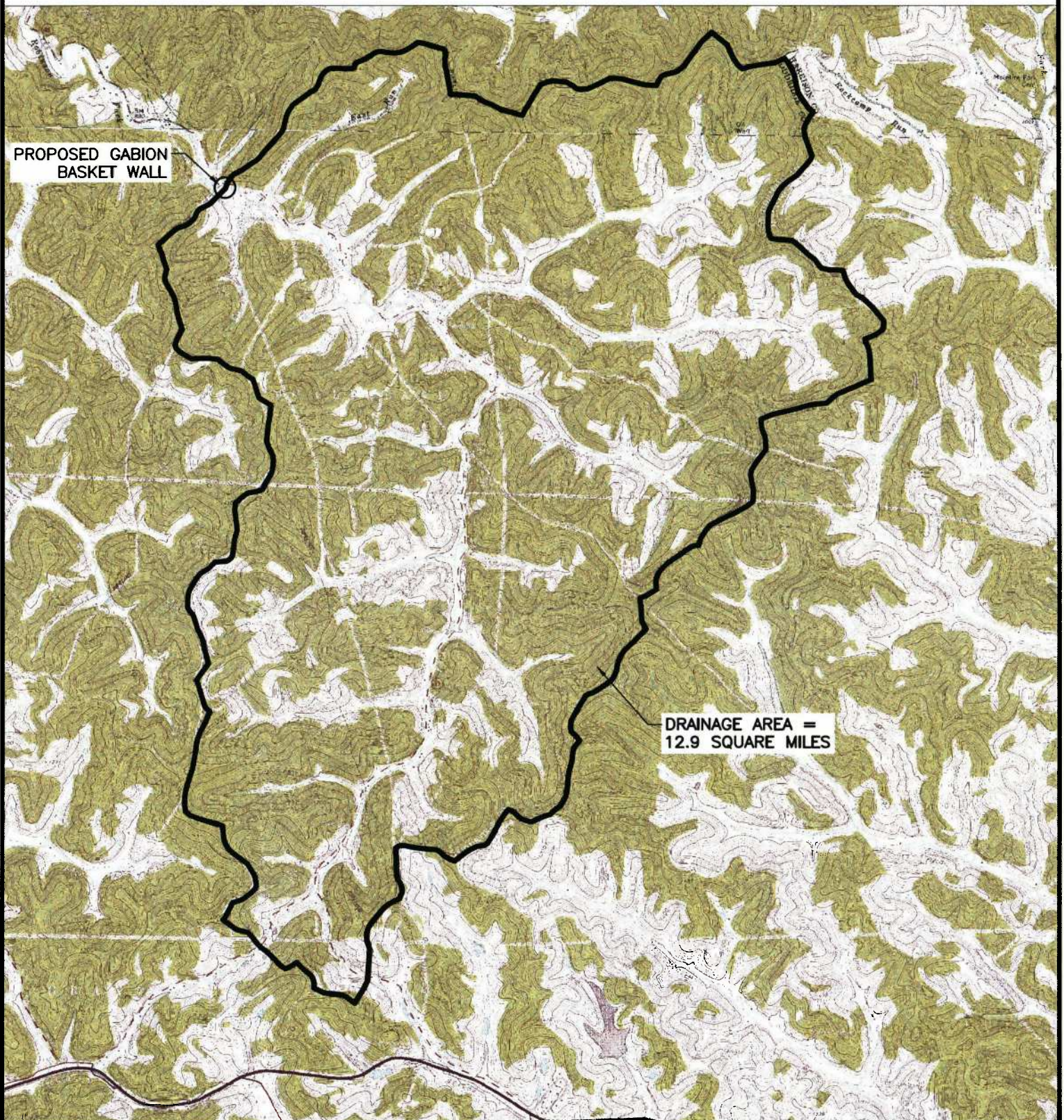


NORTH

# USGS LOCATION MAP

SCALE: 1" = 4,000 FT.

0' 4,000' 8,000'



PREPARED ON BEHALF OF:  
 DOMINION ENERGY SERVICES, INC.  
 5000 DOMINION BLVD  
 GLEN ALLEN, VIRGINIA 23060

PROJECT NO.  
 183-790

PROJECT NAME:  
 TL-283 STREAM EXPOSURE  
 PROJECT

DATE:  
 AUGUST 2018

SCALE:  
 AS SHOWN



**Civil & Environmental Consultants, Inc.**

600 Marketplace Ave · Suite 200 · Bridgeport, WV 26330

Ph: 304.933.3119 · Fax: 304.933.3327

www.cecinc.com



PROJECT TL-283 Stream ExposurePROJECT NO. 183-790PAGE 1 OF 1PREPARED BY APD DATE 8/21/18 CHECKED BY GSL DATE 9-17-18

$$\text{Drainage Area} = 8,256.6 \text{ acres} = 12.9 \text{ mi}^2$$

USGS Regression Equations (Western-Plateaus Region)

$$2\text{-year: } Q_2 = 129 (\text{DA})^{0.730} = (129)(12.9)^{0.730} = 834 \text{ cfs}$$

$$10\text{-year: } Q_{10} = 292 (\text{DA})^{0.699} = (292)(12.9)^{0.699} = 1,745 \text{ cfs}$$

$$25\text{-year: } Q_{25} = 391 (\text{DA})^{0.688} = (391)(12.9)^{0.688} = 2,271 \text{ cfs}$$

$$100\text{-year: } Q_{100} = 557 (\text{DA})^{0.674} = (557)(12.9)^{0.674} = 3,122 \text{ cfs}$$

**APPENDIX D**

**HEC-RAS Profile Summary Tables**

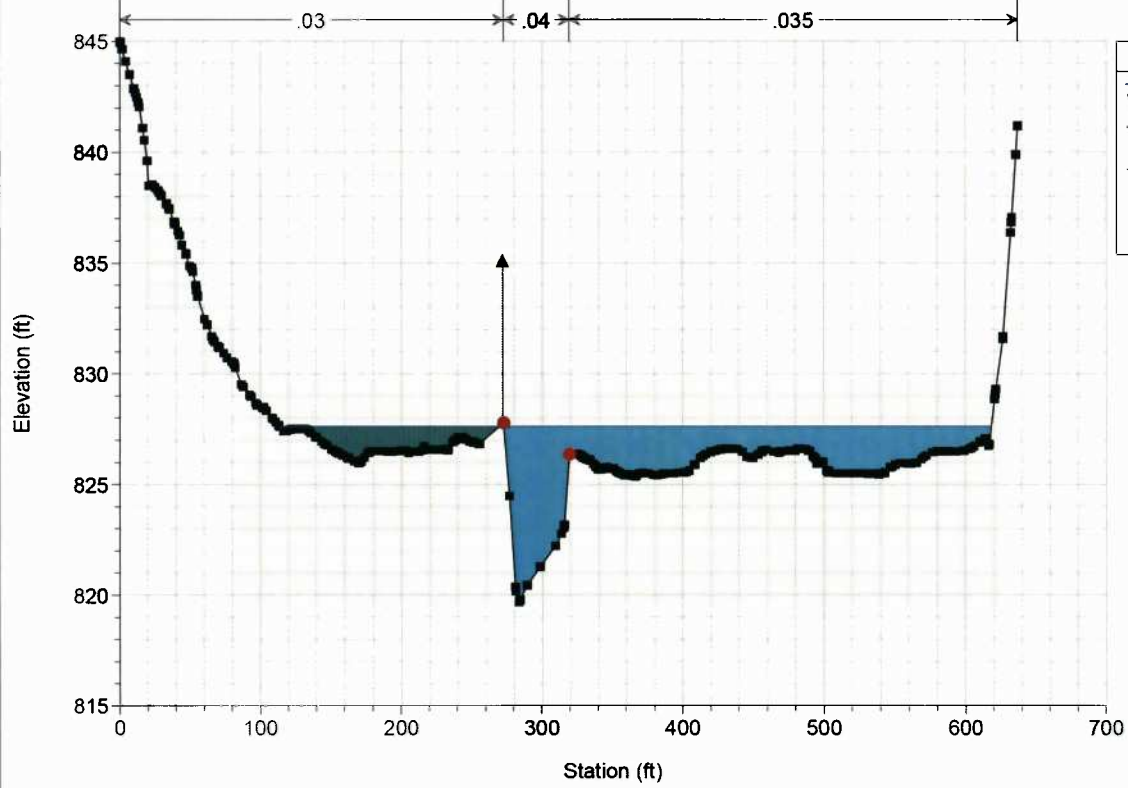
HEC-RAS River: Robinson Fork Reach: Robinson Fork Profile: 100 YR

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Robinson Fork	1516.61	100 YR	Existing	3122.00	819.70	827.63	827.22	828.02	0.003187	6.21	727.79	502.07	0.46
Robinson Fork	1516.61	100 YR	Proposed	3122.00	819.70	827.63	827.22	828.02	0.003187	6.21	727.81	502.07	0.46
Robinson Fork	1310.94	100 YR	Existing	3122.00	819.38	827.21	826.03	827.52	0.001941	5.37	752.62	534.44	0.37
Robinson Fork	1310.94	100 YR	Proposed	3122.00	819.38	827.21	826.03	827.52	0.001940	5.37	752.67	534.45	0.37
Robinson Fork	1075.5	100 YR	Existing	3122.00	818.14	826.08	825.67	826.83	0.004034	7.90	506.88	425.12	0.53
Robinson Fork	1075.5	100 YR	Proposed	3122.00	818.14	826.09	825.67	826.83	0.004021	7.89	507.53	425.50	0.53
Robinson Fork	876.02	100 YR	Existing	3122.00	817.55	825.68	825.19	826.11	0.002568	6.53	698.00	529.89	0.44
Robinson Fork	876.02	100 YR	Proposed	3122.00	817.55	825.69	825.19	826.12	0.002537	6.50	700.91	529.89	0.44
Robinson Fork	774.71	100 YR	Existing	3122.00	817.91	825.81		825.91	0.000531	3.08	1392.96	468.47	0.20
Robinson Fork	774.71	100 YR	Proposed	3122.00	817.91	825.82		825.91	0.000527	3.07	1396.85	468.54	0.20
Robinson Fork	661.98	100 YR	Existing	3122.00	817.19	825.76		825.84	0.000547	3.09	1806.31	435.49	0.20
Robinson Fork	661.98	100 YR	Proposed	3122.00	817.19	825.76		825.85	0.000543	3.08	1610.11	435.52	0.20
Robinson Fork	605.82	100 YR	Existing	3122.00	816.75	825.64		825.79	0.001072	4.35	1291.26	348.08	0.27
Robinson Fork	605.82	100 YR	Proposed	3122.00	816.75	825.65		825.80	0.001100	4.20	1290.82	348.20	0.27
Robinson Fork	575.17	100 YR	Existing	3122.00	816.62	825.60		825.76	0.001222	4.26	1269.21	325.50	0.26
Robinson Fork	575.17	100 YR	Proposed	3122.00	816.94	825.60		825.76	0.001474	3.14	1225.22	325.47	0.25
Robinson Fork	544.48	100 YR	Existing	3122.00	816.71	825.59		825.72	0.000746	3.67	1376.36	326.47	0.23
Robinson Fork	544.48	100 YR	Proposed	3122.00	816.71	825.59		825.72	0.000746	3.67	1376.36	326.47	0.23
Robinson Fork	488.2	100 YR	Existing	3122.00	813.60	825.58		825.67	0.000422	3.15	1523.95	368.65	0.17
Robinson Fork	488.2	100 YR	Proposed	3122.00	813.60	825.58		825.67	0.000422	3.15	1523.95	368.65	0.17
Robinson Fork	388.03	100 YR	Existing	3122.00	815.67	825.49		825.63	0.000615	3.39	1065.54	264.58	0.21
Robinson Fork	388.03	100 YR	Proposed	3122.00	815.67	825.49		825.63	0.000615	3.39	1065.54	264.58	0.21
Robinson Fork	256.53	100 YR	Existing	3122.00	815.99	825.35		825.53	0.000777	3.96	953.68	265.64	0.24
Robinson Fork	256.53	100 YR	Proposed	3122.00	815.99	825.35		825.53	0.000777	3.96	953.68	265.64	0.24
Robinson Fork	45.06	100 YR	Existing	3122.00	815.93	824.60	823.05	825.21	0.002597	6.93	537.04	140.74	0.45
Robinson Fork	45.06	100 YR	Proposed	3122.00	815.93	824.60	823.05	825.21	0.002597	6.93	537.04	140.74	0.45



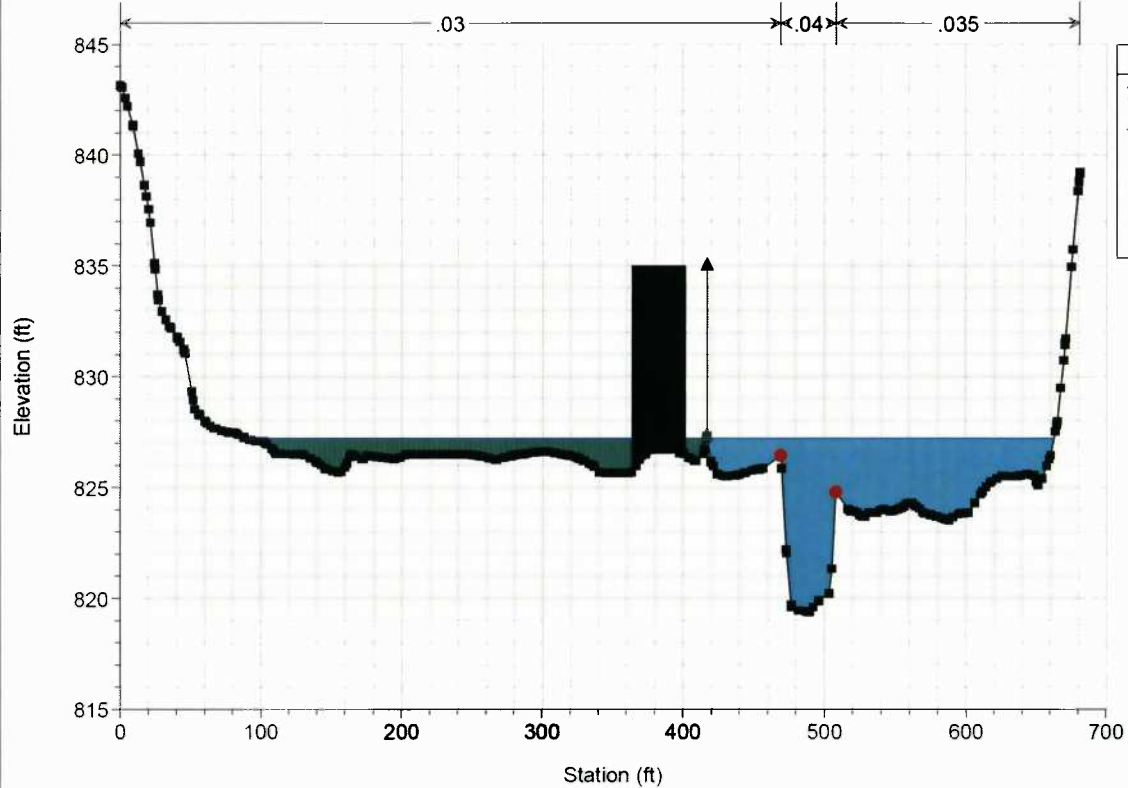
**APPENDIX E**  
**HEC-RAS Cross-Section Reports**

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RS = 1516.61



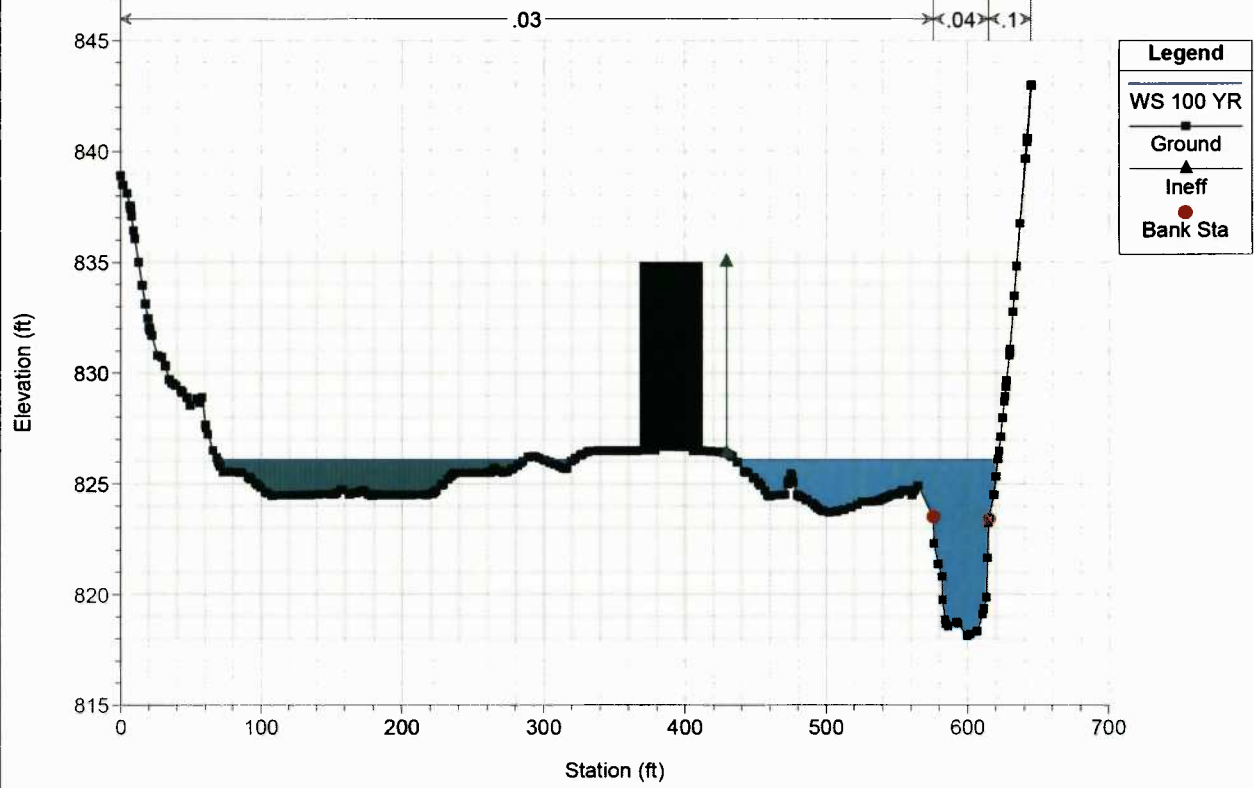
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Ground	▲
Ineff	▲
Bank Sta	●

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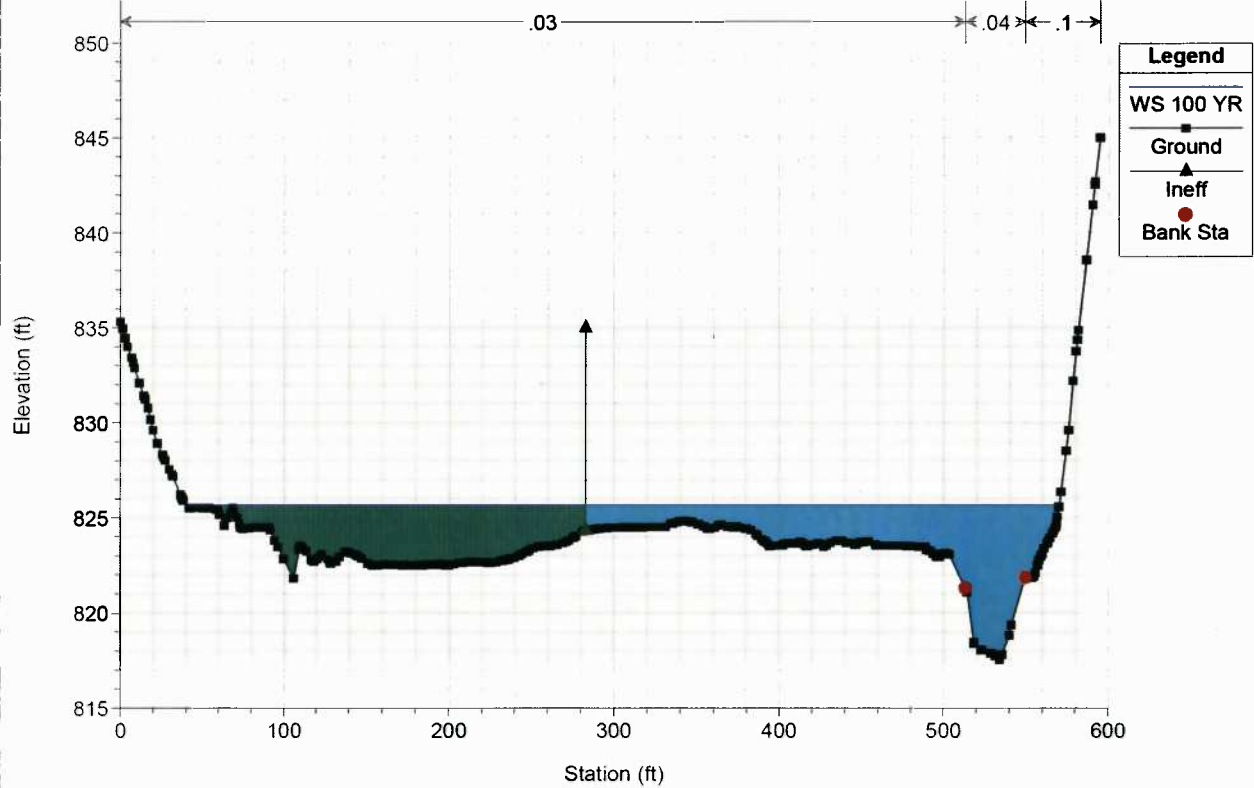


Legend	
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Ground	▲
Ineff	▲
Bank Sta	●

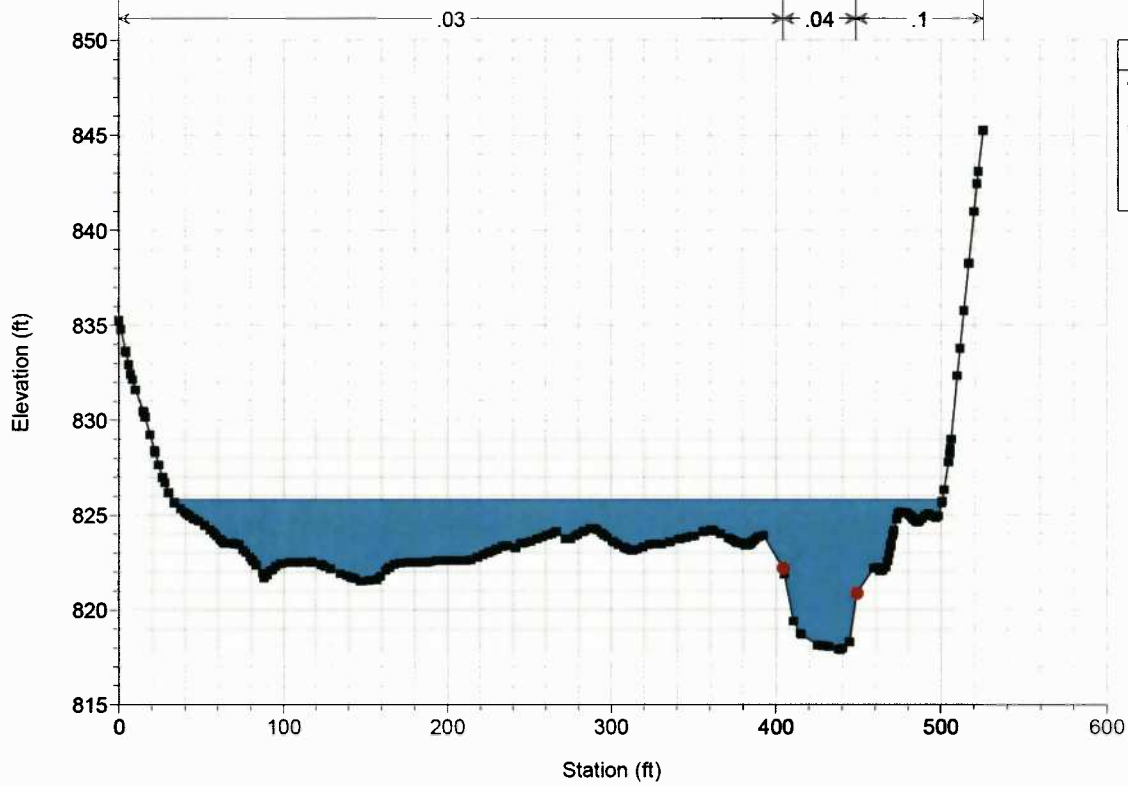
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RS = 1075.5



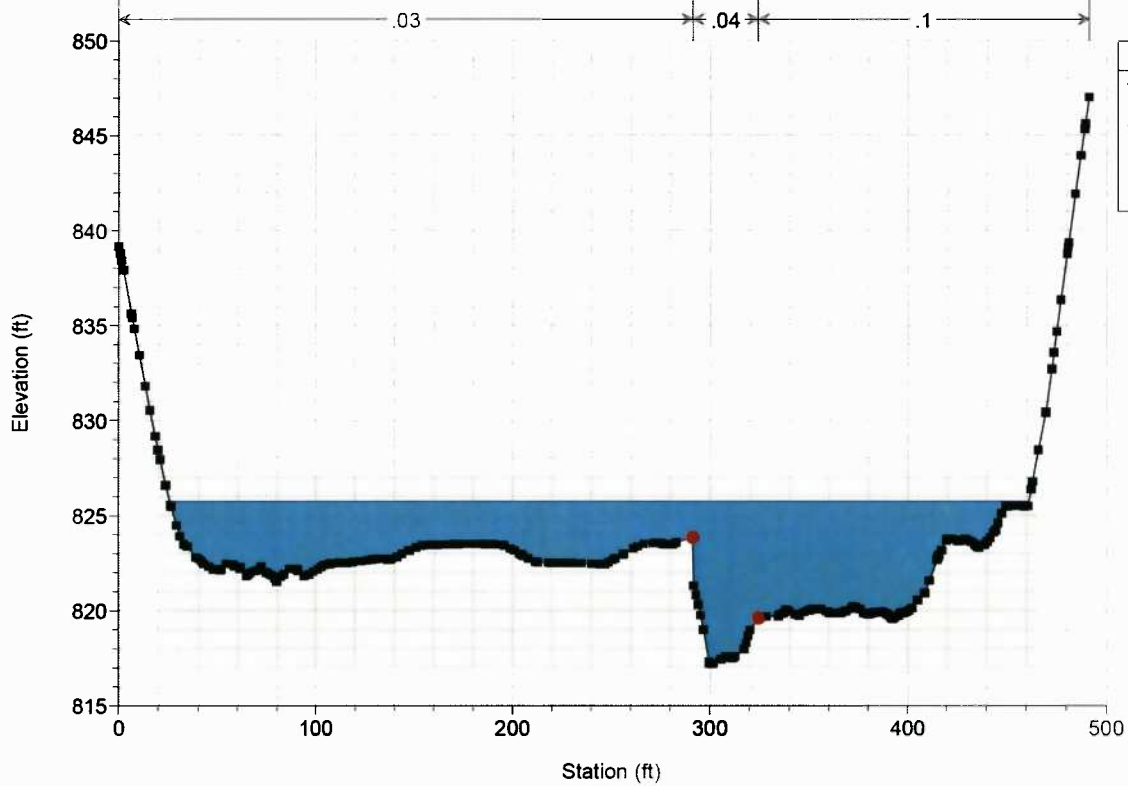
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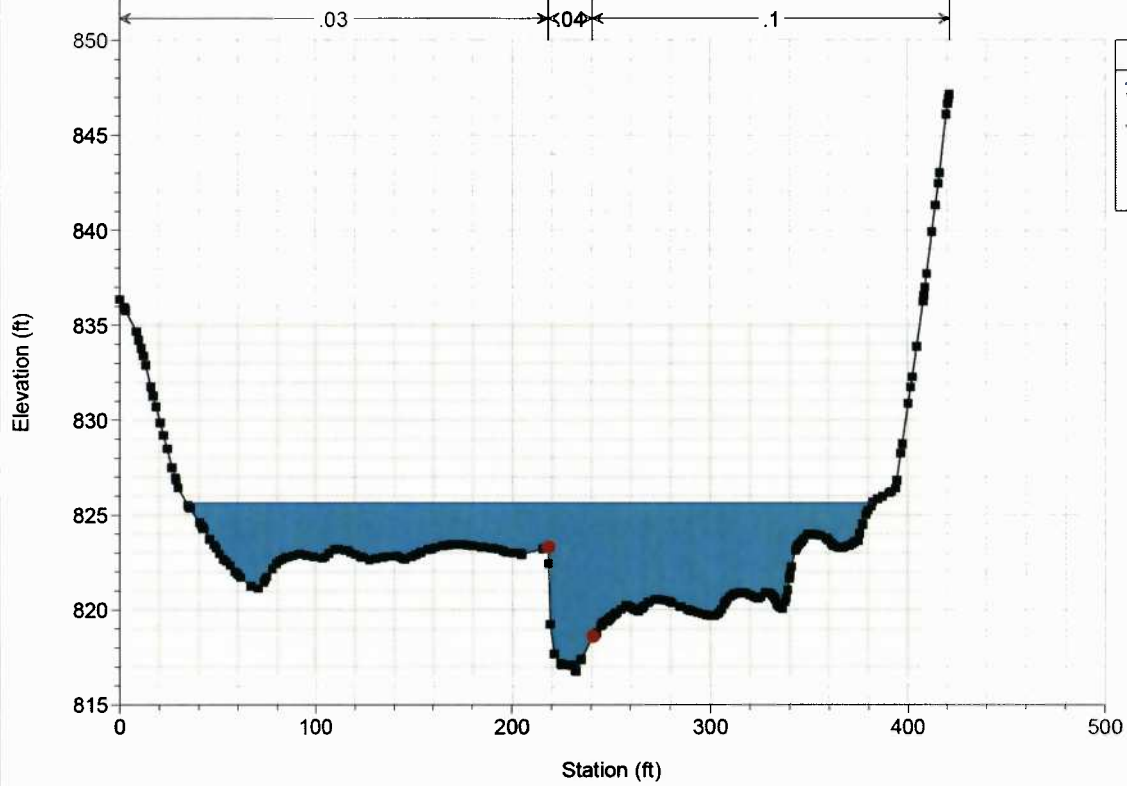
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RS = 774.71



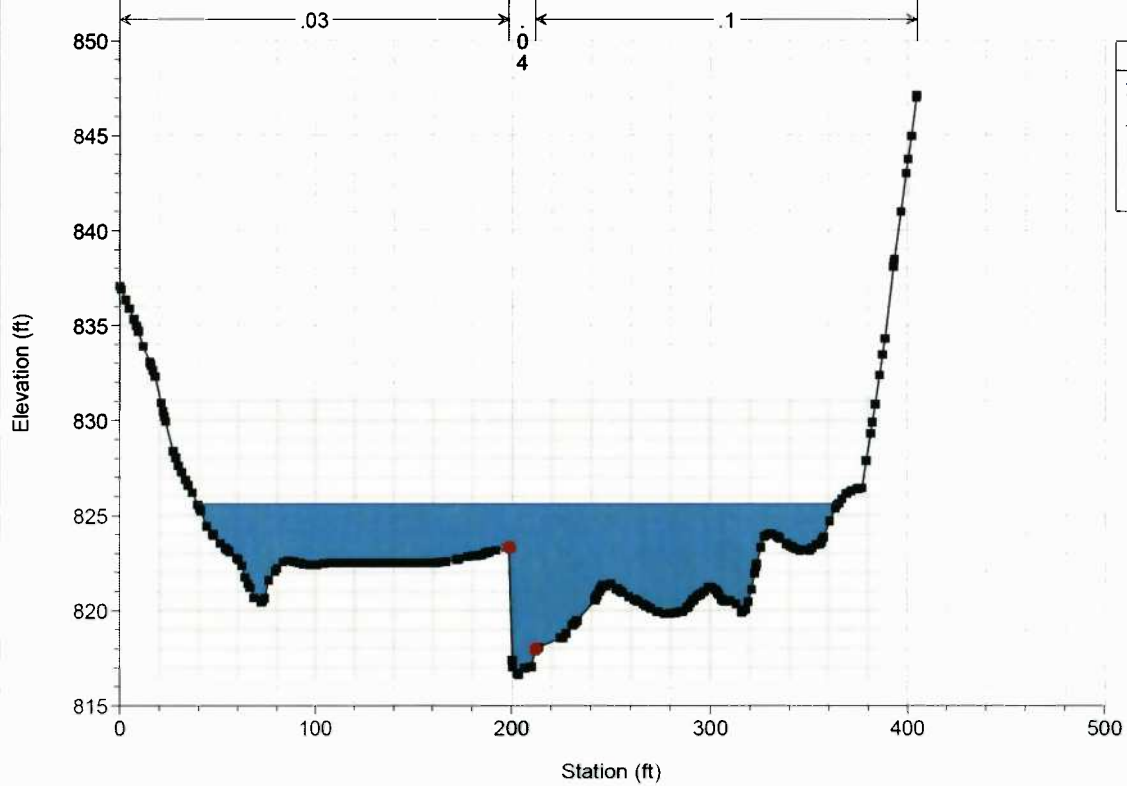
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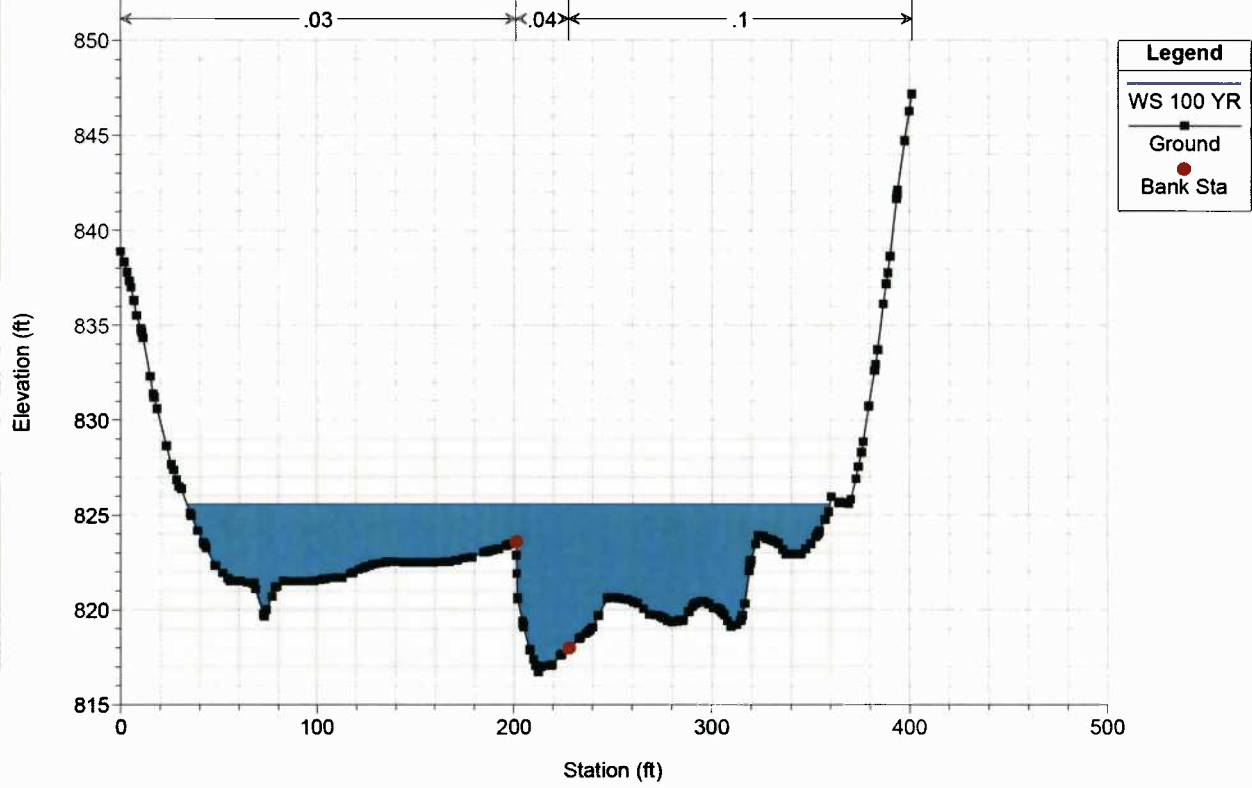
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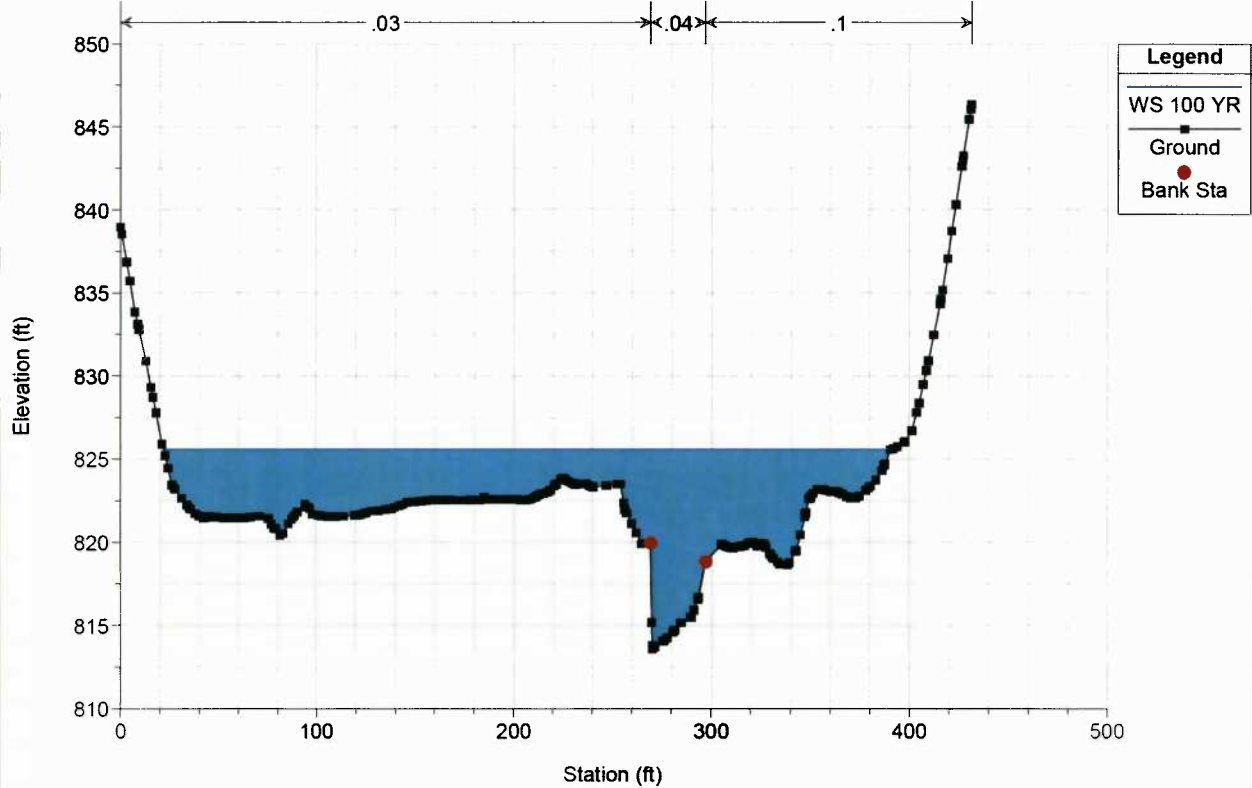
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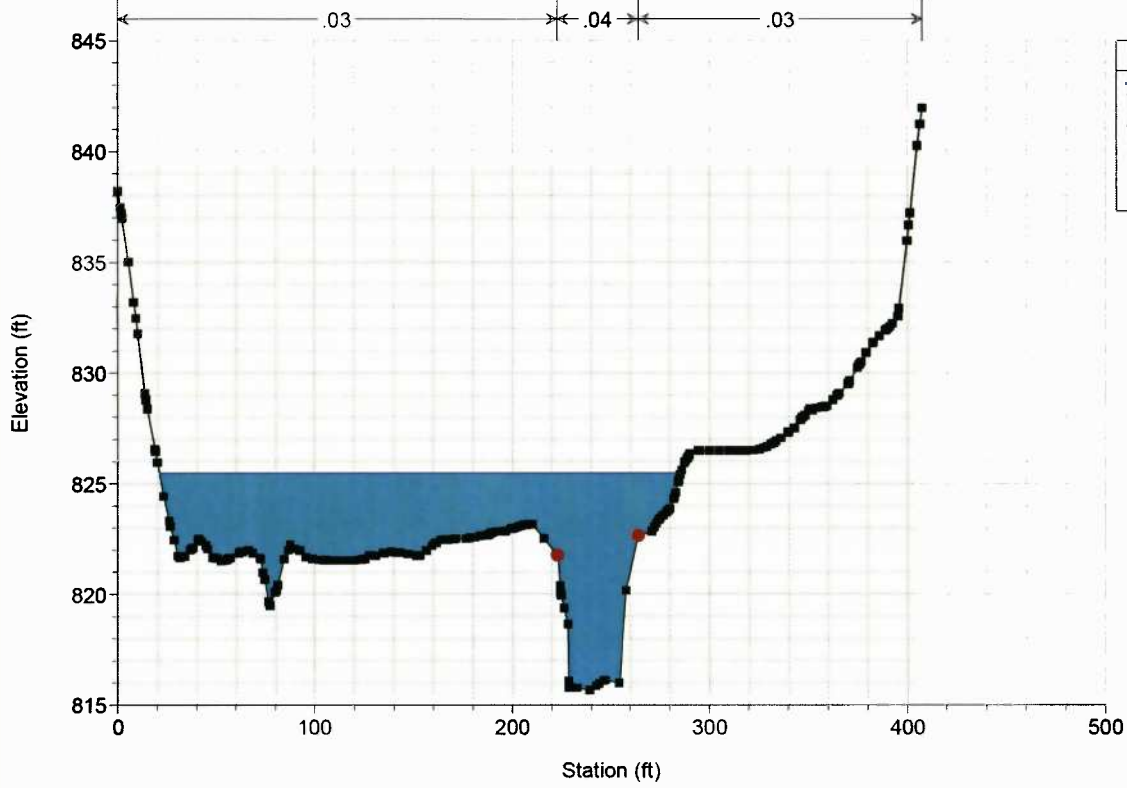
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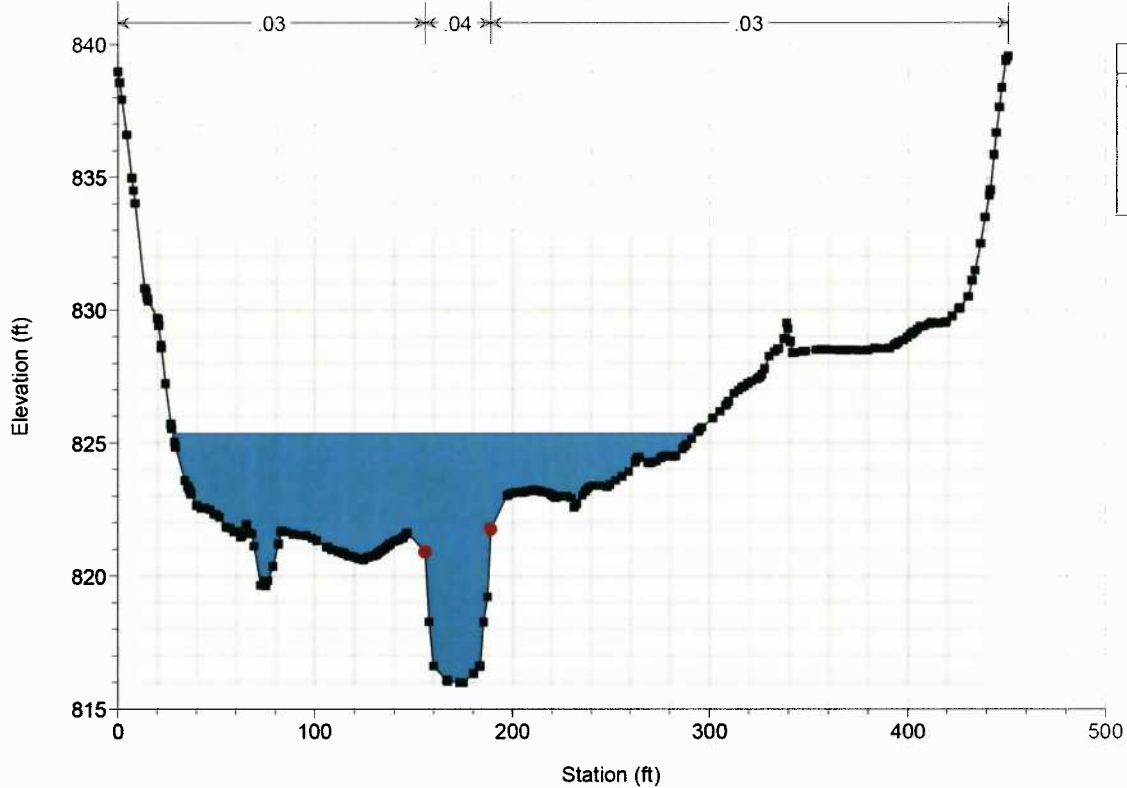
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183790 Analysis Plan: 183790 Existing Analysis 9/14/2018  
RS = 388.03



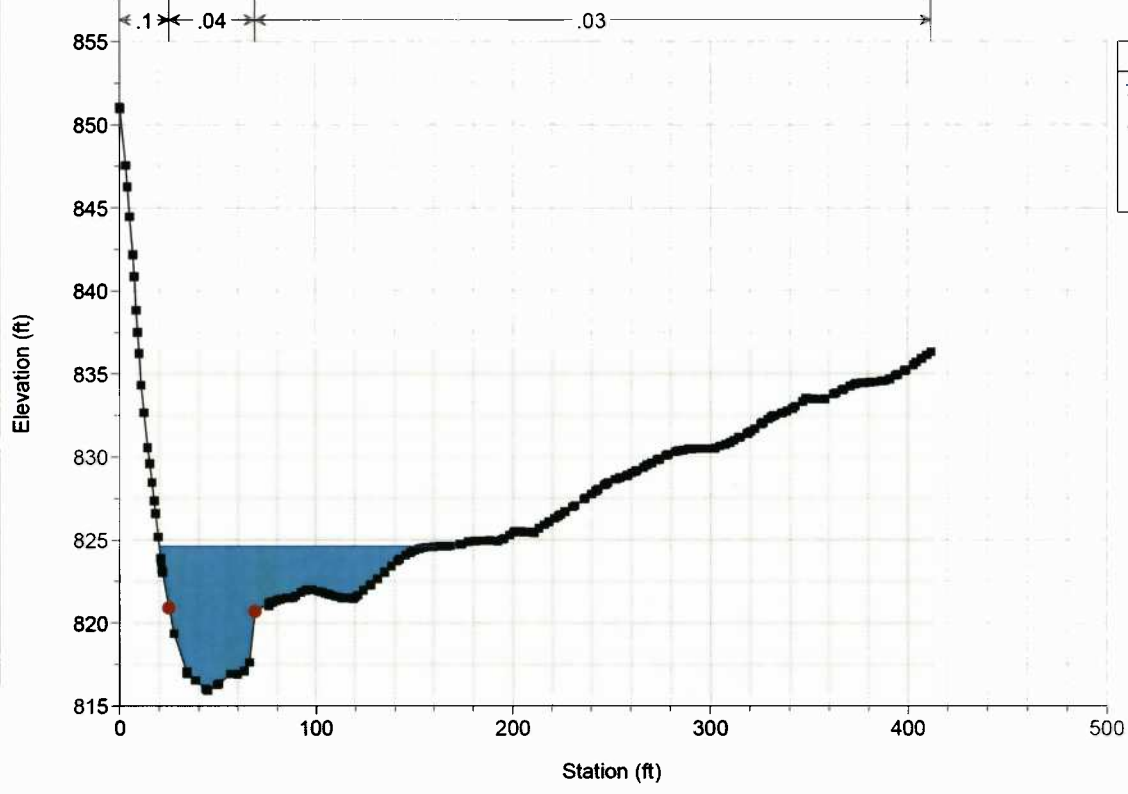
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RS = 256.53





183790 Analysis Plan: 183790 Existing Analysis 9/14/2018

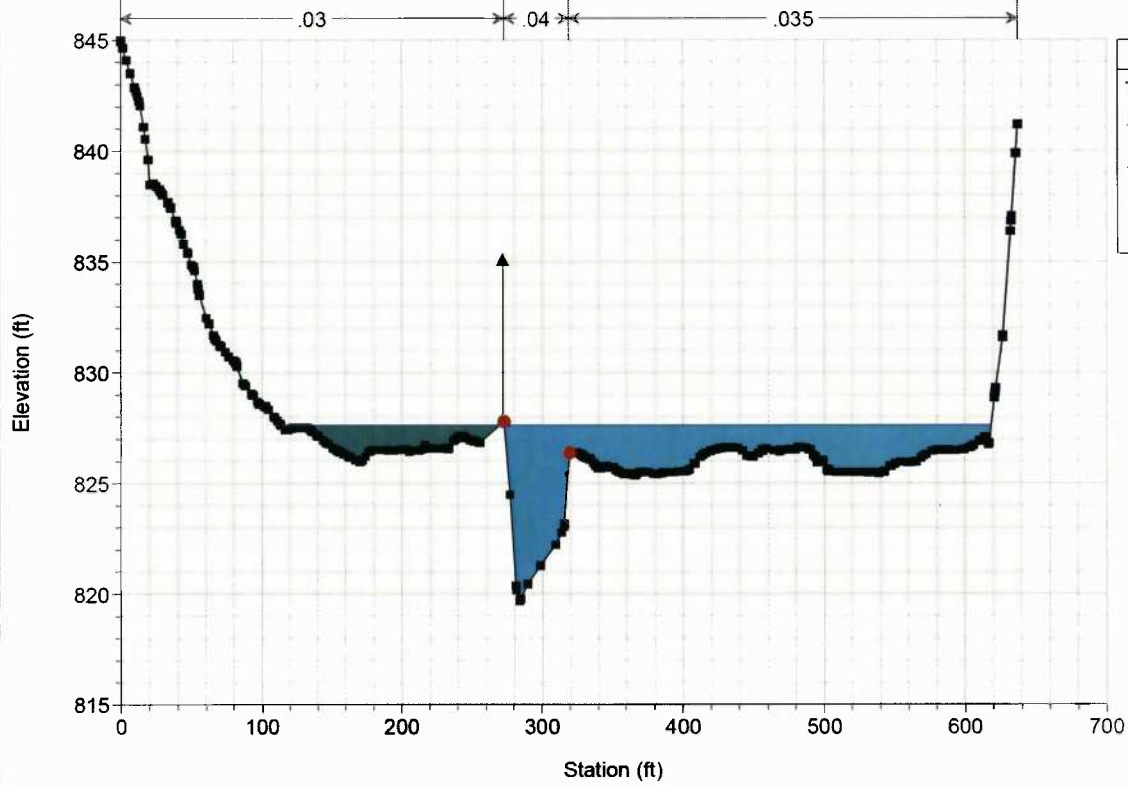
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Legend	
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Ground	■
Bank Sta	●

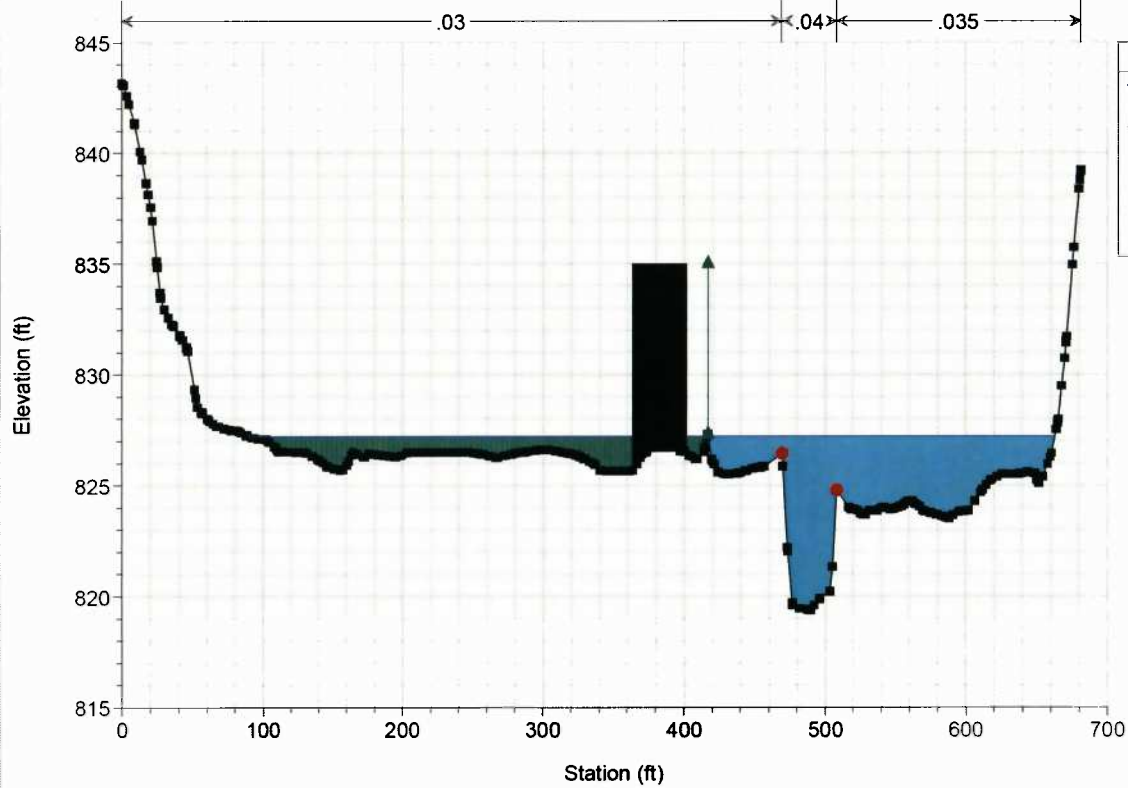


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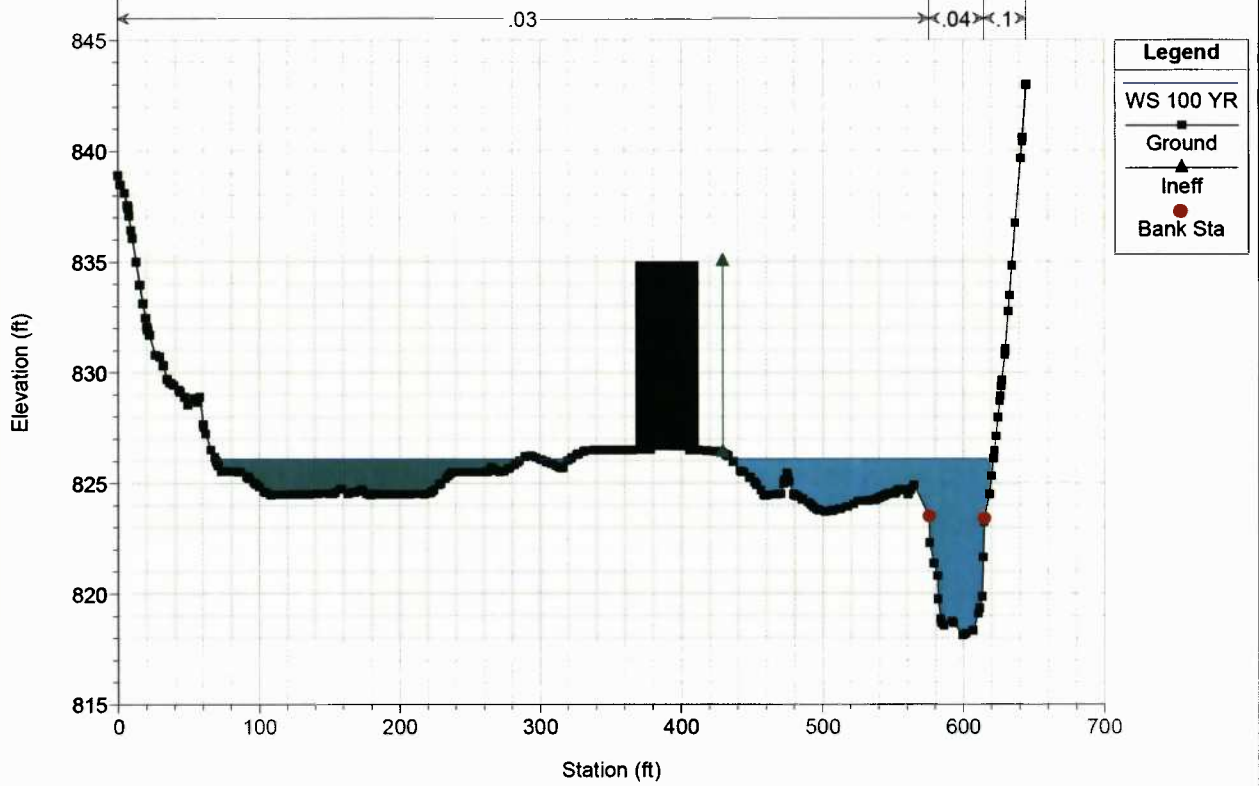
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Ineff	▲
Bank Sta	●

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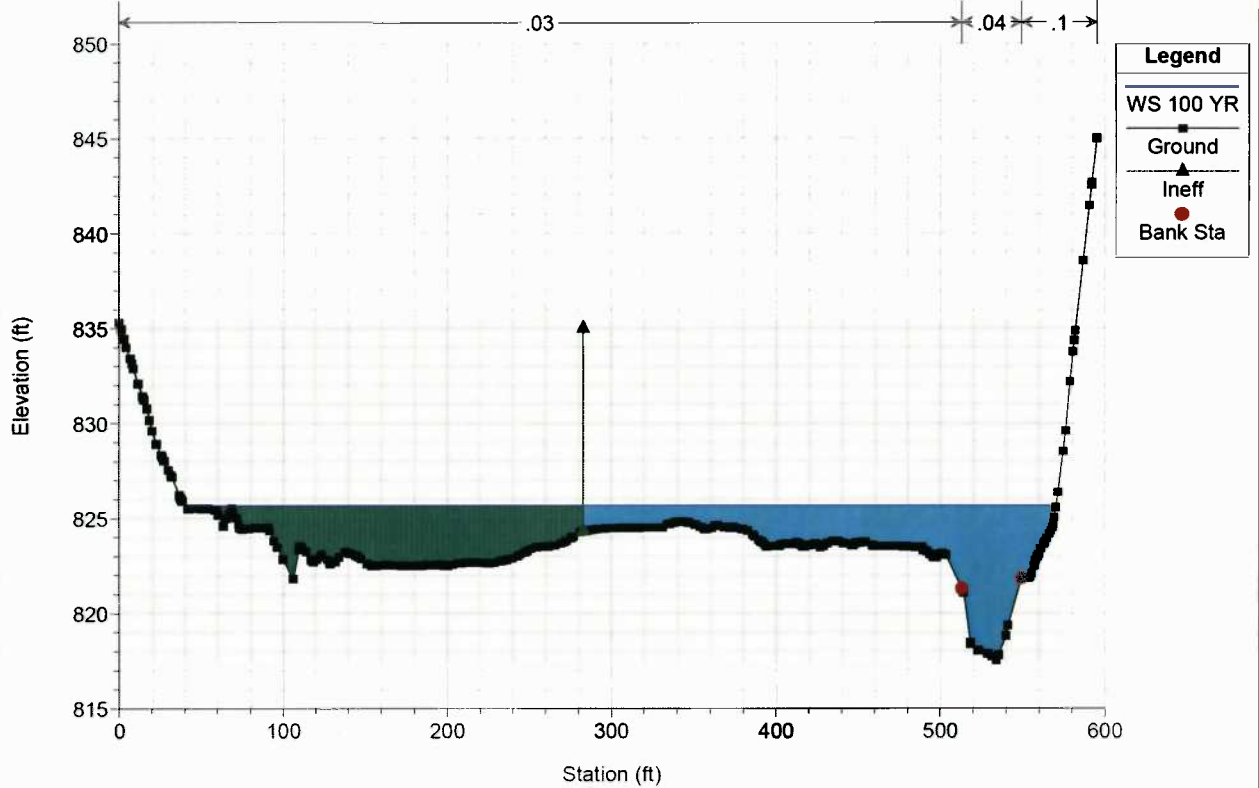


Legend	
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Ground	—▲—
Ineff	▲
Bank Sta	●

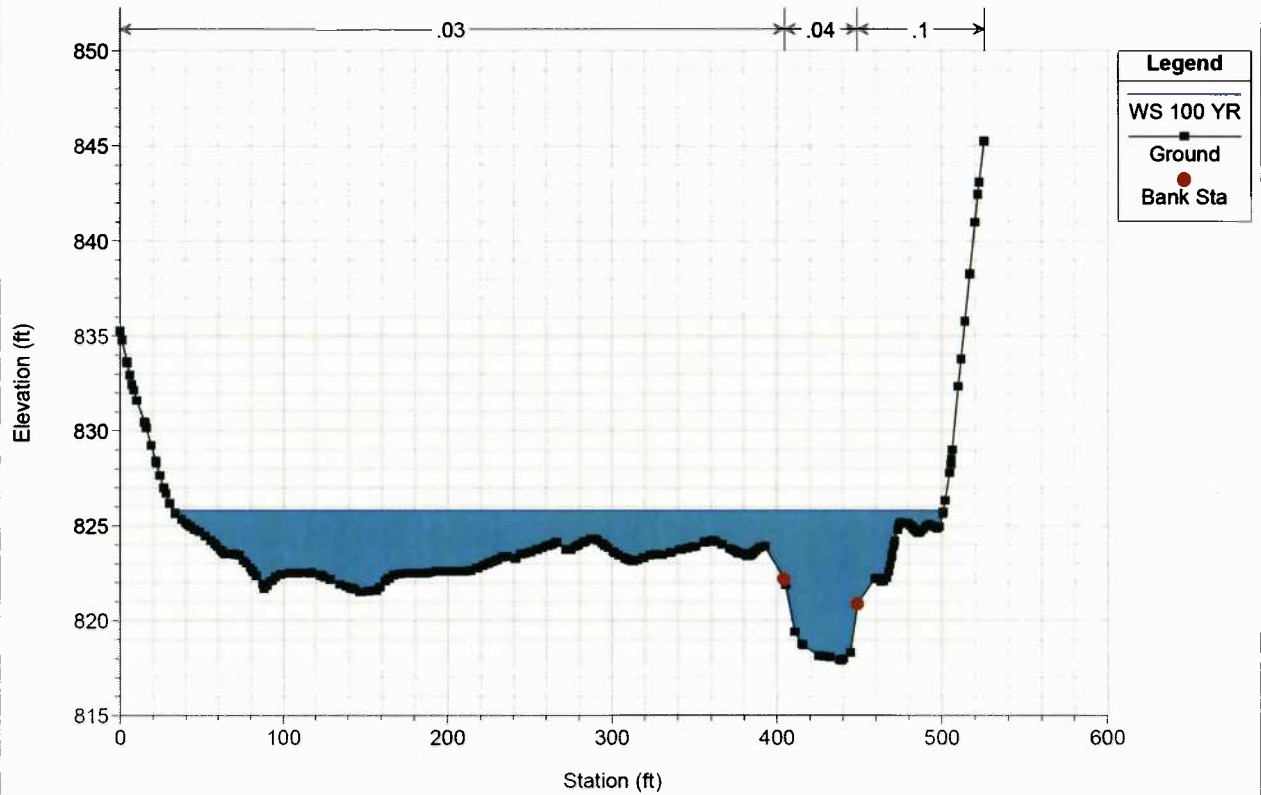
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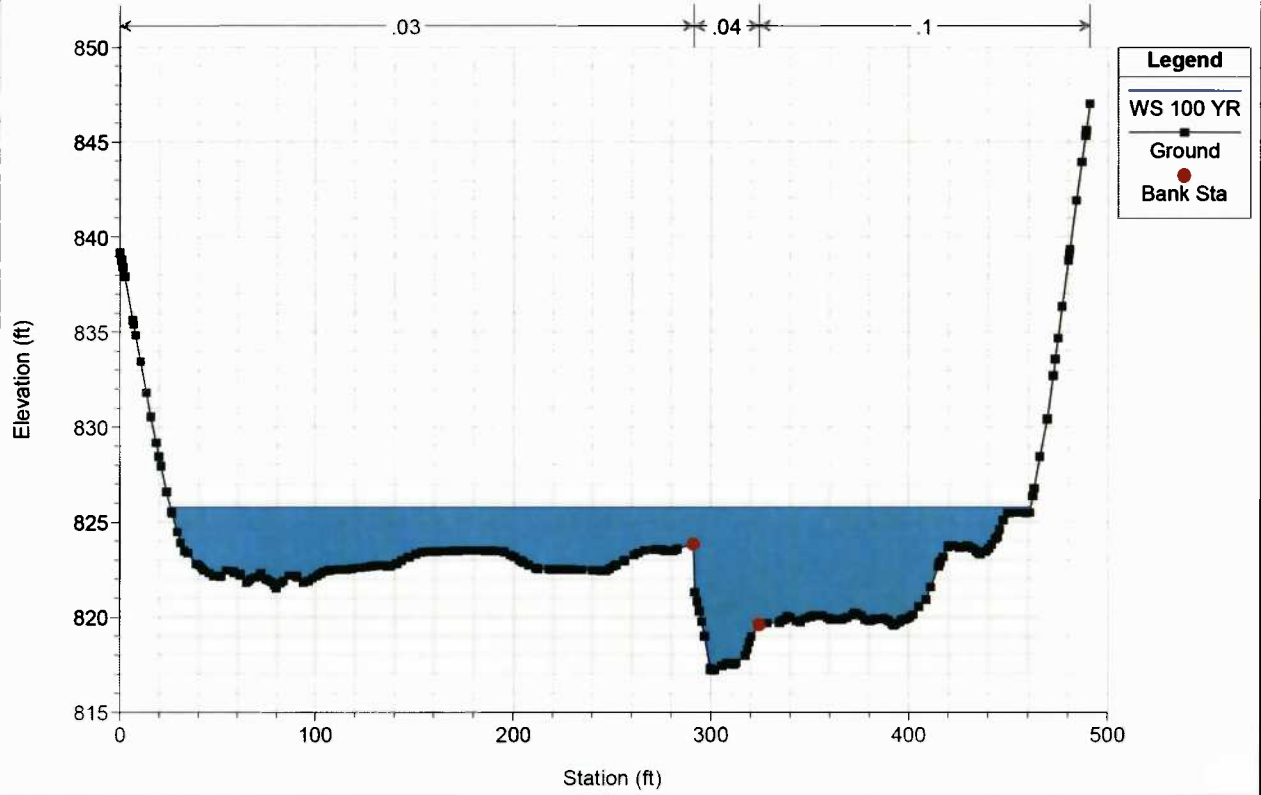
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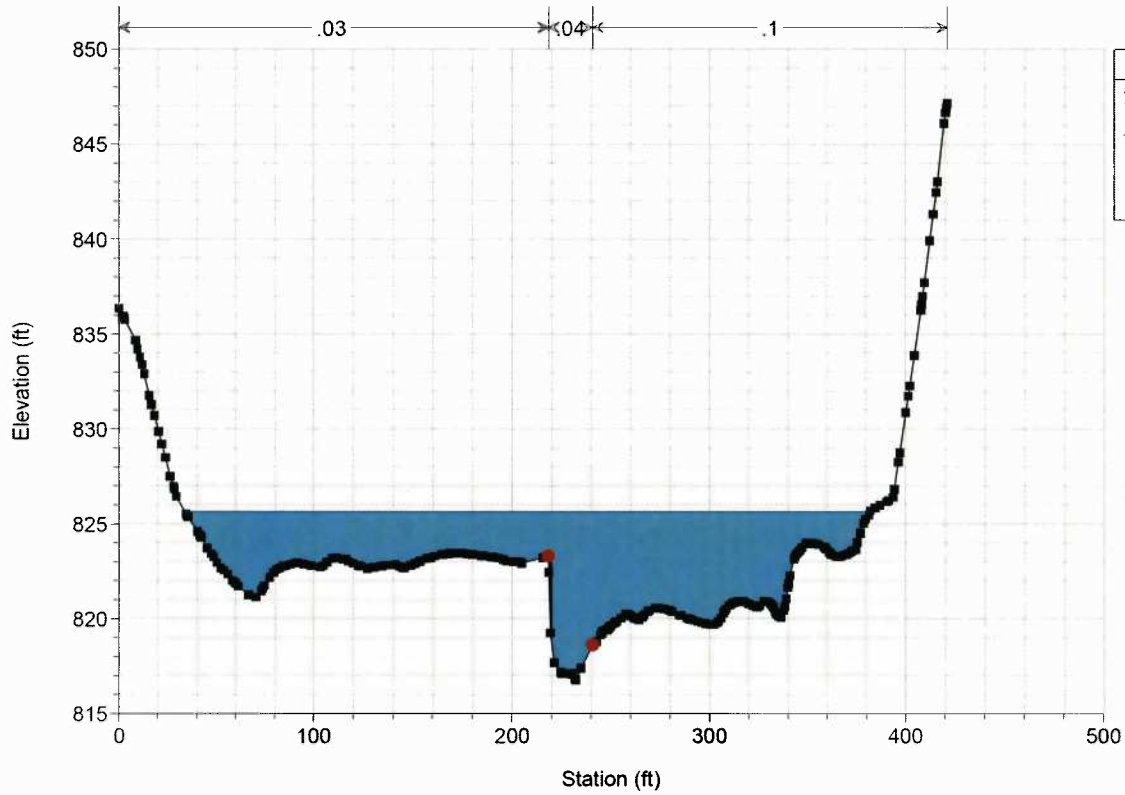
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RS = 774.71



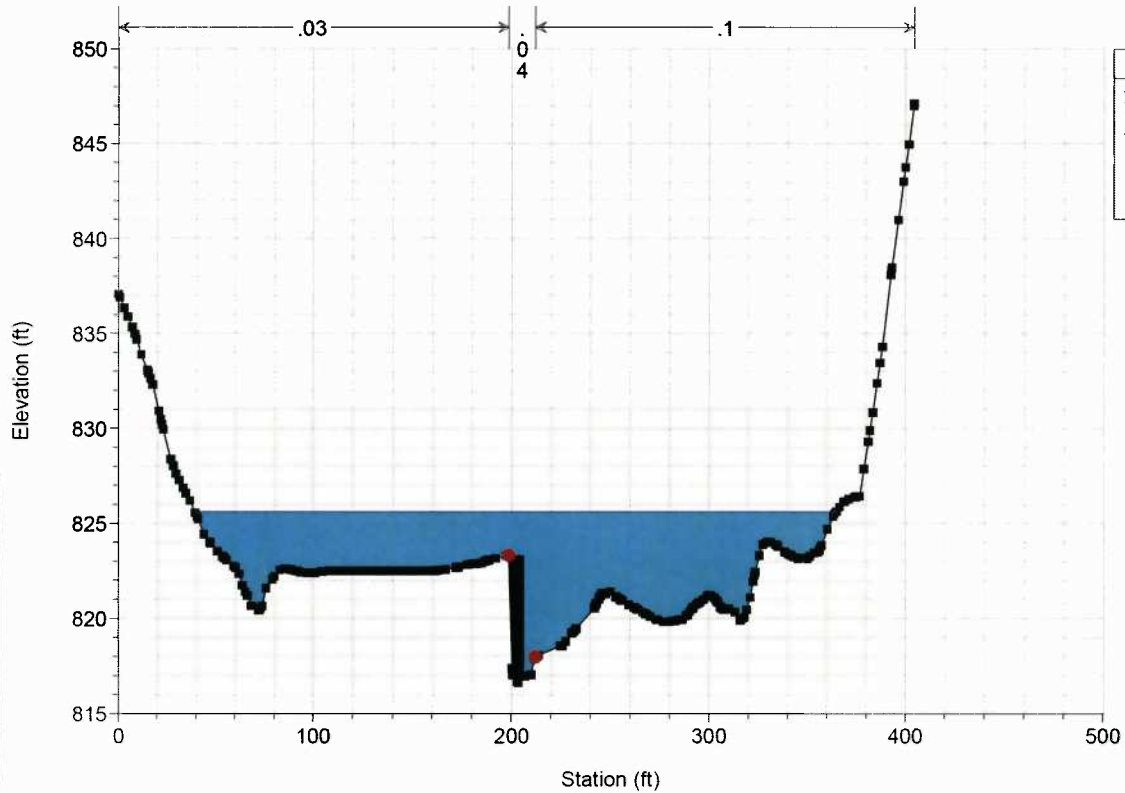
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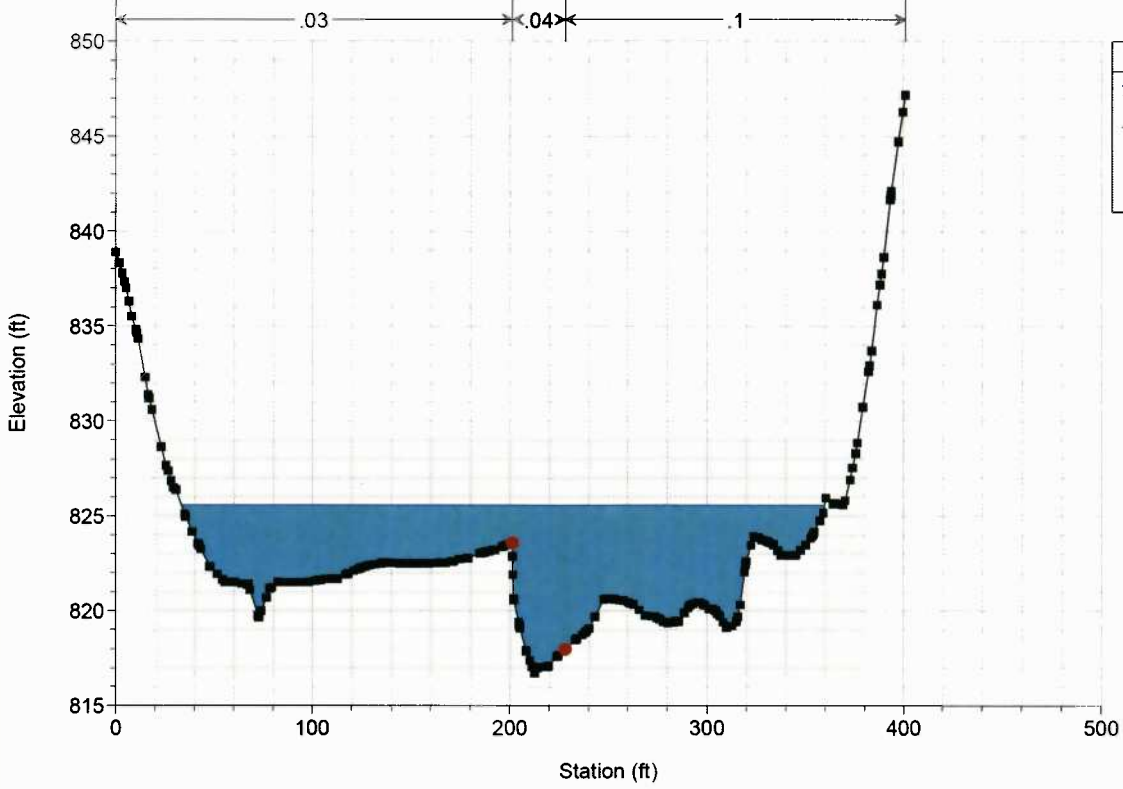
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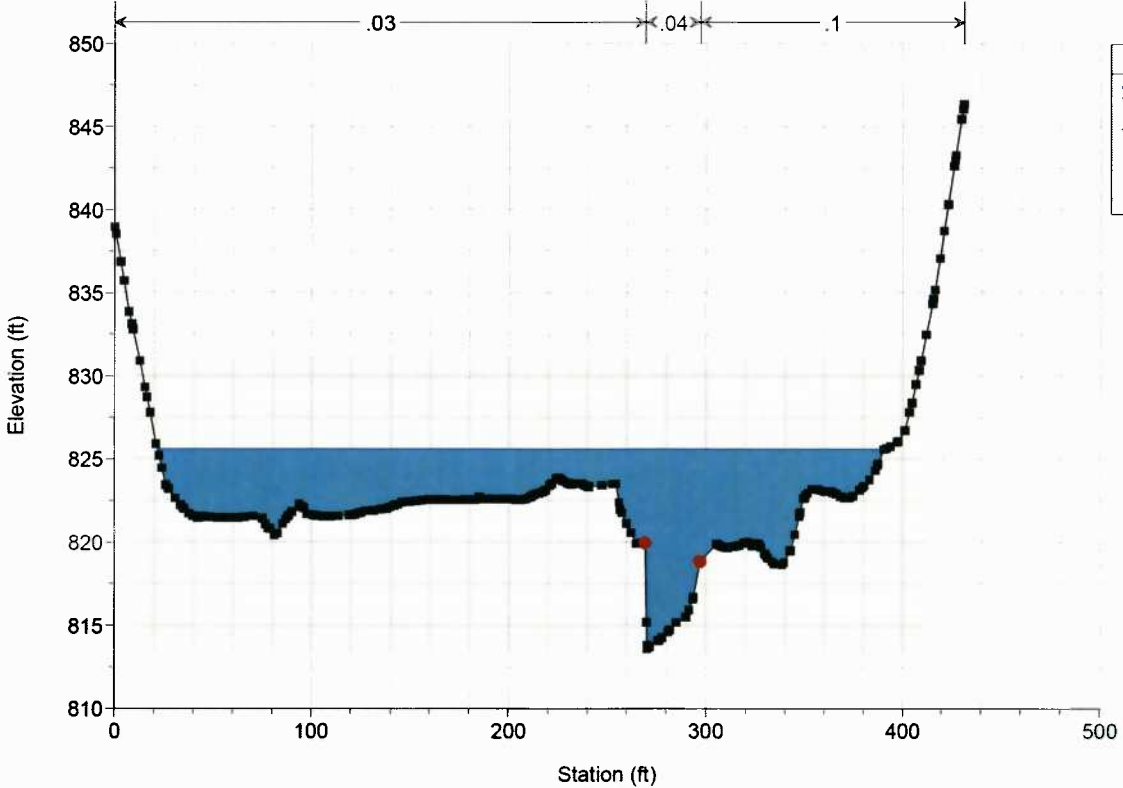
183790 Analysis Plan: 183790 Proposed Analysis 9/14/2018  
RS = 575.17



183790 Analysis Plan: 183790 Proposed Analysis 9/14/2018  
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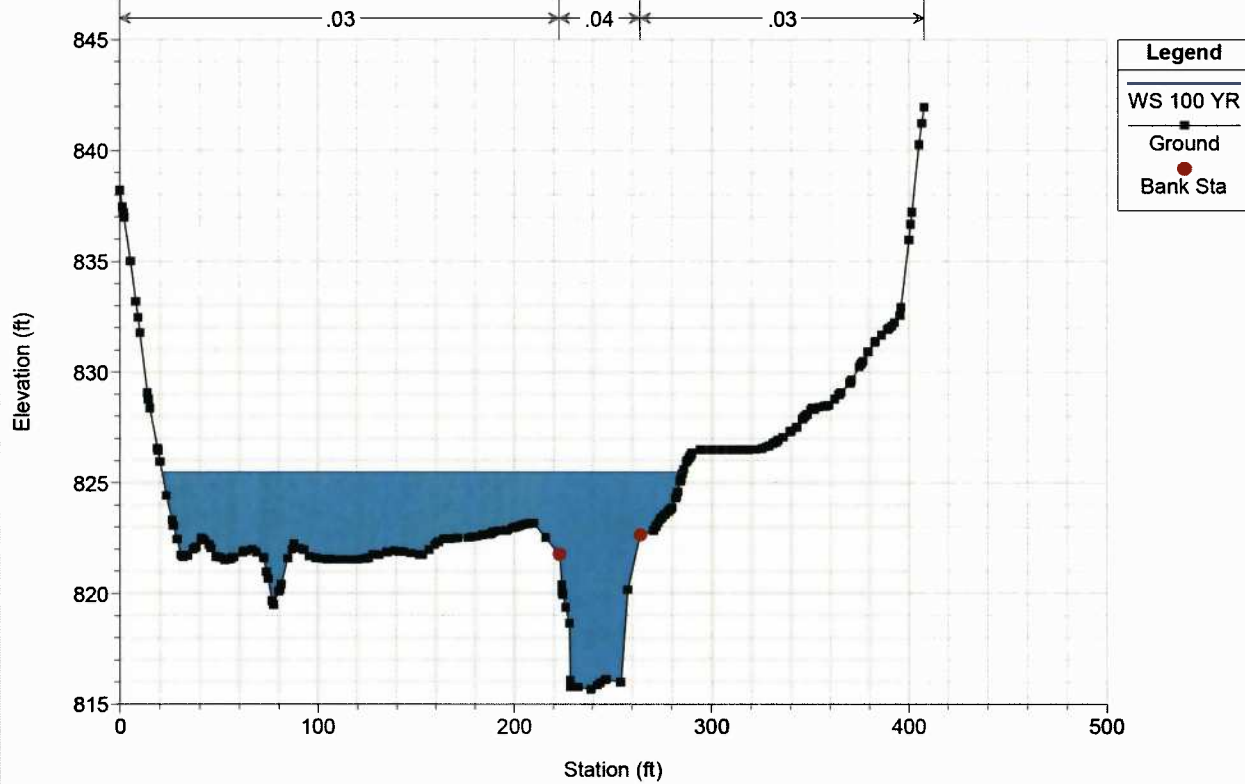


183790 Analysis Plan: 183790 Proposed Analysis 9/14/2018  
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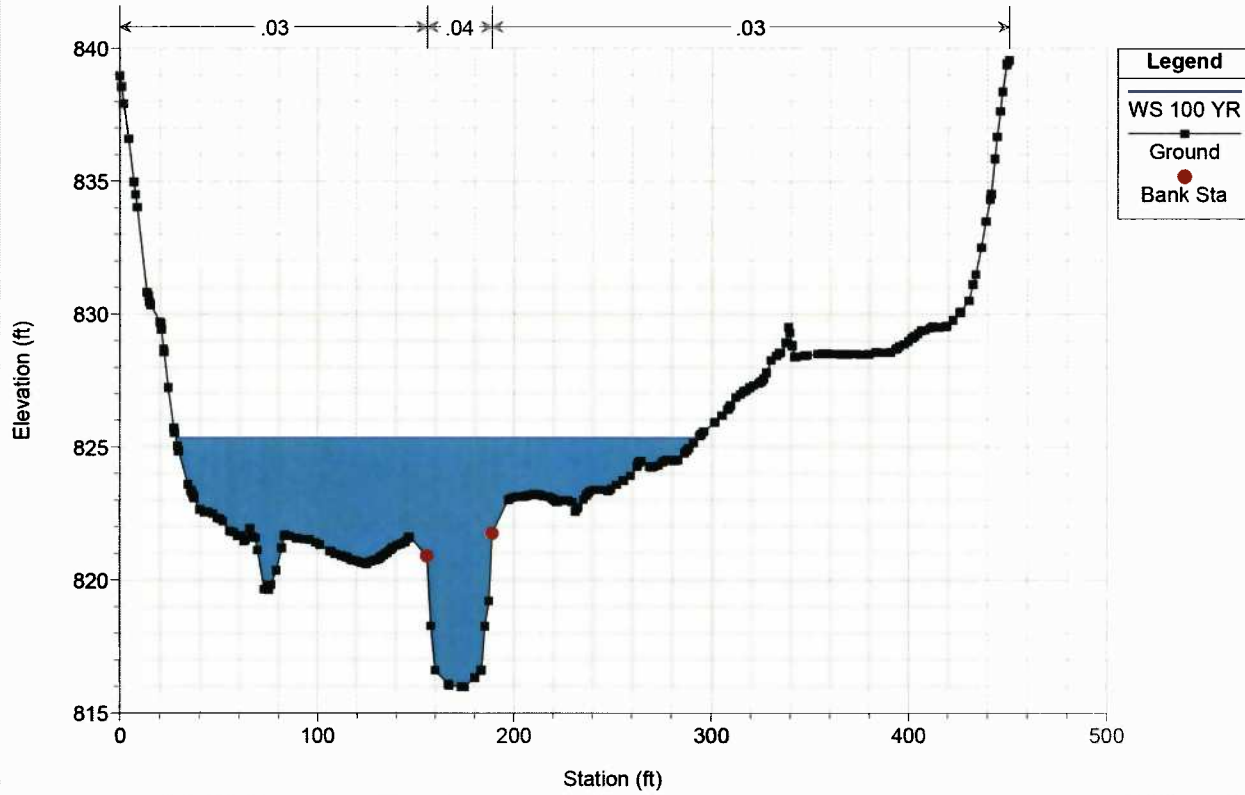




183790 Analysis Plan: 183790 Proposed Analysis 9/14/2018  
RS = 388.03

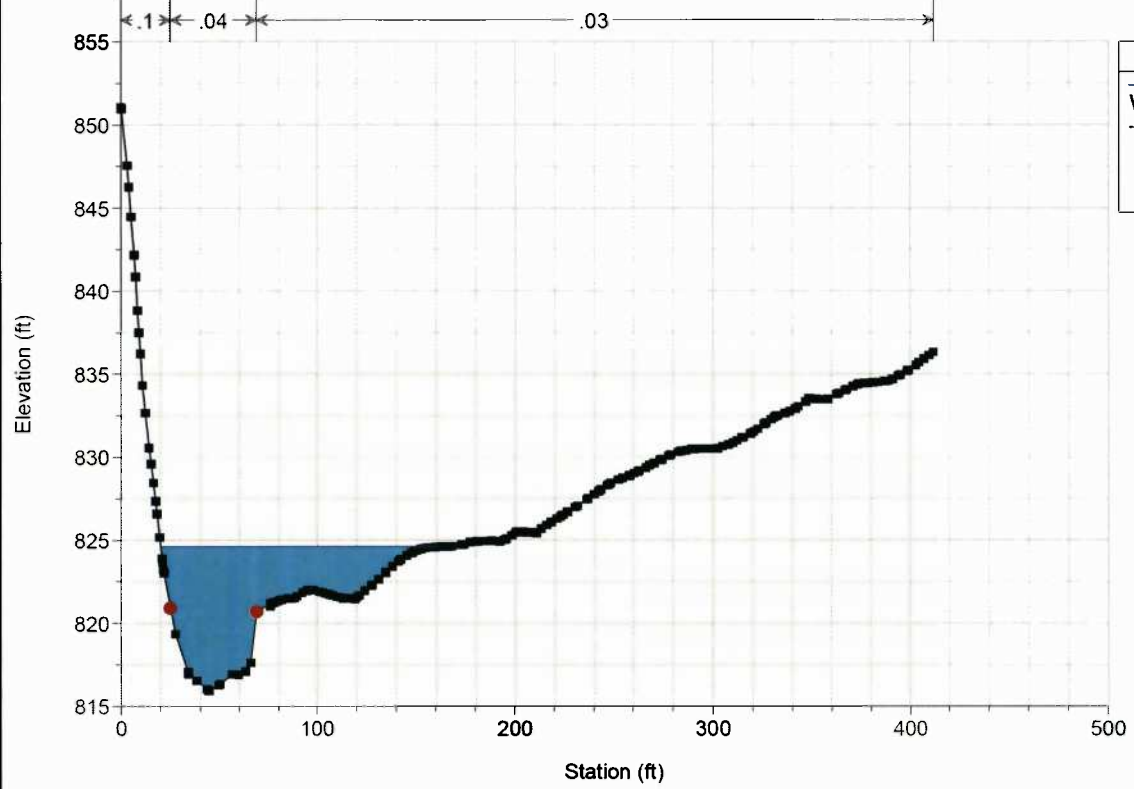


183790 Analysis Plan: 183790 Proposed Analysis 9/14/2018  
RS = 256.53



183790 Analysis Plan: 183790 Proposed Analysis 9/14/2018

RS = 45.06



**APPENDIX F**  
**HEC-RAS Output Files**



183790Analysis.rep

HEC-RAS HEC-RAS 5.0.3 September 2016  
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
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: 183790 Analysis  
Project File : 183790Analysis.prj  
Run Date and Time: 9/14/2018 2:47:52 PM

Project in English units

PLAN DATA

Plan Title: 183790 Existing Analysis  
Plan File : p:\2018\183-790\Calculations\HEC-RAS\183790Analysis.p01

Geometry Title: 183790 Existing Geometry  
Geometry File : p:\2018\183-790\Calculations\HEC-RAS\183790Analysis.g01

Flow Title : 183790 Flow  
Flow File : p:\2018\183-790\Calculations\HEC-RAS\183790Analysis.f01

Plan Summary Information:

Number of:	Cross Sections =	13	Multiple openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	0	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: 183790 Flow

Flow File : p:\2018\183-790\Calculations\HEC-RAS\183790Analysis.f01

Flow Data (cfs)

River	Reach	RS	2 YR	10 YR
25 YR	100 YR			
Robinson Fork	Robinson Fork	1516.61	834	1745
2271	3122			

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Robinson Fork	Robinson Fork	2 YR	
Normal S = 0.0026			
Robinson Fork	Robinson Fork	10 YR	
Normal S = 0.0026			
Robinson Fork	Robinson Fork	25 YR	
Normal S = 0.0026			
Robinson Fork	Robinson Fork	100 YR	
Normal S = 0.0026			

GEOMETRY DATA

Geometry Title: 183790 Existing Geometry  
 Geometry File : p:\2018\183-790\Calculations\HEC-RAS\183790Analysis.g01

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 1516.61

INPUT

Description:

Station Elevation Data		num= 378		Elev		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	844.99	1500244	844.96	1.460022	844.64	4.030029	844.09	6.800049	843.5				
9.910034	842.87	10.89001	842.68	11.98004	842.48	12.93005	842.25	13.77002	842.05				
16.19	841.09	17.48004	840.54	19.38	839.61	20.62006	838.48	22.48004	838.5				
22.82001	838.53	23.45001	838.52	25.15002	838.41	27.34003	838.29	28.16003	838.17				
29.52002	838.04	33.21002	837.7	33.5	837.66	35.15002	837.47	35.41003	837.41				
38.73004	836.85	39.31	836.75	41.28003	836.43	42.35004	836.26	44.17004	835.8				
46.84003	835.43	47.05005	835.44	49.51001	834.86	51.20001	834.77	51.90002	834.62				
53.84003	834.54	49.005	833.78	55.06	833.56	55.38	833.5	60.19	832.48				
62.30005	832.22	65.53003	831.69	66.38	831.55	66.69	831.52	67.55005	831.44				
69.73004	831.24	70.87006	831.18	73.96002	830.93	76.21002	830.72	79.73004	830.56				
80.97003	830.58	81.46002	830.42	82.21002	830.29	86.57001	829.52	87.98004	829.41				
92.22003	829.05	93.38	828.97	96.48004	828.69	97.58002	828.58	101.21	828.49				
101.7	828.5	102.2	828.47	104.1201	828.33	108.2401	828.01	108.92	827.96				
110.7401	827.83	112.8	827.68	113.58	827.62	116.15	827.43	118.4301	827.43				
118.92	827.45	121.1	827.48	122.23	827.5	124.25	827.51	124.46	827.51				
125.01	827.51	128.34	827.51	129.59	827.51	131.35	827.52	131.96	827.51				

183790Analysis.rep

133.61	827.49	134.93	827.41	136.11	827.32	139.27	827.17	140.03	827.14
140.27	827.12	143.88	826.94	145.61	826.85	147.77	826.77	150.95	826.6
151.65	826.57	153.53	826.5	155.06	826.43	156.13	826.41	158.76	826.33
161.63	826.23	163.31	826.18	166.96	826.07	167.56	826.05	170.15	825.97
171.61	826.01	172.3	826.07	174.05	826.22	176.38	826.42	177.75	826.47
178.31	826.51	178.61	826.52	182.06	826.51	182.73	826.51	182.98	826.51
186.62	826.51	188.32	826.51	190.5	826.5	193.66	826.5	194.38	826.5
196.33	826.51	196.72	826.51	197.78	826.51	199.88	826.53	201.85	826.54
203.13	826.53	205.47	826.44	209.07	826.48	209.09	826.48	209.11	826.48
212.7	826.5	215.02	826.54	216.41	826.73	218.34	826.58	218.65	826.56
220.97	826.59	223.56	826.56	226.92	826.57	227.17	826.56	227.57	826.56
228.32	826.57	230.41	826.57	231.28	826.6	233.26	826.55	233.63	826.61
236.79	826.91	238.02	826.99	238.82	827.01	240.59	827.15	243.9	827.13
244.77	827.08	245.26	827.07	246.02	827.05	248.88	826.95	250.72	826.93
251.55	826.91	251.87	826.9	252.44	826.9	255.3	826.84	255.35	826.84
255.36	826.84	255.37	826.84	255.55	826.85	255.67	826.85	272.78	827.78
277.1	824.48	281.39	820.38	281.6	820.18	283.94	819.71	283.95	819.7
284.64	819.79	289.68	820.45	298.89	821.28	299.03	821.3	309.75	822.23
313.86	822.78	315.71	823.03	315.86	823.16	319.4	826.37	324	826.36
324.82	826.39	325.01	826.38	325.1	826.38	325.72	826.37	327.07	826.34
327.27	826.34	327.86	826.3	328.92	826.25	329.29	826.23	329.83	826.2
331.4	826.16	333.24	826.13	333.73	826.12	334.27	826.08	336.56	825.94
337.82	825.84	338.36	825.79	339.81	825.7	340.31	825.68	341.58	825.68
343.57	825.72	344.06	825.74	344.66	825.75	346.25	825.78	347.8	825.73
348.21	825.72	348.54	825.73	350.78	825.73	352.65	825.62	352.99	825.6
354.55	825.55	355.17	825.52	355.29	825.52	355.7	825.51	357.3	825.46
358.06	825.44	358.35	825.43	358.86	825.44	360.58	825.46	362.2	825.45
362.45	825.45	362.97	825.43	364.54	825.38	365.08	825.38	366.82	825.36
367.48	825.42	369.18	825.49	369.69	825.49	371.86	825.53	375.22	825.5
375.48	825.5	375.64	825.5	379.09	825.45	381.59	825.43	383.24	825.44
384.45	825.44	386.33	825.48	387.54	825.49	389.35	825.49	389.96	825.49
391.97	825.49	393.69	825.5	397.15	825.52	397.42	825.52	397.56	825.52
401.15	825.55	403.14	825.56	404.88	825.63	408.37	825.89	408.54	825.89
408.73	825.91	412.34	826.19	414.31	826.28	416.07	826.37	419.6	826.46
419.8	826.47	419.9	826.47	422.67	826.52	424.22	826.54	425.48	826.57
427.26	826.58	430.82	826.61	430.98	826.61	431.07	826.61	434.71	826.62
436.65	826.6	438.96	826.59	442.04	826.49	442.23	826.48	445.44	826.25
447.82	826.24	449.63	826.2	453.27	826.34	453.38	826.34	453.41	826.34
453.5	826.35	456.17	826.47	456.57	826.53	456.75	826.53	459.14	826.57
464.49	826.48	464.55	826.48	464.57	826.48	464.67	826.48	468.2	826.43
469.43	826.5	470.17	826.52	475.72	826.53	475.73	826.53	475.74	826.53
479.46	826.53	481.33	826.62	483.19	826.61	486.91	826.59	486.92	826.59
486.93	826.59	486.97	826.59	489.01	826.53	490.21	826.51	492.51	826.28
492.63	826.27	494.05	826.18	495.23	825.94	498.07	826.03	498.13	826.03
499.57	826	502.05	825.63	502.59	825.59	502.83	825.52	503.55	825.61
509.05	825.5	509.25	825.5	509.3	825.5	509.39	825.5	513.03	825.5
514.84	825.5	516.76	825.5	520.42	825.5	520.48	825.5	520.61	825.5
524.21	825.5	526.01	825.5	529.25	825.5	531.53	825.48	531.83	825.48
535.4	825.55	537.1801	825.49	538.84	825.45	542.5601	825.51	542.76	825.53
542.86	825.53	543.0601	825.54	546.59	825.78	548.35	825.79	550.32	825.9
553.9301	825.97	554.05	825.97	554.28	825.97	557.78	825.96	559.52	825.95
561.51	825.94	565.1	825.98	565.23	825.98	565.5	825.99	568.96	826.16
570.69	826.26	572.69	826.31	576.27	826.45	576.42	826.45	576.73	826.45
580.28	826.5	581.86	826.5	583.88	826.49	587.44	826.5	587.71	826.5
587.95	826.5	592.25	826.48	593.03	826.48	598.05	826.51	598.61	826.51
599.17	826.53	602.53	826.59	604.19	826.65	606.26	826.73	609.78	826.9
609.9901	826.91	610.4	826.92	613.71	827.09	615.36	827.09	616.2	826.76
616.97	826.82	620.73	828.87	620.95	828.98	621.17	829.08	621.6201	829.3
626.55	831.59	626.64	831.63	626.7	831.68	632.1201	836.38	632.6	836.84
632.85	837.06	635.75	839.89	637.09	841.19				

0 .03 272.78 .04 319.4 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 272.78 319.4 228 205.67 179 .1 .3  
 Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 0 272 835 F

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 1310.94

INPUT

Description:

Station Elevation Data			num= 396						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	843.15	9799805	843.063	549988	842.594	929993	842.218	820007	841.36
8.880005	841.359	089966	841.2812	83997	840.0714	08997	839.7117	25995	838.64
18.60999	838.1320	38995	837.56	21.62	836.95	24.63	835.11	25.06	834.85
26.84998	833.7127	38995	833.4629	88995	832.95	32.62	832.5635	15997	832.26
36.33997	832.1940	39996	831.840	42999	831.7940	52997	831.7640	82001	831.72
42.35999	831.57	45.12	831.2545	29999	831.24	45.5	831.2146	02997	831.06
50.96997	829.33	51.87	828.9453	08997	828.5355	83997	828.31	56	828.29
56.23999	828.2856	34998	828.27	56.69	828.2560	29999	828	61.5	827.91
64.25995	827.7866	76996	827.6768	20996	827.6772	03998	827.5672	16998	827.56
72.54999	827.55	76.12	827.52	77.31	827.48	78.75	827.4880	52997	827.47
82.57996	827.4584	02997	827.3887	84998	827.2787	98999	827.2688	41998	827.25
91.94	827.15	93.12	827.1495	89996	827.08	98.38	827.08	99.94	827.09
101.68	827.07	103.65	826.97	103.81	826.97	104.28	826.94107	7599	826.75
108.92	826.69	110.04	826.57	110.92	826.51	111.67	826.51	114.19	826.52
115.68	826.51	119.46	826.51	119.53	826.51	120.15	826.51	123.59	826.5
124.73	826.5	127.54	826.49	129.99	826.49	131.5	826.45135	2599	826.33
135.45	826.32	136.02	826.3	139.41	826.17	140.53	826.1	143.36	826.01
145.8	825.86	147.32	825.81	151.07	825.76	151.27	825.74	151.88	825.73
155.23	825.69	156.34	825.71	157.39	825.71	160.04	825.9	161.6	826.09
163.39	826.37	164.44	826.5	166.3	826.44	166.61	826.43	166.87	826.42
167.09	826.42	167.75	826.4	172.13	826.27	173.21	826.27	175.77	826.43
177.41	826.41	178.96	826.41	182.68	826.38	182.91	826.38	183.62	826.38
186.87	826.35	187.95	826.35	190.82	826.32	193.22	826.31	194.34	826.29
195.03	826.27	198.14	826.33	198.81	826.36	199.48	826.37	202.69	826.47
203.75	826.49	207.52	826.5	208.14	826.5	211.48	826.5	214.29	826.5
214.55	826.5	215.35	826.5	218.51	826.5	219.56	826.5	222.46	826.5
224.83	826.5	226.42	826.5	230.09	826.5	230.37	826.5	231.22	826.5
234.33	826.5	235.36	826.5	238.28	826.5	240.63	826.5	242.24	826.5
245.9	826.5	246.19	826.5	247.08	826.49	250.15	826.48	251.17	826.47
254.11	826.44	256.44	826.41	258.06	826.39	261.71	826.33	262.02	826.33
262.95	826.31	266.82	826.25	267.83	826.26	272.24	826.33	273.88	826.36
277.51	826.41	277.84	826.42	278.82	826.43	280.94	826.46	283.14	826.5
283.41	826.5	285.1	826.5	286.57	826.5	288.05	826.52	289.7	826.53
293.32	826.56	293.66	826.56	294.68	826.58	297.61	826.6	298.58	826.61
301.57	826.62	303.85	826.61	305.52	826.59	309.12	826.56	309.48	826.55
310.55	826.54	313.43	826.51	314.39	826.5	317.39	826.46	319.66	826.43
322.49	826.39	322.69	826.39	323.71	826.38	324.93	826.34	325.3	826.33
326.41	826.29	329.25	826.2	330.19	826.19	333.21	826.07	335.46	826.02
337.16	825.95	340.73	825.68	341.12	825.68	342.28	825.67	345.07	825.66
346	825.65	349.03	825.66	351.27	825.66	352.98	825.66	356.54	825.66
356.94	825.66	358.15	825.66	361.64	825.64	363.71	825.69	367.07	825.97
369.24	826.26	370.88	826.43	373.72	826.49	373.81	826.53	397.66	826.55
400.74	826.52	400.97	826.52	401.26	826.51	403.95	826.35	404.4	826.33
405.75	826.3	408.36	826.2	409.22	826.21	414.59	826.51	414.76	826.53
415.25	826.73	416.36	827.18	416.96	827.3	419.76	826.19	420.07	826.1

183790Analysis.rep

421.61	825.96	424.41	825.59	425.03	825.58	428.13	825.52	430.3	825.51
432.09	825.51	435.56	825.52	436.03	825.52	437.48	825.54	439.41	825.57
440.12	825.58	443.81	825.65	444.9	825.67	448.81	825.75	450.74	825.78
451.46	825.79	452.14	825.8	453.51	825.8	453.71	825.8	454.57	825.83
456.33	825.85	456.57	825.85	456.58	825.85	456.59	825.85	469.08	826.42
469.21	826.43	469.28	826.43	469.32	826.43	469.33	826.43	469.35	826.43
469.36	826.43	469.37	826.43	469.38	826.43	469.38	826.44	469.39	826.44
469.4	826.44	469.41	826.44	469.93	825.86	473.22	822.2	473.46	822.03
476.73	819.71	476.88	819.6	481.76	819.45	487.05	819.4	489.31	819.38
489.36	819.38	489.77	819.41	492.17	819.59	495.8	819.87	495.91	819.88
496.39	819.9	503.34	820.21	503.4	820.22	505.3	821.33	508.22	824.79
516.84	824.02	517.28	823.99	518.5	823.91	520.24	823.93	520.88	823.92
522.99	823.88	523.09	823.88	523.11	823.88	523.2	823.87	524.99	823.75
526.5699	823.69	526.63	823.69	527.48	823.68	528.7	823.69	528.76	823.69
529.01	823.7	531.17	823.86	531.75	823.87	534.38	823.87	534.39	823.87
536.67	823.85	536.85	823.85	537.0699	823.86	537.14	823.86	539.12	823.96
541.5	824.01	541.58	824.01	541.62	824.01	542	824.01	544.4	823.96
544.55	823.96	544.84	823.96	546.64	823.91	547.87	823.94	548.92	823.95
549.12	823.95	551.35	823.99	551.52	823.99	551.63	824	551.78	824
553.91	824.06	553.96	824.07	554.89	824.08	556.22	824.15	558.17	824.25
558.96	824.26	559.18	824.25	561.01	824.3	562.02	824.31	562.52	824.3
564.22	824.17	565.08	824.13	567.33	824.05	569.51	823.88	571.13	823.83
574.8	823.77	575.06	823.76	575.81	823.75	578.99	823.69	580.09	823.67
582.92	823.62	585.38	823.57	587.14	823.53	588.28	823.51	590.67	823.66
590.74	823.66	591.11	823.66	594.71	823.79	595.96	823.83	598.64	823.83
601.25	823.87	601.72	823.86	606.41	824.28	606.51	824.29	606.54	824.29
610.44	824.68	611.83	824.81	614.37	825.02	617.12	825.2	618.3	825.26
621.71	825.38	622.31	825.4	625.4	825.51	626.8	825.53	627.74	825.51
630.05	825.5	632.99	825.5	635.71	825.5	636.39	825.51	636.77	825.51
638.28	825.53	638.96	825.54	643.5699	825.59	646.06	825.56	648.75	825.54
650.18	825.23	651.5099	825.11	653.23	825.39	654.16	825.39	657.61	825.96
659.45	826.27	660.36	826.45	663.88	827.52	664.74	827.82	665.17	827.98
667.61	829.48	669.88	830.73	670.82	831.44	670.87	831.49	671.18	831.72
675.32	834.95	676.2599	835.73	680.0099	838.37	680.61	838.79	681.2	839.15
681.29	839.22								

Manning's n Values num= 3  
 Sta n Val Sta n Val  
 0 .03 469.41 .04 508.22 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 469.41 508.22 190 235.44 280 .1 .3

Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 0 416.96 835 F

Blocked Obstructions num= 1  
 Sta L Sta R Elev  
 364 402 835

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 1075.5

INPUT

Description:  
 Station Elevation Data num= 372  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 0 838.91 1.5 838.484.469971 838.11 6.5 837.577.049988 837.42  
 7.809998 837.089.109985 836.439.940002 836.0812.84998 83515.41998 833.96  
 17.59998 833.11 19.37 832.4720.41998 832.0720.89996 831.93 22.12 831.7  
 26.37 830.7929.33997 830.7131.64001 830.3531.77997 830.3331.84998 830.32

183790Analysis.rep

34.75	829.7136.29999	829.5537.32001	829.5239.34998	829.4342.79999	829.24
43.14001	829.243.90997	829.1247.08002	828.8949.08997	828.54 49.12	828.54
49.27997	828.55 53.75	828.86 54.5	828.8256.17999	828.6757.85999	828.9
60.33997	827.6660.58002	827.5560.71997	827.5262.08997	827.2465.77997	826.52
68.44	826.1869.64001	82670.16998	825.9170.91998	825.8173.07001	825.52
74.16998	825.5375.64996	825.5577.21002	825.5680.71002	825.53 81	825.53
81.12	825.53 85.06	825.51 85.38	825.5386.77997	825.591.15997	825.31
92.08002	825.2692.34998	825.2492.97998	825.2196.14001	825.0497.54999	824.95
99.92999	824.83 103.03	824.64 104.47	824.57 105.25	824.57 107.5	824.49
108.5	824.46 111.28	824.48 113.98	824.48 115.07	824.49 117.52	824.49
118.85	824.49 119.45	824.49 122.64	824.5 124.93	824.5 126.43	824.5
129.79	824.5 130.21	824.5 130.4	824.5 134	824.5 135.88	824.5
137.78	824.51 141.35	824.52 141.57	824.52 142.05	824.52 145.36	824.54
146.83	824.54 150.34	824.51 151.93	824.52 152.3	824.53 152.68	824.54
154.32	824.58 157.84	824.73 158.32	824.75 158.39	824.75 158.69	824.75
163.25	824.53 166.59	824.58 168.07	824.59 168.73	824.6 170.41	824.66
172.99	824.71 174.21	824.63 176.53	824.52 178.86	824.49 179.43	824.47
179.68	824.47 183.21	824.52 185.16	824.49 185.22	824.49 187.04	824.5
190.63	824.5 190.78	824.5 191.13	824.5 194.57	824.5 196.11	824.5
198.36	824.5 201.58	824.5 203.5	824.5 205.43	824.5 206.32	824.5
207.06	824.5 209.71	824.51 212.53	824.51 213.5	824.51 215.66	824.51
217.26	824.51 217.43	824.48 218.01	824.53 221.4	824.55 222.53	824.61
224.22	824.7 227.93	824.93 228.64	824.97 228.96	824.99 232.43	825.2
234.43	825.32 235.4	825.41 236.68	825.48 239.91	825.49 239.98	825.5
240.2	825.5 243.79	825.5 245.39	825.5 247.57	825.5 250.86	825.5
251.36	825.5 252.47	825.5 255.14	825.5 256.34	825.5 258.62	825.5
261.57	825.54 262.14	825.51 264.97	825.72 265.27	825.74 265.42	825.73
267.29	825.62 268.52	825.58 271.22	825.5 272.76	825.52 274.07	825.54
277.01	825.65 277.86	825.68 278.24	825.7 281.64	825.83 283.71	825.94
285.43	826.02 289.19	826.2 289.21	826.21 289.27	826.21 293	826.26
294.66	826.22 296.79	826.17 300.14	826.08 300.57	826.07 301.54	826.05
304.36	825.98 305.61	825.94 308.14	825.87 311.09	825.79 313.32	825.73
313.81	825.72 315.71	825.68 316.56	825.7 319.5	826.02 322.04	826.11
322.57	826.17 326.08	826.28 327.07	826.32 327.52	826.34 331.14	826.43
332.45	826.48 338.35	826.5 338.41	826.5 338.47	826.5 342.22	826.5
343.94	826.5 346	826.5 349.42	826.5 349.79	826.5 350.62	826.5
353.57	826.5 354.89	826.5 357.36	826.5 360.37	826.5 361.14	826.5
362.88	826.5 363.97	826.5 365.84	826.5 368.72	826.51 371.32	826.51
372.5	826.51 375.15	826.51 376.29	826.51 376.79	826.51 378.05	826.52
378.39	826.52 405.72	826.5 411.62	826.49 411.67	826.5 413.11	826.49
415.12	826.48 417.93	826.47 420.6	826.46 421.72	826.45 424.23	826.44
425.5	826.43 426.07	826.42 429.29	826.38 431.55	826.3 433.07	826.23
436.49	825.99 436.86	825.97 437.02	825.96 441.89	825.56 442.82	825.52
443.75	825.5 444.34	825.49 447.97	825.29 448.22	825.28 448.76	825.23
452	825.05 453.45	824.92 456.34	824.69 458.44	824.49 458.86	824.47
459.45	824.44 460.84	824.45 461.03	824.45 464.4	824.48 468.13	824.5
469.98	824.51 470.25	824.51 472.56	824.99 473.19	825.15 474.62	825.46
474.85	825.39 475.35	825.28 476.28	825.07 479.28	824.5 480.52	824.46
480.83	824.44 482.29	824.39 485.57	824.29 486.07	824.27 486.3	824.26
489.86	824.13 491.78	824.04 493.65	823.92 496.04	823.82 497.15	823.79
497.86	823.76 502.15	823.72 502.39	823.71 506.65	823.75 507.15	823.76
507.77	823.77 512.15	823.83 512.73	823.84 517.15	823.93 517.68	823.93
522.15	824.05 525.4	824.2 526.22	824.2 527.15	824.2 527.59	824.2
532.15	824.2 532.54	824.21 537.15	824.24 537.97	824.28 540.14	824.33
541.36	824.37 541.85	824.38 542.23	824.39 542.82	824.39 543.17	824.4
544.14	824.44 545.07	824.48 545.97	824.48 547.16	824.52 547.67	824.51
549.1	824.52 550.69	824.51 551.64	824.56 552.07	824.58 552.33	824.6
554.08	824.7 554.91	824.72 557.02	824.71 557.22	824.71 557.64	824.7
558.29	824.69 559.14	824.67 560.67	824.5 560.85	824.49 562.01	824.66
562.47	824.69 563.08	824.75 565.07	824.91 565.18	824.92 575.89	823.5
575.95	823.49 575.98	823.48 576	823.48 576.01	823.48 576.02	823.48
576.03	823.48 576.35	822.32 576.41	822.3 579.37	821.38 582.01	820.81
582.32	819.76 584.18	818.86 584.54	818.69 586.39	818.57 592.1	818.76

183790Analysis.rep

592.11	818.76	592.16	818.76	593.31	818.67	599.82	818.14	600.17	818.15
602.06	818.2	606.94	818.32	607.13	818.33	610.71	819.1	611.61	819.35
613.46	819.86	613.5	819.87	614.25	821.65	614.93	823.24	615	823.4
615.01	823.42	618.71	824.5	620.17	825.32	621.6	826.12	622.3	826.49
623.33	827.11	624.73	827.98	626.05	828.71	626.46	828.94	627.2	829.38
627.66	829.64	629.59	830.8	629.85	830.96	630.01	831.08	632.14	832.75
633	833.49	634.63	834.83	637.04	836.76	640.94	839.68	641.97	840.42
642.15	840.6	644.93	842.99						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .03 575.89 .04 615 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 575.89 615 194 199.48 204 .1 .3  
 Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 0 429.29 835 F  
 Blocked Obstructions num= 1  
 Sta L Sta R Elev  
 368 412 835

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 876.02

INPUT

Description:

Station Elevation Data num= 380

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	835.311	290039	834.962	850037	834.454	190002	834	6.75	833.42
7.830017	833.158	560059	832.881	1.60004	832.091	4.28003	831.411	15.10004	831.25
16.90002	830.771	18.47003	830.161	19.99005	829.612	22.64001	828.922	25.70001	828.32
26.31006	828.192	27.42004	828.022	29.99005	827.543	31.41003	827.273	32.12006	827.17
36.66003	826.21	37.13	826.093	7.35004	826.053	7.76001	826.013	8.45001	825.92
41.95001	825.542	87006	825.548	1.00004	825.524	8.55005	825.524	9.98004	825.5
50.47003	825.554	2.6001	825.5	58.44	825.435	9.48004	825.465	9.67004	825.44
60.31006	825.196	0.59003	825.176	3.56006	824.59	65.69	82567.4	3005	825.23
68.81006	825.52	69.69	825.287	1.40002	825.027	2.79004	824.687	3.49005	824.5
74.84003	824.437	5.01001	824.427	7.11005	824.457	7.83002	824.457	9.12006	824.46
82.84003	824.498	3.95004	824.587	3.7003	824.518	8.54004	824.498	9.35004	824.51
90.72003	824.519	1.49002	824.349	4.25003	823.896	6.22003	823.469	9.79004	822.86
99.90002	822.849	9.96002	822.83	106	821.81	106.21	821.81	109.65	823.33
110.12	823.51	110.44	823.53	110.96	823.5	111.91	823.38	114.21	823.25
117.1	822.82	117.52	822.75	118.79	822.69	120.72	822.84	122.81	822.98
123.64	823.07	127.13	822.83	128.53	822.68	129.01	822.61	130.81	822.72
132.11	822.71	134.24	822.94	137.87	823.22	137.97	823.23	138.58	823.21
139.95	823.16	140.38	823.17	141.15	823.12	144.06	823.04	145.66	822.97
147.74	822.86	151.38	822.62	151.42	822.61	151.49	822.61	153.97	822.5
157.09	822.51	158.77	822.52	161.83	822.52	162.45	822.53	162.8	822.52
166.13	822.52	168.51	822.52	169.81	822.52	172.16	822.51	173.49	822.51
174.23	822.5	177.17	822.49	179.94	822.49	180.85	822.49	182.5	822.5
184.53	822.51	185.65	822.52	188.21	822.53	191.36	822.54	191.89	822.54
192.84	822.54	195.57	822.57	197.08	822.54	198.2	822.5	200.22	822.51
202.79	822.55	202.93	822.55	203.18	822.56	206.61	822.62	208.5	822.63
210.29	822.65	213.52	822.67	213.97	822.67	214.21	822.67	217.65	822.68
219.93	822.66	221.77	822.65	223.86	822.64	225	822.62	225.64	822.63
228.68	822.66	231.35	822.73	232.36	822.74	234.2	822.77	236.04	822.81
237.06	822.85	239.91	822.9	242.74	823.01	244.53	823.09	247.08	823.19
248.49	823.26	248.79	823.28	251.2	823.39	254.2	823.46	254.44	823.48
254.87	823.48	258.12	823.5	259.91	823.51	261.8	823.51	265.21	823.56



183790Analysis.rep

265.48	823.56	265.63	823.56	269.16	823.66	271.34	823.74	272.84	823.81
275.55	823.96	276.52	824.01	277.05	824.04	281.07	824.27	283.01	824.33
283.34	824.32	285.89	824.36	287.56	824.38	288.48	824.4	291.23	824.43
294.19	824.45	294.91	824.45	296.23	824.46	298.59	824.47	299.9	824.48
302.27	824.48	305.61	824.49	305.95	824.49	306.57	824.49	310.95	824.5
311.33	824.5	313.31	824.5	316.9	824.5	316.99	824.5	317.04	824.5
320.67	824.51	322.75	824.51	324.35	824.51	327.24	824.51	328.39	824.51
331.08	824.51	334.18	824.68	335.36	824.7	337.58	824.74	339.07	824.8
339.89	824.81	342.75	824.84	345.6	824.79	347.2401	824.76	350.63	824.67
351.23	824.66	353.75	824.54	354.48	824.54	356.08	824.44	356.13	824.44
357.08	824.43	357.52	824.43	358.29	824.44	360.84	824.47	362.7401	824.59
364.82	824.65	368.45	824.53	368.5	824.53	368.6	824.53	371.96	824.5
374.16	824.52	375.86	824.47	378.93	824.45	379.43	824.43	380.02	824.44
382.72	824.34	385.59	824.14	386.9	824.06	389.27	823.87	390.58	823.79
391.3	823.75	392.65	823.65	393.97	823.52	394.73	823.51	397.65	823.53
398.01	823.53	398.78	823.53	402.26	823.55	402.73	823.61	405.3	823.67
408.44	823.65	408.98	823.66	409.95	823.63	412.66	823.72	414.15	823.67
415.33	823.57	416.66	823.52	417.14	823.53	417.55	823.52	419.97	823.58
420.29	823.59	423.69	823.66	425.58	823.61	426.95	823.49	428.88	823.54
428.89	823.54	428.91	823.54	431.29	823.69	434.73	823.81	437	823.78
438.41	823.8	440.97	823.69	442.09	823.67	442.71	823.66	445.9	823.56
447.05	823.58	448.43	823.68	449.45	823.71	451.3	823.71	453.13	823.75
454.14	823.77	454.51	823.77	458.73	823.58	459.2401	823.55	459.57	823.53
461.8	823.53	462.44	823.53	464.38	823.53	464.86	823.53	469.47	823.53
471.22	823.53	474.57	823.53	477.59	823.52	479.67	823.52	483.95	823.5
484.77	823.5	485.07	823.49	485.75	823.46	487.39	823.5	489.09	823.48
489.62	823.32	489.83	823.31	490.92	823.29	491.85	823.26	492.17	823.27
493.82	823.12	494	823.11	494.07	823.1	495.49	822.97	496.25	822.94
497.81	822.94	497.94	822.94	499.27	823.08	500.52	823.13	501.45	823.14
503.24	823.09	503.37	823.08	503.55	823.07	503.58	823.07	503.61	823.07
513.25	821.3	513.53	821.25	514.01	821.17	514.02	821.16	514.0601	821.16
514.16	821.14	514.22	821.13	514.23	821.13	514.2401	821.13	514.25	821.13
514.26	821.12	514.27	821.12	514.28	821.12	514.3	821.12	514.3101	821.12
514.32	821.12	514.34	821.11	514.35	821.11	514.36	821.11	514.37	821.1
514.45	821.09	514.47	821.09	514.4901	821.09	514.51	821.08	518.54	818.46
518.67	818.37	522.98	818.07	523.36	818.05	528.9	817.88	529.38	817.86
529.45	817.86	531.47	817.73	534.13	817.55	534.19	817.55	535.47	817.82
540.13	818.82	540.15	818.82	541.25	819.36	549.54	821.87	549.9	821.9
549.97	821.9	550.28	821.92	552	821.86	552.7401	821.85	553.75	821.85
555.1	821.92	555.89	822.1	557.25	822.55	557.9901	822.77	559.2401	822.98
559.91	823.09	561.14	823.4	563.08	823.64	563.6	823.73	563.79	823.77
564.77	823.93	566.29	824.18	567.26	824.34	568.27	824.51	568.7401	824.68
568.89	824.75	569.3101	825.05	570.23	825.58	571.44	826.37	574.54	828.52
576.05	829.65	78.6801	832.21	580.47	833.75	581.3101	834.36	581.92	834.87
586.73	838.57	590.4301	841.47	591.83	842.55	592.02	842.7	595.03	845.01

Manning's n Values  
 Sta n Val Sta n Val  
 0 .03 513.25 .04 549.54 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 513.25 549.54 99 101.31 103 .1 .3

Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 0 283.01 835 F

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 774.71

INPUT

183790Analysis.rep

Description:

Station Elevation Data

num= 315

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	835.261	140015	834.794	070007	833.674	290039	833.575	900024	832.93
7.130005	832.448	160034	832.1410	02002	831.6114	79001	830.4815	04001	830.41
15.97003	830.1618	82001	829.2521	64001	828.4221	92001	828.3124	26001	827.65
26.49002	826.9927	87003	826.7230	07001	826.1933	47003	825.6833	61002	825.65
33.83002	825.6337	30002	825.3339	78003	825.1540	92001	825.0642	69003	824.96
44.86002	824.8245	73001	824.7948	15002	824.6851	68002	824.4851	77002	824.48
51.91003	824.4655	39001	824.23	57.63	824.0559	00003	823.91	61.13	823.74
62.34003	823.65	63.63	823.5464	20001	823.5267	70001	823.5269	54001	823.51
69.85001	823.5170	34003	823.4972	97003	823.4575	49002	823.1677	09003	823.02
79.56003	822.7980	70001	822.6481	44003	822.5683	36002	822.3787	06003	821.95
87.39001	821.8887	96002	821.6988	08002	821.7389	91003	821.8791	89001	822.09
93.34003	822.1195	17001	822.398	00003	822.4498	79001	822.4599	29001	822.45
103.8	822.51	105.47	822.5	105.9	822.5	107.21	822.49	109.5	822.48
111.2	822.52	116.34	822.49	117.06	822.51	117.07	822.51	117.67	822.53
123.1	822.41	124.1	822.37	125.65	822.28	129.05	822.16	134.87	821.92
134.95	821.92	135.01	821.91	138.57	821.81	140.96	821.73	142.33	821.7
144.08	821.65	146.94	821.51	148.24	821.51	152.58	821.56	152.86	821.56
153.03	821.57	153.3	821.57	157.2	821.6	158.81	821.75	159.56	821.77
162.52	822.09	163.88	822.21	164.76	822.24	167.5	822.4	170.72	822.46
171.02	822.46	171.74	822.47	174.73	822.49	176.67	822.5	178.35	822.5
180.95	822.5	181.97	822.5	182.62	822.5	184.54	822.5	186.9	822.5
188.57	822.55	189.2	822.56	190.17	822.56	193.09	822.63	194.52	822.61
196.43	822.61	199.39	822.61	200.05	822.61	200.47	822.61	203.66	822.61
206.43	822.61	207.28	822.61	208.6	822.61	210.9	822.61	212.38	822.63
214.04	822.64	217.82	822.77	218.13	822.78	218.33	822.78	221.75	822.91
224.28	823	225.36	823.04	227.04	823.1	228.98	823.17	230.23	823.22
233.39	823.34	234.84	823.39	236.19	823.39	236.21	823.39	236.26	823.39
241.02	823.26	241.23	823.27	241.74	823.29	244.34	823.5	245.47	823.52
247.06	823.54	248.09	823.57	250.68	823.62	254.04	823.73	254.3	823.73
254.69	823.75	257.91	823.83	259.99	823.94	261.53	823.96	263.91	824.03
265.91	824.13	266.53	824.12	271.9	823.76	272.19	823.75	273.13	823.77
275.15	823.76	277.85	823.91	279.61	823.99	282.34	824.12	283.23	824.16
283.8	824.18	286.84	824.3	289.75	824.29	290.46	824.27	291.56	824.21
294.08	824.07	295.7	823.96	297.69	823.84	300.78	823.64	301.63	823.58
304.02	823.44	307.61	823.32	308.54	823.27	310	823.21	312.16	823.14
313.56	823.15	315.78	823.2	319.21	823.32	319.39	823.33	319.51	823.33
323.01	823.44	324.37	823.46	325.31	823.46	326	823.49	328.14	823.48
330.46	823.47	330.72	823.46	335.5	823.58	335.61	823.58	336.11	823.6
340.76	823.73	342.27	823.75	345.91	823.82	349.09	823.88	351.06	823.91
355.91	824.13	356.2	824.13	357.11	824.15	360.64	824.24	361.35	824.22
362.73	824.16	366.5	824.03	371.09	823.81	372.16	823.77	372.97	823.74
374.25	823.68	375.5	823.62	376.13	823.57	376.8	823.55	377.41	823.56
377.96	823.56	378.73	823.55	379.61	823.51	381.43	823.42	382.85	823.42
383.82	823.44	384.57	823.51	385.49	823.58	386.71	823.66	386.84	823.67
386.86	823.67	387.69	823.74	388.88	823.84	389	823.84	389.12	823.85
389.31	823.86	389.56	823.86	392.42	823.92	392.59	823.92	404.37	822.19
404.39	822.19	404.39	822.18	404.4	822.18	404.51	822.13	405.05	821.89
410.6	819.41	410.61	819.41	415.03	818.77	415.48	818.71	425.18	818.16
425.28	818.15	425.49	818.14	425.61	818.14	428.38	818.12	431.76	818.1
431.94	818.09	437.79	817.95	438.13	817.94	439.15	817.91	439.16	817.91
440.31	818	444.54	818.31	444.62	818.32	448.82	820.88	459.23	822.22
459.27	822.22	459.28	822.22	459.3	822.22	459.87	822.19	461.48	822.25
463.07	822.09	463.44	822.05	464.09	822.09	464.85	822.09	466.79	822.25
467.74	822.59	468.78	822.96	469.54	823.34	469.69	823.41	470.01	823.57
470.75	823.92	471.07	824.04	471.6	824.21	473.24	824.8	473.95	825.06
473.99	825.07	474.99	825.18	475.74	825.14	478.79	825.15	479.04	825.16
479.77	825.12	480.78	825.02	482.05	824.96	482.84	824.86	483.74	824.74
485.11	824.67	486.09	824.63	487.11	824.7	488.66	824.81	490.4	824.97
490.5	824.97	490.7	824.98	492.49	825.08	493.25	825.02	493.55	825.01
495.13	824.97	495.38	824.95	496.04	824.91	497.08	824.87	498.58	824.95

183790Analysis.rep

500.74	825.63	500.88	825.72	502.04	826.33	504.72	827.79	505.53	828.25
505.88	828.51	506.35	829	510.01	832.35	511.66	833.77	514.02	835.77
516.94	838.27	520.2	840.99	521.88	842.45	522.72	843.08	525.77	845.25

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	404.37	.04	448.82	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
404.37	448.82	111	112.73	115	.1	.3	

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 661.98

INPUT

Description:

Station Elevation Data num= 334

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	839.18	7099915	838.81	449982	838.43	2389984	837.93	6419983	835.63
6.82	835.41	7880005	834.83	1041998	833.46	1347998	831.8	15.69	830.54
18.45	829.17	19.87	828.44	2095999	827.94	2375998	826.58	2625998	825.56
26.35	825.52	2648999	825.48	2913998	824.47	3089999	823.91	3273999	823.49
34.53	823.37	3891998	822.79	39.03	822.79	40.34	822.73	41.66	822.58
42.82	822.46	4541998	822.32	4770999	822.17	5060001	822.15	5126999	822.14
51.81	822.16	5425998	822.45	58.03	822.4	58.19	822.38	58.62	822.32
61.26	822.19	61.56	822.27	6457999	821.81	6550998	821.88	6666998	821.99
69.06	822.08	70.97	822.13	7210001	822.32	7470999	82276	17999	821.91
77.35	821.84	7872998	821.69	7985999	821.54	79.97	821.53	8194998	821.77
83.39	821.89	8373999	821.91	8641998	822.18	89.91	822.16	90.19	822.17
90.38	822.17	90.78	822.1	93.97	821.83	96.51999	821.91	96.87	821.89
98.81	822.04	101.09	822.16	102.9	822.29	104.12	822.39	106.85	822.43
108	822.47	109.29	822.49	109.62	822.49	111.98	822.5	114.81	822.5
115.68	822.5	118.88	822.53	122.07	822.58	122.44	822.58	122.92	822.59
126	822.63	128.45	822.68	129.56	822.69	130.95	822.7	133.12	822.73
134.84	822.73	136.24	822.66	137.29	822.65	138.49	822.7	141.23	822.81
143.79	822.97	147.02	823.13	147.35	823.14	147.61	823.15	150.91	823.31
154	823.42	154.39	823.43	155.06	823.43	158.03	823.45	160.39	823.46
161.59	823.45	163.09	823.46	165.15	823.47	166.78	823.47	170.05	823.49
171.13	823.49	172.26	823.49	173.16	823.5	176.22	823.5	179.16	823.5
179.38	823.5	179.55	823.5	183.36	823.5	185.77	823.49	187.2	823.49
190.06	823.48	192.33	823.47	194.21	823.47	194.65	823.46	195.59	823.41
198.71	823.26	200.73	823.16	203.27	822.99	204.29	822.94	205.1	822.88
207.85	822.74	211.31	822.57	211.39	822.56	211.49	822.56	212.69	822.54
217.87	822.52	219.34	822.51	222.01	822.5	224.26	822.51	225.71	822.5
226.07	822.5	229.05	822.5	229.83	822.5	232.8	822.49	235.07	822.48
240	822.45	240.24	822.45	240.32	822.45	244.22	822.43	245.56	822.43
246.48	822.44	247.24	822.44	248.8	822.53	250.8	822.65	252.19	822.74
256.05	822.94	256.18	822.95	256.61	822.98	261.29	823.27	263.45	823.36
266.53	823.5	271.11	823.54	271.77	823.54	272.7	823.55	274.41	823.56
275.03	823.55	276.12	823.51	277.13	823.49	278.24	823.47	278.79	823.47
280.28	823.47	281.2	823.49	282.28	823.54	283.08	823.57	283.29	823.59
283.32	823.59	283.33	823.59	291.36	823.84	291.36	823.83	291.37	823.81
291.37	823.8	291.37	823.77	291.91	821.31	293.05	820.82	294.18	820.33
294.23	820.31	295.41	819.75	296.98	819	299.67	817.32	299.82	817.23
300.96	817.19	301.92	817.24	305.31	817.42	305.6	817.43	305.7	817.44
307.93	817.57	308.91	817.55	311.43	817.5	311.45	817.49	312.16	817.55
312.71	817.6	317.21	817.96	317.43	817.98	318.39	818.3	319.46	818.67
320.34	818.97	324.48	819.61	324.67	819.67	325.1	819.68	325.18	819.68
325.4	819.68	325.44	819.67	325.45	819.67	325.62	819.68	325.78	819.68
328.38	819.69	334.65	819.71	334.66	819.71	334.74	819.71	334.87	819.73

183790Analysis.rep

334.89	819.73	336	819.82	336.03	819.82	337.38	819.88	338.5	820.04
339.81	819.97	339.91	819.97	340.04	819.95	343.01	819.78	343.39	819.81
345.18	819.74	347.59	819.92	349.77	819.99	350.42	820.01	351.88	820.08
355.57	820.09	355.88	820.07	356.28	820.06	359.03	819.95	360.32	819.9
360.99	819.88	361.32	819.87	362.53	819.88	366.22	819.86	366.99	819.92
368.82	819.98	371.58	820.11	372.65	820.22	373.72	820.19	376.27	820.08
377.94	819.88	378.43	819.86	379.45	819.82	380.24	819.78	381.16	819.84
382.24	819.86	382.89	819.89	383.49	819.93	385.27	819.91	385.65	819.91
385.92	819.9	387.64	819.95	389.53	819.84	389.65	819.83	390.52	819.76
391.75	819.64	392.27	819.59	392.68	819.57	393.61	819.62	395.57	819.73
396.21	819.83	396.9	819.87	397.89	819.88	398.27	819.9	399.45	819.93
400.82	820.01	402.31	820.12	405.17	820.53	405.22	820.54	405.23	820.54
405.24	820.54	405.38	820.56	408.82	820.92	411.2	821.57	415.03	822.66
415.41	822.76	415.73	822.86	415.91	822.89	416.08	822.92	417.39	823.17
419.84	823.69	420.06	823.73	420.74	823.75	422.39	823.75	422.92	823.73
425.56	823.63	425.86	823.63	426.29	823.65	427.18	823.69	429.11	823.76
430.19	823.72	431.81	823.63	432.54	823.6	433.89	823.49	433.96	823.48
434.41	823.43	435.53	823.33	436.3	823.3	438.34	823.43	439.19	823.49
440.33	823.62	441.81	823.82	443.7	824.11	444.71	824.23	445.87	824.6
447.41	825.08	447.77	825.11	449.7	825.49	450.68	825.48	450.84	825.49
451.22	825.49	453.05	825.49	455.4	825.49	456.96	825.49	458.93	825.48
460.79	825.49	462.35	826.36	462.99	826.78	465.85	828.44	469.53	830.39
469.62	830.44	469.64	830.45	472.6	832.7	473.6	833.57	474.95	834.67
477.05	836.33	480.21	838.77	480.66	839.12	480.95	839.35	484.26	841.92
486.95	843.95	488.91	845.35	489.26	845.61	491.15	847.01		

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .03 291.36	.04	324.48 .1

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
291.36 324.48	68 56.16 44	.1	.3

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 605.82

INPUT

Description:

Station Elevation Data	num=	327		
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev				
0 836.372.320007	835.952.640015	835.872.990021	835.768.279999	834.68
9.560028 834.2210.80002	833.77 11.88	833.3813.08002	832.9 15.75	831.75
16.93002 831.2818.40002	830.7220.48001	829.87 22.13	829.2124.04001	828.49
26.45001 827.5128.18002	826.9828.52002	826.8429.49002	826.4434.49002	825.52
34.72 825.4534.90002	825.4435.62003	825.3540.35001	824.59 41.28	824.44
41.84003 824.3642.54001	824.2845.40002	823.7147.67001	823.4348.86002	823.27
50.58002 822.9752.51001	822.6754.05002	822.5656.07001	822.36 58.63	822.02
59.63 821.9260.43002	821.8561.59003	821.7166.67001	821.27 66.75	821.27
66.81003 821.2670.31003	821.1373.20001	821.4573.87003	821.59 74.72	821.74
77.43002 822.1679.58002	822.4380.99002	822.5982.76001	822.6884.55002	822.77
85.96002 822.7988.10001	822.8590.81003	822.93 91.88	822.9492.34003	822.93
95.22 822.8898.73001	822.8 98.78	822.898.85001	822.899.08002	822.79
103.58 822.72 104.94	822.79 106.89	822.96 107	822.98 109.6	823.18
111.53 823.21 114.94	823.14 116.4	823.14 117.87	823.03 120.13	822.92
122.98 822.8 123.69	822.76 124.26	822.75 127.29	822.64 130.38	822.71
130.64 822.71 130.81	822.72 131.03	822.72 134.37	822.77 137.02	822.82
137.93 822.83 139.07	822.82 141.49	822.85 143.4	822.75 143.46	822.75
144.74 822.69 145.69	822.68 148.65	822.8 149.23	822.83 151.09	822.91
153.22 823.01 153.89	823.04 157.22	823.18 159.13	823.22 161.21	823.29
164.37 823.36 165.2	823.38 167.88	823.41 169.19	823.44 169.6	823.44

183790Analysis.rep

173.18	823.44	174.84	823.45	177.18	823.41	180.08	823.39	181.17	823.37
184.67	823.32	185.16	823.32	185.32	823.32	189.15	823.26	190.55	823.25
193.15	823.2	195.79	823.11	197.48	823.03	197.84	823.03	198.42	823.02
199.38	823.02	200.7	823.01	201.17	823.01	201.58	823.01	202.14	823.01
204.03	822.99	204.84	822.91	205.19	822.95	215.76	823.22	217.34	823.27
217.62	823.28	217.75	823.28	217.97	823.29	218.06	823.29	218.34	823.3
218.39	823.3	218.44	823.3	218.47	823.3	218.68	822.43	219.47	819.24
221.33	817.67	221.39	817.66	224.71	817.18	225.03	817.13	225.23	817.11
227.46	817.11	229.86	817.12	230.24	817.06	231.8	816.84	232.29	816.78
232.45	816.75	234.89	817.37	234.95	817.38	235.1	817.42	240.93	818.62
241.48	818.57	242.83	818.8	244.95	819.15	245.49	819.23	245.75	819.27
245.9	819.3	246.54	819.38	247.96	819.4	247.97	819.41	248.02	819.41
248.05	819.42	248.07	819.42	248.23	819.44	248.29	819.43	248.31	819.43
248.35	819.43	248.41	819.44	248.9	819.5	249.27	819.55	249.71	819.6
250.32	819.65	251.72	819.76	251.81	819.77	252.2	819.8	252.37	819.81
252.87	819.85	255.15	820.03	257.52	820.21	257.52	820.22	257.83	820.23
258.05	820.24	258.09	820.24	258.1	820.24	258.14	820.25	258.43	820.25
260.14	820.15	260.2	820.15	261.25	820.06	261.86	820.03	262.68	819.99
264.07	819.93	265.56	820.07	266.11	820.11	266.9	820.21	268.87	820.38
269.39	820.42	272.37	820.55	274.36	820.55	276.98	820.51	279.59	820.44
280.97	820.37	284.83	820.2	284.97	820.2	285.4	820.18	288.65	820.02
289.77	819.98	290.11	819.97	291.42	819.93	293.8	819.85	296.01	819.79
296.47	819.78	298.12	819.74	300.59	819.7	301.85	819.7	302.4	819.69
303.91	819.79	304.53	819.85	305.82	820.02	307.09	820.29	307.74	820.43
308.51	820.53	310.09	820.7	311.18	820.78	312.41	820.85	313.24	820.87
313.98	820.89	315.2	820.91	315.43	820.91	315.66	820.92	316.56	820.91
317.98	820.88	319.98	820.8	320.17	820.79	322.23	820.7	322.74	820.68
324.12	820.59	325.14	820.67	325.38	820.69	325.63	820.69	327.52	820.9
327.59	820.91	327.66	820.91	329.8	820.89	330.3	820.87	331.27	820.78
332	820.7	332.59	820.6	332.9	820.54	333.7	820.32	334.12	820.24
335.17	820.14	336.48	820.05	337.71	820.43	338.23	820.63	339.08	821.06
339.98	821.64	340.29	821.86	340.85	822.28	343.11	823.13	343.43	823.23
343.61	823.26	343.66	823.27	344.26	823.4	345.05	823.49	345.72	823.56
346.11	823.6	347.2	823.73	347.34	823.75	348.86	823.93	349.41	823.99
351.68	824	352.41	823.97	353.43	823.96	354.54	823.93	355.02	823.93
355.67	823.9	358.42	823.79	358.58	823.78	358.84	823.77	359.54	823.69
361.21	823.51	362.09	823.4	362.33	823.38	362.78	823.37	364.41	823.29
365.86	823.26	366.3	823.26	367.48	823.31	369.11	823.37	370.12	823.38
371.53	823.46	372.28	823.53	372.94	823.59	374.78	823.65	375.37	824.02
376.97	824.5	376.99	824.51	377.03	824.52	378.65	825.04	379.71	825.25
381.38	825.48	382.14	825.7	384.56	825.84	386.96	825.98	390.46	826.16
390.61	826.17	391.49	826.24	393.7	826.4	394.37	826.83	396.36	828.25
397.16	828.74	400.2	830.87	401.47	831.74	402.26	832.27	404.55	833.88
407.79	836.27	408.17	836.57	408.72	837.01	409.6	837.71	412.35	839.92
414.07	841.32	415.62	842.46	416.23	843.02	419.52	846.09	420.36	846.64
420.77	846.94	421.17	847.15						

Manning's n Values num= 3  
 Sta n Val Sta n Val  
 0 .03 218.47 .04 240.93 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 218.47 240.93 35 30.65 26 .1 .3

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 575.17

INPUT  
 Description:  
 Station Elevation Data num= 288

183790Analysis.rep

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	837.07	5500183	836.92	950012	836.344	720001	835.886	980011	835.32
8.280029	834.979	290009	834.681	11.84003	833.915	11002	833.061	5.40002	832.98
15.64001	832.916	73001	832.631	7.87003	832.3	20.91	830.93	21.98001	830.47
22.53003	830.222	3.23001	829.942	7.03003	828.372	8.33002	828.032	9.65002	827.61
31.35001	827.273	3.20001	826.873	4.67001	826.593	6.78003	826.239	4.48001	825.56
40.34003	825.384	1.01001	825.23	43.94	824.424	7.06003	824.024	7.36002	823.99
47.38	823.994	7.60001	823.965	1.03003	823.535	3.70001	823.285	4.59003	823.18
55.73001	823.085	9.45001	822.756	0.40002	822.686	2.11002	822.356	3.85001	821.74
65.28003	821.466	3.90001	821.21	68.44	820.67	71.97	820.45	7.52002	820.42
72.81003	820.55	73.75	820.65	7.78003	821.59	7.08002	822.06	8.10001	822.21
83.09003	822.568	5.42001	822.62	8.65002	822.62	88.22	822.57	8.01001	822.57
90.45001	822.52	9.176001	822.59	3.77002	822.44	9.34003	822.42	9.34003	822.41
98.11002	822.42	100.9	822.4	104.45	822.47	104.46	822.47	104.47	822.47
108.02	822.5	110.8	822.5	111.49	822.5	112.59	822.5	115.15	822.5
117.14	822.5	118.71	822.5	120.72	822.5	122.27	822.5	123.48	822.5
125.83	822.5	128.84	822.5	129.39	822.5	129.83	822.5	130.11	822.5
133.12	822.5	136.17	822.5	137.65	822.5	137.79	822.5	137.96	822.5
142.52	822.5	143.64	822.5	145.09	822.5	147.21	822.51	148.61	822.51
148.84	822.51	150.8	822.51	153.81	822.51	154.41	822.51	154.8	822.51
158.03	822.51	160.76	822.51	161.64	822.51	163	822.53	164.93	822.55
165.8	822.55	166.72	822.57	172.19	822.68	172.68	822.69	173.08	822.7
177.61	822.82	179.02	822.86	179.4	822.86	180.07	822.86	180.93	822.87
182.07	822.88	182.4	822.89	183.47	822.9	184.38	822.91	184.4	822.91
184.53	822.92	184.91	822.93	186.61	823.01	187.77	823.05	187.9	823.06
188.53	823.07	188.62	823.07	191.99	823.16	197.48	823.29	197.78	823.3
197.88	823.3	197.9	823.3	197.95	823.31	198.03	823.31	198.07	823.31
198.13	823.31	198.17	823.31	198.19	823.31	198.2	823.31	198.36	823.32
198.46	823.32	198.61	823.32	200.43	817.37	200.53	817.03	202.86	816.7
203.49	816.62	206.43	816.96	206.45	816.96	206.47	816.97	206.59	816.97
209.73	817.03	209.77	817.03	209.85	817.03	211.68	817.88	211.76	817.91
211.93	817.99	212.87	818.03	213.16	818.05	213.71	818.07	224.69	818.56
225.66	818.56	227.43	818.8	230.55	819.23	231.39	819.28	231.94	819.35
232.85	819.46	242.02	820.56	242.03	820.55	242.06	820.54	242.48	820.66
243	820.79	244.36	821.02	245.11	821.17	246.09	821.34	247.71	821.27
249.91	821.4	252.92	821.16	253.25	821.12	254.88	821.02	255.63	820.95
256.12	820.94	259.25	820.72	262.08	820.58	263.27	820.52	264.07	820.47
266.48	820.33	268.04	820.25	270.09	820.11	273.26	819.96	273.97	819.92
276.99	819.82	279.96	819.84	281.76	819.85	282.76	819.87	284.37	819.93
285.72	819.94	286.39	819.95	288.15	820.13	288.73	820.16	288.97	820.17
290.18	820.36	291.29	820.49	291.72	820.55	292.02	820.58	293.54	820.74
294.62	820.82	295.41	820.85	296.75	820.96	297.47	821.01	299.23	821.18
299.45	821.19	299.85	821.22	300.83	821.21	302.8	821.09	303.73	820.95
304.47	820.84	305.75	820.62	306.04	820.58	306.29	820.55	307.45	820.46
308.02	820.46	309.29	820.5	309.7	820.51	309.81	820.51	310	820.49
313.09	820.35	313.17	820.34	315.73	819.93	316.14	819.89	316.74	819.99
317.13	820.03	318.09	820.05	319.15	820.46	321	821.11	322.54	821.95
323.16	822.29	323.51	822.46	325.67	823.31	327.3	823.89	327.54	823.9
329.06	823.97	329.76	824	329.9	824	329.96	824.01	330.37	824.02
331.35	824	333.82	823.89	334.46	823.85	335.2	823.78	338.49	823.51
338.77	823.48	340.45	823.4	340.93	823.36	341.81	823.31	343.59	823.23
345.36	823.15	346.76	823.2	350.18	823.14	351.48	823.28	353.52	823.44
355.33	823.46	356.3	823.59	356.85	823.77	357.43	823.86	360.47	824.69
363.39	825.35	364.06	825.52	365.14	825.63	366.75	825.86	368.87	826.13
369.35	826.15	371.31	826.28	374.33	826.39	374.93	826.4	375.31	826.41
375.39	826.41	376.91	826.43	379.06	827.87	381.27	829.3	382.16	829.89
383.52	830.83	385.77	832.37	387.23	833.46	388.47	834.3	392.7	838.07
393	838.32	393.19	838.47	396.62	840.98	399.15	843	400.23	843.75
401.89	844.96	404.46	847	404.64	847.1				

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .03 198.61 .04 211.93 .1



183790Analysis.rep

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 198.61 211.93 35 30.69 26 .1 .3

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 544.48

INPUT

Description:

Station Elevation Data

num= 285

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	838.91	709991	838.33	333.22	0001	837.79	4.35	0006	837.33
6.66	0004	836.38	05	9998	835.51	10.07	9999	834.82	10.28
11.31		834.34	14	.81	832.3	16.41		831.39	16.76
18.35	9999	830.62	3.10	9999	828.65	25.53		827.67	26.67
29.35	9999	826.51	30	.63	826.38	35.00	9998	825.13	35.35
38.92	9999	824.17	41	.87	823.55	42.5		823.44	43.32
47.82	9999	822.34	48	.04	822.32	51.64	9999	821.95	54.17
55.63	9998	821.53	59	.97	821.52	60.12		821.52	60.63
66.88	9998	821.39	67	.60	821.42	68.29	9999	821.17	72.32
73.79	9999	820	76	.62	820.69	78.32	9999	821.19	79.39
84.94	9998	821.51	85	.35	821.51	85.64	9999	821.51	88.91
92.48	9999	821.59	93	.26	821.5	96.91		821.5	98.16
101.6		821.58	103	.2	821.63	104.41		821.61	106.78
110.47		821.7	111	.04	821.68	112.96		821.69	116.92
118.24		821.96	121	.06	822.11	123.17		822.18	124.63
128.2		822.39	129	.43	822.42	131.77		822.46	134.89
138.31		822.54	141	.94	822.52	144.02		822.5	144.27
148.19		822.5	150	.24	822.5	151.3		822.5	151.49
155.11		822.5	157	.03	822.5	158.4		822.5	159.04
163.81		822.52	164	.8	822.53	167.24		822.54	170.26
171.46		822.62	174	.44	822.72	177.83		822.76	178.31
184.53		823.03	184	.59	823.03	184.69		823.03	185.24
187.43		823.11	188	.89	823.14	189.41		823.15	189.77
191.29		823.2	191	.81	823.21	192.21		823.22	196.02
197.77		823.47	197	.92	823.46	198.75		823.49	201.3
201.42		822.87	201	.58	821.92	201.8		820.66	202.01
204.69		819.29	204	.91	819.19	205.19		819.08	208.06
210		817.39	211	.24	817.07	212.5		816.73	212.57
214.26		817.05	214	.32	817.06	218.1		817.05	218.29
219.47		817.11	223	.62	817.59	223.77		817.6	223.82
224.09		817.63	224	.53	817.67	228		817.99	233.14
234.06		818.56	236	.73	818.74	238.03		818.86	238.62
240.11		819.08	243	.13	819.7	247.43		820.62	247.49
248.91		820.67	249	.12	820.67	250.88		820.64	251.33
253.58		820.6	255	.93	820.57	257.99		820.54	260.37
262.94		820.35	265	.89	820.06	265.91		820.06	269.03
272.32		819.72	273	.23	819.72	274.69		819.64	276.3
280.25		819.35	283	.07	819.4	283.27		819.4	283.69
285.38		819.44	285	.54	819.45	285.68		819.46	288.66
291.39		820.29	291	.75	820.33	292.96		820.38	295.26
296.38		820.47	298	.07	820.34	298.63		820.33	299.03
301.49		820.09	302	.86	820.12	303.05		820.1	303.63
305.51		819.85	306	.64	819.73	308.28		819.41	310.08
312.87		819.21	314	.74	819.43	315.06		819.49	315.56
319.11		822.04	319	.63	822.44	319.96		822.63	322.43
323.74		823.92	324	.31	823.91	324.35		823.91	324.5
326.07		823.89	327	.66	823.76	328.5		823.73	329.9
331.56		823.62	333	.63	823.51	333.74		823.51	333.81
335.92		823.18	335	.97	823.18	337.68		822.94	338.58

183790Analysis.rep

340.77	822.95	341.99	822.93	344.3	822.92	344.74	822.92	345.18	822.97
347.52	823.22	350.1	823.48	352.52	823.83	353.33	823.95	353.99	824.04
354.31	824.15	357.34	824.77	359.13	825.17	360.43	825.97	364.16	825.65
364.47	825.67	364.93	825.7	368.12	825.64	369.17	825.61	370.25	825.83
372.85	826.91	374.01	827.56	375.69	828.3	376.54	828.88	379.25	830.74
382.34	832.62	382.78	832.93	383.86	833.71	386.62	836.12	388.15	837.19
388.96	837.75	390.07	838.63	393.44	841.67	393.71	841.91	393.86	842.04
393.95	842.11	397.51	844.71	399.75	846.29	401.17	847.17	401.21	847.19

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.03	201.3	.04
		228	.1

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	201.3	228		65	56.28	48		.1	.3

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 488.2

INPUT

Description:

Station	Elevation	Data	num=	341					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	838.95	5800171	838.533	089996	836.854	679993	835.72	7.23999	833.84
8.670013	833.119	209991	832.849	269989	832.812	82001	830.9	15.31	829.32
16.41	828.72	17.97	827.821	04001	825.9	22.66	825.2124	17001	824.45
25.95999	823.4626	07001	823.4427	20999	823.24	27.53	823.1930	76001	822.64
33.64001	822.2434	67999	822.0735	36002	822.01	37.94	821.71	39.75	821.59
41.92999	821.4742	11002	821.4742	42999	821.47	44.06	821.55	45.12	821.55
45.86002	821.548	70999	821.551	98001	821.4852	29999	821.4752	76001	821.47
55.89001	821.46	58.09	821.4559	48001	821.4661	45999	821.4663	07001	821.47
64.20001	821.4965	79001	821.570	14999	821.57	70.28	821.57	70.41	821.57
75.04001	821.4276	42001	821.09	77.81	820.8578	85001	820.8281	01001	820.41
82.53	820.5385	23999	821.186	98999	821.3787	92999	821.5388	64001	821.62
90.08002	821.8293	85001	822.28	94.75	822.13	95.37	822.1396	23999	822.04
97.95001	821.68	100.86	821.62	102.55	821.58	104.94	821.56	105.59	821.54
106.97	821.55	109.72	821.55	113.08	821.57	113.31	821.57	113.64	821.57
119.2	821.63	120.52	821.64	120.85	821.61	122.33	821.67	124.08	821.73
125.31	821.77	127.67	821.88	131.03	821.88	131.26	821.89	131.42	821.89
134.85	821.96	137.53	822.01	138.17	822.01	139.73	822.1	142.02	822.2
143.64	822.26	145.8	822.39	148.43	822.43	149.2	822.44	149.75	822.44
150.48	822.45	153.03	822.48	155.86	822.51	156.38	822.52	157.12	822.52
159.97	822.54	161.97	822.55	163.56	822.55	165.82	822.54	167.15	822.54
168.08	822.54	171	822.53	174.08	822.53	174.19	822.53	174.33	822.53
174.52	822.53	177.92	822.55	180.3	822.55	182.14	822.54	182.61	822.53
184.89	822.72	184.92	822.72	185.04	822.72	187.2	822.57	189.35	822.58
189.47	822.58	189.96	822.58	191.17	822.57	191.74	822.56	192.3	822.56
192.63	822.56	193.6	822.56	195.19	822.58	196.9	822.58	197.5	822.59
197.55	822.59	197.66	822.59	198.03	822.59	200.1	822.58	200.67	822.58
201.68	822.59	203.56	822.54	204.34	822.53	206.14	822.56	206.52	822.55
208.18	822.59	208.8	822.6	208.93	822.6	209.09	822.61	210.5	822.68
211.23	822.73	211.79	822.78	213.09	822.86	214.09	822.91	215.34	822.94
216.83	823	216.91	823	217.43	823.03	218.49	823.1	218.84	823.15
220.61	823.39	221.15	823.46	221.74	823.52	223.98	823.79	224.07	823.79
224.25	823.8	224.3	823.81	224.33	823.82	224.37	823.82	225	823.84
225.36	823.85	226.02	823.8	226.97	823.71	228.17	823.65	229.63	823.56
229.94	823.55	230.69	823.51	230.92	823.51	231.54	823.48	232.52	823.51
234.39	823.52	235.03	823.54	235.92	823.54	236.64	823.54	236.81	823.52
237.33	823.49	238.53	823.41	239.19	823.38	240.08	823.36	240.19	823.36
240.23	823.35	240.25	823.35	240.26	823.35	240.35	823.35	240.39	823.35

183790Analysis.rep

240.4	823.35	240.49	823.31	240.5	823.31	246.83	823.42	247.01	823.42
247.08	823.42	247.09	823.42	247.17	823.42	247.35	823.42	247.4	823.42
247.43	823.42	247.47	823.42	247.5	823.42	252.42	823.49	252.65	823.49
252.73	823.49	252.83	823.49	254.03	823.49	254.3	823.49	255.96	822.38
256.59	821.96	257.44	821.75	260.01	821.13	262.3	820.57	265.08	819.9
265.6	819.9	267.29	819.92	269.5	819.95	270.2	815.19	270.4	813.82
270.44	813.6	271.71	813.71	275.95	814.07	276.26	814.09	276.68	814.13
278.09	814.25	281	814.6	281.75	814.71	285.13	815.16	285.14	815.16
285.21	815.17	290.08	815.5	290.17	815.5	291.41	815.91	293.4	816.55
293.78	816.68	297.09	818.82	305.39	819.89	305.45	819.89	305.52	819.89
306.28	819.85	307.05	819.79	307.85	819.76	308.22	819.74	308.93	819.71
309.01	819.71	309.7	819.69	310.99	819.66	311.25	819.67	312.88	819.72
314.03	819.74	314.64	819.76	315.54	819.78	317.13	819.81	319.1	819.97
320.16	819.96	320.98	820.02	321.82	819.91	323.43	819.77	325.01	819.95
325.61	819.92	326.96	819.89	327.94	819.7	329.74	819.33	330.09	819.26
330.81	819.09	331.5	819.01	333.53	818.83	334.54	818.7	338.41	818.64
339.34	818.74	339.37	818.74	339.45	818.76	342.52	819.46	342.8	819.5
345.07	820.44	347.26	821.54	347.5	821.68	347.55	821.7	347.75	821.8
349.42	822.61	349.74	822.64	349.87	822.65	350.01	822.66	350.1	822.69
350.58	822.83	350.59	822.83	351.6	822.95	353.69	823.19	355.86	823.18
356.59	823.17	357.18	823.15	358.14	823.1	359.73	823.06	360.38	823.05
360.59	823.05	361.64	823.06	362.92	823.06	363.35	823.05	364.52	822.97
364.65	822.96	366.09	822.89	366.4	822.87	368.43	822.75	368.46	822.75
368.53	822.75	368.88	822.73	370.46	822.66	372.5	822.66	372.85	822.67
372.98	822.67	373.08	822.68	374.35	822.76	374.91	822.78	377.95	823.13
379.41	823.27	380.29	823.38	383.05	823.74	386.14	824.3	387.11	824.63
387.61	824.7	390.44	825.58	391.98	825.63	393.97	825.74	397.26	826.02
397.75	826.04	397.83	826.06	401.25	826.71	403.67	827.82	404.89	828.38
406.91	829.49	408.54	830.33	409.52	830.91	412.18	832.47	415.36	834.35
415.82	834.64	416.57	835.18	419.19	837.06	421.21	838.73	423.28	840.33
426.22	842.62	426.74	843.01	427.05	843.27	429.92	845.46	430.77	846.06
431.19	846.36								

Manning's n Values num= 3  
 Sta n Val Sta n Val  
 0 .03 269.5 .04 297.09 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 269.5 297.09 73 100.17 128 .1 .3

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 388.03

INPUT

Description:

Station Elevation Data num= 267

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	838.221	230011	837.481	700012	837.2	2.02002	8375.300018	835.02	
8.059998	833.199	190002	832.48	10.13	831.7813	77002	829.0714	17001	828.78
15.01001	828.38	18.91	826.5719	05002	826.4919	14999	826.45	20.16	825.96
23.30002	824.4326	20001	823.3326	73999	823.07	28.66	822.46	30.62	821.74
31.67001	821.66	32.25	821.74	34.09	821.7236	80002	822.01	37.69	822.07
38.30002	822.11	40.84	822.46	41.22	822.51	42.47	822.444	76001	822.21
45.69	822.05	48.31	821.6750	39001	821.6452	57001	821.5254	58002	821.55
55.69	821.58	56.44	821.6357	45999	821.6561	76001	821.8762	48001	821.91
62.70999	821.9263	48001	821.9366	48001	822	68.53	821.87	72.12	821.65
72.44	821.61	73.66	820.9974	58002	820.6776	60001	819.67	77.22	819.5
79.95001	820.180	76001	820.1981	26001	820.4284	48001	821.5986	67001	821.99
87.59	822.2490	14999	822.0692	23001	822	92.72	821.9795	73001	821.68
98.77002	821.6198	89001	821.699	04001	821.6	102.48	821.56	104.81	821.55

183790Analysis.rep

106.07	821.55	107.93	821.54	109.67	821.53	110.86	821.53	113.27	821.53
116.83	821.53	116.87	821.53	116.9	821.53	120.47	821.54	122.95	821.56
124.07	821.57	125.72	821.6	127.71	821.76	129	821.76	130.73	821.74
134.61	821.87	134.96	821.87	135.04	821.87	138.47	821.93	141.09	821.89
142.07	821.9	143.5	821.88	147.14	821.82	151.48	821.75	152.09	821.75
152.55	821.74	152.88	821.74	153.18	821.76	156.46	821.98	159.23	822.2
160.46	822.31	161.29	822.33	163.66	822.46	165.27	822.48	167.26	822.48
170.18	822.5	170.86	822.51	171.32	822.51	176.23	822.51	176.67	822.51
177.7	822.55	178.2	822.56	178.75	822.58	180.57	822.58	180.75	822.58
180.9	822.58	183.51	822.65	184.01	822.66	184.98	822.66	186.37	822.66
186.93	822.67	187.93	822.71	188.78	822.76	189.23	822.78	189.37	822.79
189.96	822.8	191.34	822.83	191.76	822.83	193.12	822.84	193.41	822.84
195.22	822.86	195.79	822.85	195.89	822.85	196.38	822.86	198.69	822.95
199.35	822.97	200.61	822.99	201.44	823.01	202.16	823.03	203.22	823.07
204.07	823.1	205.05	823.13	206	823.14	207.1	823.14	208.21	823.16
209.18	823.16	209.41	823.16	209.45	823.16	209.96	823.16	215.91	822.53
222.94	821.77	223.13	821.76	224.15	820.41	224.42	820.06	224.68	819.95
226.16	819.38	228.05	818.65	228.53	816.08	228.59	815.79	229.98	815.78
231.73	815.78	232.4	815.78	232.53	815.78	238.88	815.67	239.03	815.67
239.31	815.69	242.31	815.87	243.95	815.97	246.2	816.1	246.61	816.13
247.15	816.12	254.12	816	254.47	816	257.86	820.17	264.11	822.65
271	822.85	271.1	822.86	272.16	823.02	272.44	823.07	273.39	823.21
274.44	823.36	274.73	823.39	275.25	823.44	276.56	823.56	276.71	823.57
276.8	823.58	278.51	823.72	279.46	823.8	280.28	823.88	282.12	824.31
282.61	824.41	283.15	824.6	284.42	825.06	284.75	825.17	285.41	825.41
286.22	825.62	287.58	825.95	288.07	826.02	289.02	826.16	289.62	826.25
290.13	826.33	290.25	826.35	294.65	826.51	295.11	826.5	295.44	826.5
300.03	826.5	300.11	826.5	300.4	826.5	305.11	826.5	305.31	826.5
310.11	826.5	310.23	826.5	313.98	826.5	314.08	826.5	314.83	826.5
315.37	826.5	318.64	826.5	321.52	826.51	322	826.51	322.66	826.51
325.58	826.55	327.68	826.63	329.17	826.67	331.24	826.78	332.75	826.85
333.83	826.92	336.33	827.07	339.83	827.31	339.93	827.32	339.94	827.32
340.21	827.33	343.22	827.51	346.13	827.89	347.08	827.99	348.41	828.09
350.34	828.31	350.83	828.37	351.01	828.38	352.28	828.32	354.25	828.42
356.99	828.48	357.83	828.47	358.43	828.5	359.28	828.51	362.4	828.79
364.58	828.99	365	829.03	365.58	829.08	370.08	829.51	370.16	829.52
370.49	829.57	371.01	829.65	374.94	830.24	375.74	830.36	376.26	830.43
376.89	830.51	379.25	830.92	382.74	831.36	383.05	831.41	386.06	831.67
389.19	831.94	390.08	832.01	391.33	832.1	392.53	832.24	395.44	832.55
395.96	832.94	399.91	835.96	400.83	836.68	401.49	837.23	405	840.27
406.48	841.23	407.63	841.95						

Manning's n Values num= 3  
 Sta n Val Sta n Val  
 0 .03 222.94 .04 264.11 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 222.94 264.11 125 131.5 138 .1 .3

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 256.53

INPUT

Description:  
 Station Elevation Data num= 299  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 0 838.97 7.9999878 838.561 9.29993 837.924 3.339996 836.59 7.01001 834.96  
 7.860016 834.498 6.70013 834.011 3.51999 830.81 14.47 830.67 14.95999 830.45  
 15.39999 830.34 20.06 829.72 0.39001 829.66 20.42999 829.65 20.78 829.42  
 21.94 828.67 22.14001 828.57 24.20001 827.23 26.98999 825.71 27.31 825.54

183790Analysis.rep

28.88	825.03	29.12	824.92	29.39	824.84	34.16	823.59	35.61	823.37
36.20001	823.27	36.86	823.15	37.22	823.07	40.12	822.65	42.23	822.55
44.32001	822.56	46.82	822.49	49.09	822.33	50.37	822.3	51.78	822.2
55.04001	821.84	55.82	821.82	57.44	821.79	59.23	821.65	61.17	821.66
62.57001	821.46	63.12	821.5	65.44	821.94	66.70	821.61	68.06	821.58
69.29999	821.12	72.60	819.65	74.16	819.81	75.01	819.62	76.03	819.82
78.67999	820.36	81.62	821.28	82.89	821.65	83.13	821.7	85.41	821.65
89.08002	821.57	89.29	821.57	89.51	821.56	92.84	821.53	94.45	821.53
95.85001	821.52	98.70	821.41	101.11	821.32	106.11	821.1	106.37	821.08
106.38	821.08	106.84	821.07	108.87	820.98	109.31	820.98	111.85	820.92
112.12	820.91	113.5	820.88	114.39	820.87	114.53	820.86	114.99	820.84
116.82	820.76	117.46	820.74	118.84	820.73	119.71	820.71	120.81	820.68
122.12	820.66	122.16	820.66	122.22	820.66	122.53	820.65	123.15	820.64
124.56	820.61	124.7	820.6	124.85	820.62	126.72	820.69	126.98	820.7
127.2	820.71	128.34	820.73	129.22	820.75	129.84	820.76	131.19	820.79
132.13	820.86	133.46	820.94	134.86	821	135.49	821.04	136.75	821.12
137.59	821.18	137.9	821.2	138.1	821.21	139.79	821.29	140.54	821.31
141.87	821.35	142.02	821.36	142.07	821.36	142.2	821.36	143.85	821.41
144.55	821.45	145.79	821.55	146.25	821.59	146.68	821.63	146.7	821.63
155.59	820.9	157.58	818.28	159.81	816.61	166.46	816.09	166.8	816.07
167.12	816.04	173.2	816	174.59	815.99	174.86	815.99	180.08	816.34
183.05	816.59	183.33	816.62	185.07	818.26	187.11	819.21	188.73	821.75
196.89	823.01	197.03	823.02	197.04	823.02	197.05	823.02	197.53	823.04
198.98	823.09	199.12	823.09	199.52	823.1	201.28	823.13	201.83	823.13
203.54	823.12	204.08	823.13	205.09	823.12	205.95	823.15	207.14	823.18
208.2	823.19	210.04	823.23	210.5	823.23	210.96	823.23	212.67	823.2
214.06	823.18	215.06	823.14	216.65	823.14	217.54	823.12	217.71	823.12
219.4	823.06	220.31	823.01	220.83	822.98	221.64	822.93	222.05	822.94
223.43	822.99	227.31	822.99	229.68	822.93	231.29	822.58	232.45	822.7
232.66	822.73	235.34	823.02	236.79	823.18	237.82	823.26	238.68	823.34
240.76	823.38	243.08	823.39	243.69	823.38	247.84	823.35	248.06	823.35
248.14	823.35	249.47	823.42	252.21	823.58	255.46	823.73	255.89	823.74
256.01	823.74	259.31	823.92	262.55	824.26	262.82	824.3	263.5	824.41
263.84	824.44	264.2	824.47	264.74	824.46	269.08	824.27	269.95	824.23
270.98	824.27	273.5	824.3	275.62	824.43	276.36	824.47	277.68	824.5
278.95	824.5	280.09	824.5	281.54	824.48	282.36	824.52	283.3	824.51
286.5	824.77	287.69	824.86	288.69	824.95	291.24	825.15	294.27	825.41
294.98	825.47	296.18	825.58	301.77	825.91	301.89	825.92	302.03	825.93
305.44	826.18	308.3	826.4	308.96	826.44	309.79	826.55	312.53	826.85
314.84	826.97	316.44	827.08	317.55	827.12	319.63	827.23	321.38	827.31
323.92	827.39	324.74	827.43	325.61	827.47	326.66	827.57	327.92	827.78
330.27	828.25	333.08	828.42	334.45	828.53	334.93	828.54	337.89	828.92
339.13	829.49	339.71	829.29	340.89	828.82	341.03	828.8	342.19	828.38
342.88	828.39	347.53	828.43	348.02	828.44	348.6	828.44	353.9	828.5
354.06	828.5	355.11	828.5	356.36	828.51	358.6	828.51	360.6	828.5
362.21	828.5	364.12	828.5	365.76	828.48	367.14	828.49	369.31	828.48
371.89	828.49	373.55	828.5	375.34	828.47	377.31	828.47	377.57	828.47
379.65	828.48	379.95	828.48	380.21	828.48	383.5	828.56	386.75	828.54
387.05	828.54	387.41	828.54	390.77	828.55	393.29	828.66	394.15	828.7
395.17	828.77	397.7	828.86	399.82	828.97	401.57	829.08	401.92	829.1
402.93	829.16	404.79	829.25	406.36	829.37	408.34	829.39	410.7	829.46
412.08	829.52	412.9	829.5	415.44	829.49	418.46	829.52	418.99	829.52
419.43	829.55	422.54	829.76	425.97	830.04	426.08	830.05	426.22	830.07
430.5	830.5	432.51	831.11	433.98	831.48	436.73	832.49	439.04	833.48
441.27	834.32	441.73	834.51	443.51	835.83	444.65	836.66	446.34	837.63
447.4	838.37	449.42	839.38	449.6	839.43	450.69	839.54		

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.03	155.59	.04
		188.73	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	155.59	188.73		239	211.47		.1	.3

183790Analysis.rep

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork

RS: 45.06

INPUT

Description:

Station Elevation Data

num= 243

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	851.04	.07	850.95	3	847.553	.920013	846.265	.040009	844.45
6.649994	842.177	.380005	840.878	.290009	838.838	.990021	837.519	.820007	836.23
10.84	834.3112	.29001	832.66	14.13	830.5715	.24002	829.6116	.33002	828.46
17.45999	827.3618	.20999	826.5919	.57001	825.18	20.75	823.91	21.03	823.68
21.5	823.1721	.73001	823.0225	.04001	820.9125	.05002	820.925	.08002	820.89
25.10001	820.8825	.11002	820.87	27.53	819.3633	.74002	817.0733	.82001	817.04
33.86002	817.0333	.92999	817	33.94	816.9934	.07001	816.9538	.17001	816.54
43.44	816.03	43.97	815.98	44.34	815.94	44.41	815.93	44.59	815.95
49.28	816.2649	.45999	816.27	49.84	816.31	50.22	816.3456	.29001	816.93
56.42001	816.9359	.67999	816.91	63.19	817.1	65.75	817.62	68.66	820.69
75.51001	821.1875	.57001	821.14	75.62	821.11	75.62	821.04	75.63	821.11
75.70999	821.1275	.82001	821.14	76.75	821.22	77.09	821.27	77.66	821.27
79.01001	821.31	79.66	821.34	80.88	821.3981	.49002	821.42	81.75	821.42
84.51001	821.586	.67001	821.4888	.26001	821.52	89.34	821.6292	.17999	821.84
94.64999	821.95	95.72	821.99	96.94	821.98	98	822.01	101.29	821.89
102.81	821.86	104.53	821.79	106.35	821.72	107.94	821.66	109.89	821.59
112.13	821.55	113.44	821.5	114.58	821.48	117.57	821.5	119.07	821.46
120.18	821.56	121.22	821.67	124.07	821.96	127.32	822.25	127.61	822.28
127.86	822.31	131.15	822.65	134.51	823.02	134.7	823.04	134.91	823.07
138.24	823.43	141.15	823.71	141.78	823.78	142.51	823.84	145.33	824.07
147.79	824.24	148.93	824.34	150.1	824.36	152.41	824.46	154.44	824.52
155.96	824.55	157.7	824.56	159.5	824.59	161.08	824.6	163.04	824.63
165.29	824.61	166.59	824.62	167.72	824.63	168.45	824.63	173.2	824.74
173.56	824.74	174.06	824.75	174.36	824.76	177.22	824.89	180.48	824.93
180.76	824.93	181.01	824.93	184.31	824.95	187.65	824.95	187.85	824.95
188.08	824.96	192.32	824.92	194.29	825.02	194.94	825.02	195.67	825.08
198.48	825.29	198.63	825.3	200.44	825.44	200.92	825.52	204.04	825.5
205.67	825.47	206.47	825.47	209.12	825.45	210.86	825.42	210.94	825.47
213.35	825.7	216.12	825.9	218.5	826.08	221.35	826.3	223.15	826.43
224.41	826.53	226.42	826.68	226.57	826.69	230.52	826.98	231.8	827.06
236.36	827.46	237.06	827.51	240.14	827.76	242.25	827.93	242.6	827.98
243.49	828.05	246.55	828.29	247.48	828.36	248.54	828.44	252.17	828.65
252.7	828.66	254.56	828.75	257.93	828.87	258.57	828.9	260.68	829.03
262.58	829.14	263.16	829.18	266.58	829.37	268.38	829.52	270.59	829.64
273.61	829.83	274.6	829.88	277.86	830.09	278.61	830.13	278.83	830.14
282.61	830.32	284.06	830.38	286.62	830.4	289.29	830.48	290.63	830.48
294.51	830.5	294.64	830.5	295.04	830.5	298.58	830.5	299.74	830.51
302.65	830.53	304.96	830.66	307.85	830.75	310.21	830.87	312.23	831.01
314.67	831.17	315.42	831.2	318.98	831.41	319.47	831.44	320.64	831.54
322.69	831.71	325.87	831.99	326.7	832.06	329.41	832.29	330.93	832.42
332.05	832.5	332.22	832.5	332.78	832.51	336.32	832.63	338.72	832.76
341.55	832.92	343.08	833.04	346.6	833.34	346.73	833.35	346.77	833.35
348.5	833.53	348.98	833.54	352	833.5	354.97	833.48	356.99	833.47
357.91	833.5	362.45	833.78	362.76	833.8	363.78	833.86	366.77	834.03
367.68	834.08	370.78	834.25	372.9	834.37	373.67	834.43	376.58	834.46
378.13	834.46	379.98	834.48	380.97	834.49	382.8	834.5	383.36	834.51
386.81	834.56	388.58	834.59	390.81	834.7	393.81	834.9	394.82	834.96
398.15	835.19	398.83	835.23	399.03	835.25	402.84	835.53	404.26	835.7
406.84	835.93	409.49	836.14	411.6	836.33				

Manning's n Values  
 Sta n Val Sta n Val

num= 3

Sta n Val



0 .125.04001 .04 68.66 .03

Bank Sta: Left Right Coeff Contr. Expan.  
 25.04001 68.66 .1 .3

SUMMARY OF MANNING'S N VALUES

River: Robinson Fork

Reach	River Sta.	n1	n2	n3
Robinson Fork	1516.61	.03	.04	.035
Robinson Fork	1310.94	.03	.04	.035
Robinson Fork	1075.5	.03	.04	.1
Robinson Fork	876.02	.03	.04	.1
Robinson Fork	774.71	.03	.04	.1
Robinson Fork	661.98	.03	.04	.1
Robinson Fork	605.82	.03	.04	.1
Robinson Fork	575.17	.03	.04	.1
Robinson Fork	544.48	.03	.04	.1
Robinson Fork	488.2	.03	.04	.1
Robinson Fork	388.03	.03	.04	.03
Robinson Fork	256.53	.03	.04	.03
Robinson Fork	45.06	.1	.04	.03

SUMMARY OF REACH LENGTHS

River: Robinson Fork

Reach	River Sta.	Left	Channel	Right
Robinson Fork	1516.61	228	205.67	179
Robinson Fork	1310.94	190	235.44	280
Robinson Fork	1075.5	194	199.48	204
Robinson Fork	876.02	99	101.31	103
Robinson Fork	774.71	111	112.73	115
Robinson Fork	661.98	68	56.16	44
Robinson Fork	605.82	35	30.65	26
Robinson Fork	575.17	35	30.69	26
Robinson Fork	544.48	65	56.28	48
Robinson Fork	488.2	73	100.17	128
Robinson Fork	388.03	125	131.5	138
Robinson Fork	256.53	239	211.47	185
Robinson Fork	45.06			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Robinson Fork

Reach	River Sta.	Contr.	Expan.
Robinson Fork	1516.61	.1	.3
Robinson Fork	1310.94	.1	.3
Robinson Fork	1075.5	.1	.3
Robinson Fork	876.02	.1	.3

		183790Analysis.rep	
Robinson Fork	774.71	.1	.3
Robinson Fork	661.98	.1	.3
Robinson Fork	605.82	.1	.3
Robinson Fork	575.17	.1	.3
Robinson Fork	544.48	.1	.3
Robinson Fork	488.2	.1	.3
Robinson Fork	388.03	.1	.3
Robinson Fork	256.53	.1	.3
Robinson Fork	45.06	.1	.3

183790Analysis.rep

HEC-RAS HEC-RAS 5.0.3 September 2016  
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
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  XXXXXX      XXXX      X      X      X      XXXXX
```

PROJECT DATA

Project Title: 183790 Analysis  
Project File : 183790Analysis.prj  
Run Date and Time: 9/14/2018 2:47:46 PM

Project in English units

PLAN DATA

Plan Title: 183790 Proposed Analysis  
Plan File : p:\2018\183-790\Calculations\HEC-RAS\183790Analysis.p02

Geometry Title: 183790 Proposed Geometry  
Geometry File : p:\2018\183-790\Calculations\HEC-RAS\183790Analysis.g02

Flow Title : 183790 Flow  
Flow File : p:\2018\183-790\Calculations\HEC-RAS\183790Analysis.f01

Plan Summary Information:

Number of:	Cross Sections =	13	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	0	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: 183790 Flow

Flow File : p:\2018\183-790\Calculations\HEC-RAS\183790Analysis.f01

Flow Data (cfs)

River	Reach	RS	2 YR	10 YR
25 YR	100 YR			
Robinson Fork	Robinson Fork	1516.61	834	1745
2271	3122			

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Robinson Fork	Robinson Fork	2 YR	
Normal S = 0.0026			
Robinson Fork	Robinson Fork	10 YR	
Normal S = 0.0026			
Robinson Fork	Robinson Fork	25 YR	
Normal S = 0.0026			
Robinson Fork	Robinson Fork	100 YR	
Normal S = 0.0026			

GEOMETRY DATA

Geometry Title: 183790 Proposed Geometry  
 Geometry File : p:\2018\183-790\Calculations\HEC-RAS\183790Analysis.g02

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 1516.61

INPUT

Description:

Station Elevation Data		num= 378									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	844.99	1500244	844.96	1460022	844.64	4030029	844.09	6800049	843.5		
9.910034	842.87	1089001	842.68	1198004	842.48	1293005	842.25	1377002	842.05		
16.19	841.09	1748004	840.54	19.38	839.61	2062006	838.48	2248004	838.5		
22.82001	838.53	2345001	838.52	25.15002	838.41	2734003	838.29	2816003	838.17		
29.52002	838.04	3321002	837.7	33.5	837.66	3515002	837.47	3541003	837.41		
38.73004	836.85	39.31	836.75	41.28003	836.43	4235004	836.26	4417004	835.8		
46.84003	835.43	47.05005	835.44	49.51001	834.86	51.20001	834.77	51.90002	834.62		
53.84003	834.54	49.005	833.78	55.06	833.56	55.38	833.5	60.19	832.48		
62.30005	832.22	65.53003	831.69	66.38	831.55	66.69	831.52	67.55005	831.44		
69.73004	831.24	70.87006	831.18	73.96002	830.93	76.21002	830.72	79.73004	830.56		
80.97003	830.58	81.46002	830.42	82.21002	830.29	86.57001	829.52	87.98004	829.41		
92.22003	829.05	93.38	828.97	96.48004	828.69	97.58002	828.58	101.21	828.49		
101.7	828.5	102.2	828.47	104.1201	828.33	108.2401	828.01	108.92	827.96		
110.7401	827.83	112.8	827.68	113.58	827.62	116.15	827.43	118.4301	827.43		
118.92	827.45	121.1	827.48	122.23	827.5	124.25	827.51	124.46	827.51		
125.01	827.51	128.34	827.51	129.59	827.51	131.35	827.52	131.96	827.51		

183790Analysis.rep

133.61	827.49	134.93	827.41	136.11	827.32	139.27	827.17	140.03	827.14
140.27	827.12	143.88	826.94	145.61	826.85	147.77	826.77	150.95	826.6
151.65	826.57	153.53	826.5	155.06	826.43	156.13	826.41	158.76	826.33
161.63	826.23	163.31	826.18	166.96	826.07	167.56	826.05	170.15	825.97
171.61	826.01	172.3	826.07	174.05	826.22	176.38	826.42	177.75	826.47
178.31	826.51	178.61	826.52	182.06	826.51	182.73	826.51	182.98	826.51
186.62	826.51	188.32	826.51	190.5	826.5	193.66	826.5	194.38	826.5
196.33	826.51	196.72	826.51	197.78	826.51	199.88	826.53	201.85	826.54
203.13	826.53	205.47	826.44	209.07	826.48	209.09	826.48	209.11	826.48
212.7	826.5	215.02	826.54	216.41	826.73	218.34	826.58	218.65	826.56
220.97	826.59	223.56	826.56	226.92	826.57	227.17	826.56	227.57	826.56
228.32	826.57	230.41	826.57	231.28	826.6	233.26	826.55	233.63	826.61
236.79	826.91	238.02	826.99	238.82	827.01	240.59	827.15	243.9	827.13
244.77	827.08	245.26	827.07	246.02	827.05	248.88	826.95	250.72	826.93
251.55	826.91	251.87	826.9	252.44	826.9	255.3	826.84	255.35	826.84
255.36	826.84	255.37	826.84	255.55	826.85	255.67	826.85	272.78	827.78
277.1	824.48	281.39	820.38	281.6	820.18	283.94	819.71	283.95	819.7
284.64	819.79	289.68	820.45	298.89	821.28	299.03	821.3	309.75	822.23
313.86	822.78	315.71	823.03	315.86	823.16	319.4	826.37	324	826.36
324.82	826.39	325.01	826.38	325.1	826.38	325.72	826.37	327.07	826.34
327.27	826.34	327.86	826.3	328.92	826.25	329.29	826.23	329.83	826.2
331.4	826.16	333.24	826.13	333.73	826.12	334.27	826.08	336.56	825.94
337.82	825.84	338.36	825.79	339.81	825.7	340.31	825.68	341.58	825.68
343.57	825.72	344.06	825.74	344.66	825.75	346.25	825.78	347.8	825.73
348.21	825.72	348.54	825.73	350.78	825.73	352.65	825.62	352.99	825.6
354.55	825.55	355.17	825.52	355.29	825.52	355.7	825.51	357.3	825.46
358.06	825.44	358.35	825.43	358.86	825.44	360.58	825.46	362.2	825.45
362.45	825.45	362.97	825.43	364.54	825.38	365.08	825.38	366.82	825.36
367.48	825.42	369.18	825.49	369.69	825.49	371.86	825.53	375.22	825.5
375.48	825.5	375.64	825.5	379.09	825.45	381.59	825.43	383.24	825.44
384.45	825.44	386.33	825.48	387.54	825.49	389.35	825.49	389.96	825.49
391.97	825.49	393.69	825.5	397.15	825.52	397.42	825.52	397.56	825.52
401.15	825.55	403.14	825.56	404.88	825.63	408.37	825.89	408.54	825.89
408.73	825.91	412.34	826.19	414.31	826.28	416.07	826.37	419.6	826.46
419.8	826.47	419.9	826.47	422.67	826.52	424.22	826.54	425.48	826.57
427.26	826.58	430.82	826.61	430.98	826.61	431.07	826.61	434.71	826.62
436.65	826.6	438.96	826.59	442.04	826.49	442.23	826.48	445.44	826.25
447.82	826.24	449.63	826.2	453.27	826.34	453.38	826.34	453.41	826.34
453.5	826.35	456.17	826.47	456.57	826.53	456.75	826.53	459.14	826.57
464.49	826.48	464.55	826.48	464.57	826.48	464.67	826.48	468.2	826.43
469.43	826.5	470.17	826.52	475.72	826.53	475.73	826.53	475.74	826.53
479.46	826.53	481.33	826.62	483.19	826.61	486.91	826.59	486.92	826.59
486.93	826.59	486.97	826.59	489.01	826.53	490.21	826.51	492.51	826.28
492.63	826.27	494.05	826.18	495.23	825.94	498.07	826.03	498.13	826.03
499.57	826	502.05	825.63	502.59	825.59	502.83	825.52	503.55	825.61
509.05	825.5	509.25	825.5	509.3	825.5	509.39	825.5	513.03	825.5
514.84	825.5	516.76	825.5	520.42	825.5	520.48	825.5	520.61	825.5
524.21	825.5	526.01	825.5	529.25	825.5	531.53	825.48	531.83	825.48
535.4	825.55	537.1801	825.49	538.84	825.45	542.5601	825.51	542.76	825.53
542.86	825.53	543.0601	825.54	546.59	825.78	548.35	825.79	550.32	825.9
553.9301	825.97	554.05	825.97	554.28	825.97	557.78	825.96	559.52	825.95
561.51	825.94	565.1	825.98	565.23	825.98	565.5	825.99	568.96	826.16
570.69	826.26	572.69	826.31	576.27	826.45	576.42	826.45	576.73	826.45
580.28	826.5	581.86	826.5	583.88	826.49	587.44	826.5	587.71	826.5
587.95	826.5	592.25	826.48	593.03	826.48	598.05	826.51	598.61	826.51
599.17	826.53	602.53	826.59	604.19	826.65	606.26	826.73	609.78	826.9
609.9901	826.91	610.4	826.92	613.71	827.09	615.36	827.09	616.2	826.76
616.97	826.82	620.73	828.87	620.95	828.98	621.17	829.08	621.6201	829.3
626.55	831.59	626.64	831.63	626.7	831.68	632.1201	836.38	632.6	836.84
632.85	837.06	635.75	839.89	637.09	841.19				

0 .03 272.78 .04 319.4 .035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
272.78	319.4	228	205.67	179	.1	.3	
Ineffective Flow	num=	1					
Sta L	Sta R	Elev	Permanent				
0	272	835	F				

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 1310.94

INPUT

Description:

Station	Elevation	Data	num=	396	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	843.15	9799805	843.063	549988	842.594	929993	842.218	820007	841.36		
8.880005	841.359	089966	841.2812	83997	840.0714	08997	839.7117	25995	838.64		
18.60999	838.1320	38995	837.56	21.62	836.95	24.63	835.11	25.06	834.85		
26.84998	833.7127	38995	833.4629	88995	832.95	32.62	832.5635	15997	832.26		
36.33997	832.1940	39996	831.840	42999	831.7940	52997	831.7640	82001	831.72		
42.35999	831.57	45.12	831.2545	29999	831.24	45.5	831.2146	02997	831.06		
50.96997	829.33	51.87	828.9453	08997	828.5355	83997	828.31	56	828.29		
56.23999	828.2856	34998	828.27	56.69	828.2560	29999	828	61.5	827.91		
64.25995	827.7866	76996	827.6768	20996	827.6772	03998	827.5672	16998	827.56		
72.54999	827.55	76.12	827.52	77.31	827.48	78.75	827.4880	52997	827.47		
82.57996	827.4584	02997	827.3887	84998	827.2787	98999	827.2688	41998	827.25		
91.94	827.15	93.12	827.1495	89996	827.08	98.38	827.08	99.94	827.09		
101.68	827.07	103.65	826.97	103.81	826.97	104.28	826.94107	7599	826.75		
108.92	826.69	110.04	826.57	110.92	826.51	111.67	826.51	114.19	826.52		
115.68	826.51	119.46	826.51	119.53	826.51	120.15	826.51	123.59	826.5		
124.73	826.5	127.54	826.49	129.99	826.49	131.5	826.45135	2599	826.33		
135.45	826.32	136.02	826.3	139.41	826.17	140.53	826.1	143.36	826.01		
145.8	825.86	147.32	825.81	151.07	825.76	151.27	825.74	151.88	825.73		
155.23	825.69	156.34	825.71	157.39	825.71	160.04	825.9	161.6	826.09		
163.39	826.37	164.44	826.5	166.3	826.44	166.61	826.43	166.87	826.42		
167.09	826.42	167.75	826.4	172.13	826.27	173.21	826.27	175.77	826.43		
177.41	826.41	178.96	826.41	182.68	826.38	182.91	826.38	183.62	826.38		
186.87	826.35	187.95	826.35	190.82	826.32	193.22	826.31	194.34	826.29		
195.03	826.27	198.14	826.33	198.81	826.36	199.48	826.37	202.69	826.47		
203.75	826.49	207.52	826.5	208.14	826.5	211.48	826.5	214.29	826.5		
214.55	826.5	215.35	826.5	218.51	826.5	219.56	826.5	222.46	826.5		
224.83	826.5	226.42	826.5	230.09	826.5	230.37	826.5	231.22	826.5		
234.33	826.5	235.36	826.5	238.28	826.5	240.63	826.5	242.24	826.5		
245.9	826.5	246.19	826.5	247.08	826.49	250.15	826.48	251.17	826.47		
254.11	826.44	256.44	826.41	258.06	826.39	261.71	826.33	262.02	826.33		
262.95	826.31	266.82	826.25	267.83	826.26	272.24	826.33	273.88	826.36		
277.51	826.41	277.84	826.42	278.82	826.43	280.94	826.46	283.14	826.5		
283.41	826.5	285.1	826.5	286.57	826.5	288.05	826.52	289.7	826.53		
293.32	826.56	293.66	826.56	294.68	826.58	297.61	826.6	298.58	826.61		
301.57	826.62	303.85	826.61	305.52	826.59	309.12	826.56	309.48	826.55		
310.55	826.54	313.43	826.51	314.39	826.5	317.39	826.46	319.66	826.43		
322.49	826.39	322.69	826.39	323.71	826.38	324.93	826.34	325.3	826.33		
326.41	826.29	329.25	826.2	330.19	826.19	333.21	826.07	335.46	826.02		
337.16	825.95	340.73	825.68	341.12	825.68	342.28	825.67	345.07	825.66		
346	825.65	349.03	825.66	351.27	825.66	352.98	825.66	356.54	825.66		
356.94	825.66	358.15	825.66	361.64	825.64	363.71	825.69	367.07	825.97		
369.24	826.26	370.88	826.43	373.72	826.49	373.81	826.53	397.66	826.55		
400.74	826.52	400.97	826.52	401.26	826.51	403.95	826.35	404.4	826.33		
405.75	826.3	408.36	826.2	409.22	826.21	414.59	826.51	414.76	826.53		
415.25	826.73	416.36	827.18	416.96	827.3	419.76	826.19	420.07	826.1		



183790Analysis.rep

421.61	825.96	424.41	825.59	425.03	825.58	428.13	825.52	430.3	825.51
432.09	825.51	435.56	825.52	436.03	825.52	437.48	825.54	439.41	825.57
440.12	825.58	443.81	825.65	444.9	825.67	448.81	825.75	450.74	825.78
451.46	825.79	452.14	825.8	453.51	825.8	453.71	825.8	454.57	825.83
456.33	825.85	456.57	825.85	456.58	825.85	456.59	825.85	469.08	826.42
469.21	826.43	469.28	826.43	469.32	826.43	469.33	826.43	469.35	826.43
469.36	826.43	469.37	826.43	469.38	826.43	469.38	826.44	469.39	826.44
469.4	826.44	469.41	826.44	469.93	825.86	473.22	822.2	473.46	822.03
476.73	819.71	476.88	819.6	481.76	819.45	487.05	819.4	489.31	819.38
489.36	819.38	489.77	819.41	492.17	819.59	495.8	819.87	495.91	819.88
496.39	819.9	503.34	820.21	503.4	820.22	505.3	821.33	508.22	824.79
516.84	824.02	517.28	823.99	518.5	823.91	520.24	823.93	520.88	823.92
522.99	823.88	523.09	823.88	523.11	823.88	523.2	823.87	524.99	823.75
526.5699	823.69	526.63	823.69	527.48	823.68	528.7	823.69	528.76	823.69
529.01	823.7	531.17	823.86	531.75	823.87	534.38	823.87	534.39	823.87
536.67	823.85	536.85	823.85	537.0699	823.86	537.14	823.86	539.12	823.96
541.5	824.01	541.58	824.01	541.62	824.01	542	824.01	544.4	823.96
544.55	823.96	544.84	823.96	546.64	823.91	547.87	823.94	548.92	823.95
549.12	823.95	551.35	823.99	551.52	823.99	551.63	824	551.78	824
553.91	824.06	553.96	824.07	554.89	824.08	556.22	824.15	558.17	824.25
558.96	824.26	559.18	824.25	561.01	824.3	562.02	824.31	562.52	824.3
564.22	824.17	565.08	824.13	567.33	824.05	569.51	823.88	571.13	823.83
574.8	823.77	575.06	823.76	575.81	823.75	578.99	823.69	580.09	823.67
582.92	823.62	585.38	823.57	587.14	823.53	588.28	823.51	590.67	823.66
590.74	823.66	591.11	823.66	594.71	823.79	595.96	823.83	598.64	823.83
601.25	823.87	601.72	823.86	606.41	824.28	606.51	824.29	606.54	824.29
610.44	824.68	611.83	824.81	614.37	825.02	617.12	825.2	618.3	825.26
621.71	825.38	622.31	825.4	625.4	825.51	626.8	825.53	627.74	825.51
630.05	825.5	632.99	825.5	635.71	825.5	636.39	825.51	636.77	825.51
638.28	825.53	638.96	825.54	643.5699	825.59	646.06	825.56	648.75	825.54
650.18	825.23	651.50985	825.11	653.23	825.39	654.16	825.39	657.61	825.96
659.45	826.27	660.36	826.45	663.88	827.52	664.74	827.82	665.17	827.98
667.61	829.48	669.88	830.73	670.82	831.44	670.87	831.49	671.18	831.72
675.32	834.95	676.2599	835.73	680.0099	838.37	680.61	838.79	681.2	839.15
681.29	839.22								

Manning's n Values num= 3  
 Sta n Val Sta n Val  
 0 .03 469.41 .04 508.22 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 469.41 508.22 190 235.44 280 .1 .3

Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 0 416.96 835 F

Blocked Obstructions num= 1  
 Sta L Sta R Elev  
 364 402 835

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 1075.5

INPUT

Description:  
 Station Elevation Data num= 372  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 0 838.91 1.5 838.484.469971 838.11 6.5 837.577.049988 837.42  
 7.809998 837.089.109985 836.439.940002 836.0812.84998 83515.41998 833.96  
 17.59998 833.11 19.37 832.4720.41998 832.0720.89996 831.93 22.12 831.7  
 26.37 830.7929.33997 830.7131.64001 830.3531.77997 830.3331.84998 830.32

183790Analysis.rep

34.75	829.7136.29999	829.5537.32001	829.5239.34998	829.4342.79999	829.24
43.14001	829.243.90997	829.1247.08002	828.8949.08997	828.54 49.12	828.54
49.27997	828.55 53.75	828.86 54.5	828.8256.17999	828.6757.85999	828.9
60.33997	827.6660.58002	827.5560.71997	827.5262.08997	827.2465.77997	826.52
68.44	826.1869.64001	82670.16998	825.9170.91998	825.8173.07001	825.52
74.16998	825.5375.64996	825.5577.21002	825.5680.71002	825.53 81	825.53
81.12	825.53 85.06	825.51 85.38	825.5386.77997	825.591.15997	825.31
92.08002	825.2692.34998	825.2492.97998	825.2196.14001	825.0497.54999	824.95
99.92999	824.83 103.03	824.64 104.47	824.57 105.25	824.57 107.5	824.49
108.5	824.46 111.28	824.48 113.98	824.48 115.07	824.49 117.52	824.49
118.85	824.49 119.45	824.49 122.64	824.5 124.93	824.5 126.43	824.5
129.79	824.5 130.21	824.5 130.4	824.5 134	824.5 135.88	824.5
137.78	824.51 141.35	824.52 141.57	824.52 142.05	824.52 145.36	824.54
146.83	824.54 150.34	824.51 151.93	824.52 152.3	824.53 152.68	824.54
154.32	824.58 157.84	824.73 158.32	824.75 158.39	824.75 158.69	824.75
163.25	824.53 166.59	824.58 168.07	824.59 168.73	824.6 170.41	824.66
172.99	824.71 174.21	824.63 176.53	824.52 178.86	824.49 179.43	824.47
179.68	824.47 183.21	824.52 185.16	824.49 185.22	824.49 187.04	824.5
190.63	824.5 190.78	824.5 191.13	824.5 194.57	824.5 196.11	824.5
198.36	824.5 201.58	824.5 203.5	824.5 205.43	824.5 206.32	824.5
207.06	824.5 209.71	824.51 212.53	824.51 213.5	824.51 215.66	824.51
217.26	824.51 217.43	824.48 218.01	824.53 221.4	824.55 222.53	824.61
224.22	824.7 227.93	824.93 228.64	824.97 228.96	824.99 232.43	825.2
234.43	825.32 235.4	825.41 236.68	825.48 239.91	825.49 239.98	825.5
240.2	825.5 243.79	825.5 245.39	825.5 247.57	825.5 250.86	825.5
251.36	825.5 252.47	825.5 255.14	825.5 256.34	825.5 258.62	825.5
261.57	825.54 262.14	825.51 264.97	825.72 265.27	825.74 265.42	825.73
267.29	825.62 268.52	825.58 271.22	825.5 272.76	825.52 274.07	825.54
277.01	825.65 277.86	825.68 278.24	825.7 281.64	825.83 283.71	825.94
285.43	826.02 289.19	826.2 289.21	826.21 289.27	826.21 293	826.26
294.66	826.22 296.79	826.17 300.14	826.08 300.57	826.07 301.54	826.05
304.36	825.98 305.61	825.94 308.14	825.87 311.09	825.79 313.32	825.73
313.81	825.72 315.71	825.68 316.56	825.7 319.5	826.02 322.04	826.11
322.57	826.17 326.08	826.28 327.07	826.32 327.52	826.34 331.14	826.43
332.45	826.48 338.35	826.5 338.41	826.5 338.47	826.5 342.22	826.5
343.94	826.5 346	826.5 349.42	826.5 349.79	826.5 350.62	826.5
353.57	826.5 354.89	826.5 357.36	826.5 360.37	826.5 361.14	826.5
362.88	826.5 363.97	826.5 365.84	826.5 368.72	826.51 371.32	826.51
372.5	826.51 375.15	826.51 376.29	826.51 376.79	826.51 378.05	826.52
378.39	826.52 405.72	826.5 411.62	826.49 411.67	826.5 413.11	826.49
415.12	826.48 417.93	826.47 420.6	826.46 421.72	826.45 424.23	826.44
425.5	826.43 426.07	826.42 429.29	826.38 431.55	826.3 433.07	826.23
436.49	825.99 436.86	825.97 437.02	825.96 441.89	825.56 442.82	825.52
443.75	825.5 444.34	825.49 447.97	825.29 448.22	825.28 448.76	825.23
452	825.05 453.45	824.92 456.34	824.69 458.44	824.49 458.86	824.47
459.45	824.44 460.84	824.45 461.03	824.45 464.4	824.48 468.13	824.5
469.98	824.51 470.25	824.51 472.56	824.99 473.19	825.15 474.62	825.46
474.85	825.39 475.35	825.28 476.28	825.07 479.28	824.5 480.52	824.46
480.83	824.44 482.29	824.39 485.57	824.29 486.07	824.27 486.3	824.26
489.86	824.13 491.78	824.04 493.65	823.92 496.04	823.82 497.15	823.79
497.86	823.76 502.15	823.72 502.39	823.71 506.65	823.75 507.15	823.76
507.77	823.77 512.15	823.83 512.73	823.84 517.15	823.93 517.68	823.93
522.15	824.05 525.4	824.2 526.22	824.2 527.15	824.2 527.59	824.2
532.15	824.2 532.54	824.21 537.15	824.24 537.97	824.28 540.14	824.33
541.36	824.37 541.85	824.38 542.23	824.39 542.82	824.39 543.17	824.4
544.14	824.44 545.07	824.48 545.97	824.48 547.16	824.52 547.67	824.51
549.1	824.52 550.69	824.51 551.64	824.56 552.07	824.58 552.33	824.6
554.08	824.7 554.91	824.72 557.02	824.71 557.22	824.71 557.64	824.7
558.29	824.69 559.14	824.67 560.67	824.5 560.85	824.49 562.01	824.66
562.47	824.69 563.08	824.75 565.07	824.91 565.18	824.92 575.89	823.5
575.95	823.49 575.98	823.48 576	823.48 576.01	823.48 576.02	823.48
576.03	823.48 576.35	822.32 576.41	822.3 579.37	821.38 582.01	820.81
582.32	819.76 584.18	818.86 584.54	818.69 586.39	818.57 592.1	818.76

183790Analysis.rep

592.11	818.76	592.16	818.76	593.31	818.67	599.82	818.14	600.17	818.15
602.06	818.2	606.94	818.32	607.13	818.33	610.71	819.1	611.61	819.35
613.46	819.86	613.5	819.87	614.25	821.65	614.93	823.24	615	823.4
615.01	823.42	618.71	824.5	620.17	825.32	621.6	826.12	622.3	826.49
623.33	827.11	624.73	827.98	626.05	828.71	626.46	828.94	627.2	829.38
627.66	829.64	629.59	830.8	629.85	830.96	630.01	831.08	632.14	832.75
633	833.49	634.63	834.83	637.04	836.76	640.94	839.68	641.97	840.42
642.15	840.6	644.93	842.99						

Manning's n Values

num=	3				
Sta	n Val	Sta	n Val	Sta	n Val
0	.03	575.89	.04	615	.1

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

575.89	615	194	199.48	204	.1	.3
Ineffective Flow num= 1						
Sta L	Sta R	Elev	Permanent			
0	429.29	835	F			
Blocked obstructions num= 1						
Sta L	Sta R	Elev				
368	412	835				

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 876.02

INPUT

Description:

Station Elevation Data num= 380

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	835.311	290039	834.962	850037	834.454	190002	834	6.75	833.42
7.830017	833.158	560059	832.881	1.60004	832.091	4.28003	831.411	5.10004	831.25
16.90002	830.771	8.47003	830.161	9.99005	829.612	2.64001	828.922	5.70001	828.32
26.31006	828.192	7.42004	828.022	9.99005	827.543	1.41003	827.273	2.12006	827.17
36.66003	826.21	37.13	826.093	7.35004	826.053	7.76001	826.013	8.45001	825.92
41.95001	825.542	8.7006	825.548	1.0004	825.524	8.55005	825.524	9.98004	825.5
50.47003	825.554	2.6001	825.5	58.44	825.435	9.48004	825.465	9.67004	825.44
60.31006	825.196	0.59003	825.176	3.56006	824.59	65.69	825.67	4.43005	825.23
68.81006	825.52	69.69	825.287	1.40002	825.027	2.79004	824.687	3.49005	824.5
74.84003	824.437	5.01001	824.427	7.11005	824.457	7.83002	824.457	9.12006	824.46
82.84003	824.498	3.95004	824.587	3.7003	824.518	8.54004	824.498	9.35004	824.51
90.72003	824.519	1.49002	824.349	4.25003	823.896	2.2003	823.469	9.79004	822.86
99.90002	822.849	9.96002	822.83	106	821.81	106.21	821.81	109.65	823.33
110.12	823.51	110.44	823.53	110.96	823.5	111.91	823.38	114.21	823.25
117.1	822.82	117.52	822.75	118.79	822.69	120.72	822.84	122.81	822.98
123.64	823.07	127.13	822.83	128.53	822.68	129.01	822.61	130.81	822.72
132.11	822.71	134.24	822.94	137.87	823.22	137.97	823.23	138.58	823.21
139.95	823.16	140.38	823.17	141.15	823.12	144.06	823.04	145.66	822.97
147.74	822.86	151.38	822.62	151.42	822.61	151.49	822.61	153.97	822.5
157.09	822.51	158.77	822.52	161.83	822.52	162.45	822.53	162.8	822.52
166.13	822.52	168.51	822.52	169.81	822.52	172.16	822.51	173.49	822.51
174.23	822.5	177.17	822.49	179.94	822.49	180.85	822.49	182.5	822.5
184.53	822.51	185.65	822.52	188.21	822.53	191.36	822.54	191.89	822.54
192.84	822.54	195.57	822.57	197.08	822.54	198.2	822.5	200.22	822.51
202.79	822.55	202.93	822.55	203.18	822.56	206.61	822.62	208.5	822.63
210.29	822.65	213.52	822.67	213.97	822.67	214.21	822.67	217.65	822.68
219.93	822.66	221.77	822.65	223.86	822.64	225	822.62	225.64	822.63
228.68	822.66	231.35	822.73	232.36	822.74	234.2	822.77	236.04	822.81
237.06	822.85	239.91	822.9	242.74	823.01	244.53	823.09	247.08	823.19
248.49	823.26	248.79	823.28	251.2	823.39	254.2	823.46	254.44	823.48
254.87	823.48	258.12	823.5	259.91	823.51	261.8	823.51	265.21	823.56

183790Analysis.rep

265.48	823.56	265.63	823.56	269.16	823.66	271.34	823.74	272.84	823.81
275.55	823.96	276.52	824.01	277.05	824.04	281.07	824.27	283.01	824.33
283.34	824.32	285.89	824.36	287.56	824.38	288.48	824.4	291.23	824.43
294.19	824.45	294.91	824.45	296.23	824.46	298.59	824.47	299.9	824.48
302.27	824.48	305.61	824.49	305.95	824.49	306.57	824.49	310.95	824.5
311.33	824.5	313.31	824.5	316.9	824.5	316.99	824.5	317.04	824.5
320.67	824.51	322.75	824.51	324.35	824.51	327.24	824.51	328.39	824.51
331.08	824.51	334.18	824.68	335.36	824.7	337.58	824.74	339.07	824.8
339.89	824.81	342.75	824.84	345.6	824.79	347.2401	824.76	350.63	824.67
351.23	824.66	353.75	824.54	354.48	824.54	356.08	824.44	356.13	824.44
357.08	824.43	357.52	824.43	358.29	824.44	360.84	824.47	362.7401	824.59
364.82	824.65	368.45	824.53	368.5	824.53	368.6	824.53	371.96	824.5
374.16	824.52	375.86	824.47	378.93	824.45	379.43	824.43	380.02	824.44
382.72	824.34	385.59	824.14	386.9	824.06	389.27	823.87	390.58	823.79
391.3	823.75	392.65	823.65	393.97	823.52	394.73	823.51	397.65	823.53
398.01	823.53	398.78	823.53	402.26	823.55	402.73	823.61	405.3	823.67
408.44	823.65	408.98	823.66	409.95	823.63	412.66	823.72	414.15	823.67
415.33	823.57	416.66	823.52	417.14	823.53	417.55	823.52	419.97	823.58
420.29	823.59	423.69	823.66	425.58	823.61	426.95	823.49	428.88	823.54
428.89	823.54	428.91	823.54	431.29	823.69	434.73	823.81	437	823.78
438.41	823.8	440.97	823.69	442.09	823.67	442.71	823.66	445.9	823.56
447.05	823.58	448.43	823.68	449.45	823.71	451.3	823.71	453.13	823.75
454.14	823.77	454.51	823.77	458.73	823.58	459.2401	823.55	459.57	823.53
461.8	823.53	462.44	823.53	464.38	823.53	464.86	823.53	469.47	823.53
471.22	823.53	474.57	823.53	477.59	823.52	479.67	823.52	483.95	823.5
484.77	823.5	485.07	823.49	485.75	823.46	487.39	823.5	489.09	823.48
489.62	823.32	489.83	823.31	490.92	823.29	491.85	823.26	492.17	823.27
493.82	823.12	494	823.11	494.07	823.1	495.49	822.97	496.25	822.94
497.81	822.94	497.94	822.94	499.27	823.08	500.52	823.13	501.45	823.14
503.24	823.09	503.37	823.08	503.55	823.07	503.58	823.07	503.61	823.07
513.25	821.3	513.53	821.25	514.01	821.17	514.02	821.16	514.0601	821.16
514.16	821.14	514.22	821.13	514.23	821.13	514.2401	821.13	514.25	821.13
514.26	821.12	514.27	821.12	514.28	821.12	514.3	821.12	514.3101	821.12
514.32	821.12	514.34	821.11	514.35	821.11	514.36	821.11	514.37	821.1
514.45	821.09	514.47	821.09	514.4901	821.09	514.51	821.08	518.54	818.46
518.67	818.37	522.98	818.07	523.36	818.05	528.9	817.88	529.38	817.86
529.45	817.86	531.47	817.73	534.13	817.55	534.19	817.55	535.47	817.82
540.13	818.82	540.15	818.82	541.25	819.36	549.54	821.87	549.9	821.9
549.97	821.9	550.28	821.92	552	821.86	552.7401	821.85	553.75	821.85
555.1	821.92	555.89	822.1	557.25	822.55	557.9901	822.77	559.2401	822.98
559.91	823.09	561.14	823.4	563.08	823.64	563.6	823.73	563.79	823.77
564.77	823.93	566.29	824.18	567.26	824.34	568.27	824.51	568.7401	824.68
568.89	824.75	569.3101	825.05	570.23	825.58	571.44	826.37	574.54	828.52
576.05	829.65	78.6801	832.21	580.47	833.75	581.3101	834.36	581.92	834.87
586.73	838.57	590.4301	841.47	591.83	842.55	592.02	842.7	595.03	845.01

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .03 513.25 .04 549.54 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 513.25 549.54 99 101.31 103 .1 .3

Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 0 283.01 835 F

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 774.71

INPUT

183790Analysis.rep

Description:

Station Elevation Data		num= 315									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	835.261	140015	834.794	070007	833.674	290039	833.575	900024	832.93		
7.130005	832.448	160034	832.1410	02002	831.6114	79001	830.4815	04001	830.41		
15.97003	830.1618	82001	829.2521	64001	828.4221	92001	828.3124	26001	827.65		
26.49002	826.9927	87003	826.7230	07001	826.1933	47003	825.6833	61002	825.65		
33.83002	825.6337	30002	825.3339	78003	825.1540	92001	825.0642	69003	824.96		
44.86002	824.8245	73001	824.7948	15002	824.6851	68002	824.4851	77002	824.48		
51.91003	824.4655	39001	824.23	57.63	824.0559	00003	823.91	61.13	823.74		
62.34003	823.65	63.63	823.5464	20001	823.5267	70001	823.5269	54001	823.51		
69.85001	823.5170	34003	823.4972	97003	823.4575	49002	823.1677	09003	823.02		
79.56003	822.7980	70001	822.6481	44003	822.5683	36002	822.3787	06003	821.95		
87.39001	821.8887	96002	821.6988	08002	821.7389	91003	821.8791	89001	822.09		
93.34003	822.1195	17001	822.398	00003	822.4498	79001	822.4599	29001	822.45		
103.8	822.51	105.47	822.5	105.9	822.5	107.21	822.49	109.5	822.48		
111.2	822.52	116.34	822.49	117.06	822.51	117.07	822.51	117.67	822.53		
123.1	822.41	124.1	822.37	125.65	822.28	129.05	822.16	134.87	821.92		
134.95	821.92	135.01	821.91	138.57	821.81	140.96	821.73	142.33	821.7		
144.08	821.65	146.94	821.51	148.24	821.51	152.58	821.56	152.86	821.56		
153.03	821.57	153.3	821.57	157.2	821.6	158.81	821.75	159.56	821.77		
162.52	822.09	163.88	822.21	164.76	822.24	167.5	822.4	170.72	822.46		
171.02	822.46	171.74	822.47	174.73	822.49	176.67	822.5	178.35	822.5		
180.95	822.5	181.97	822.5	182.62	822.5	184.54	822.5	186.9	822.5		
188.57	822.55	189.2	822.56	190.17	822.56	193.09	822.63	194.52	822.61		
196.43	822.61	199.39	822.61	200.05	822.61	200.47	822.61	203.66	822.61		
206.43	822.61	207.28	822.61	208.6	822.61	210.9	822.61	212.38	822.63		
214.04	822.64	217.82	822.77	218.13	822.78	218.33	822.78	221.75	822.91		
224.28	823	225.36	823.04	227.04	823.1	228.98	823.17	230.23	823.22		
233.39	823.34	234.84	823.39	236.19	823.39	236.21	823.39	236.26	823.39		
241.02	823.26	241.23	823.27	241.74	823.29	244.34	823.5	245.47	823.52		
247.06	823.54	248.09	823.57	250.68	823.62	254.04	823.73	254.3	823.73		
254.69	823.75	257.91	823.83	259.99	823.94	261.53	823.96	263.91	824.03		
265.91	824.13	266.53	824.12	271.9	823.76	272.19	823.75	273.13	823.77		
275.15	823.76	277.85	823.91	279.61	823.99	282.34	824.12	283.23	824.16		
283.8	824.18	286.84	824.3	289.75	824.29	290.46	824.27	291.56	824.21		
294.08	824.07	295.7	823.96	297.69	823.84	300.78	823.64	301.63	823.58		
304.02	823.44	307.61	823.32	308.54	823.27	310	823.21	312.16	823.14		
313.56	823.15	315.78	823.2	319.21	823.32	319.39	823.33	319.51	823.33		
323.01	823.44	324.37	823.46	325.31	823.46	326	823.49	328.14	823.48		
330.46	823.47	330.72	823.46	335.5	823.58	335.61	823.58	336.11	823.6		
340.76	823.73	342.27	823.75	345.91	823.82	349.09	823.88	351.06	823.91		
355.91	824.13	356.2	824.13	357.11	824.15	360.64	824.24	361.35	824.22		
362.73	824.16	366.5	824.03	371.09	823.81	372.16	823.77	372.97	823.74		
374.25	823.68	375.5	823.62	376.13	823.57	376.8	823.55	377.41	823.56		
377.96	823.56	378.73	823.55	379.61	823.51	381.43	823.42	382.85	823.42		
383.82	823.44	384.57	823.51	385.49	823.58	386.71	823.66	386.84	823.67		
386.86	823.67	387.69	823.74	388.88	823.84	389	823.84	389.12	823.85		
389.31	823.86	389.56	823.86	392.42	823.92	392.59	823.92	404.37	822.19		
404.39	822.19	404.39	822.18	404.4	822.18	404.51	822.13	405.05	821.89		
410.6	819.41	410.61	819.41	415.03	818.77	415.48	818.71	425.18	818.16		
425.28	818.15	425.49	818.14	425.61	818.14	428.38	818.12	431.76	818.1		
431.94	818.09	437.79	817.95	438.13	817.94	439.15	817.91	439.16	817.91		
440.31	818	444.54	818.31	444.62	818.32	448.82	820.88	459.23	822.22		
459.27	822.22	459.28	822.22	459.3	822.22	459.87	822.19	461.48	822.25		
463.07	822.09	463.44	822.05	464.09	822.09	464.85	822.09	466.79	822.25		
467.74	822.59	468.78	822.96	469.54	823.34	469.69	823.41	470.01	823.57		
470.75	823.92	471.07	824.04	471.6	824.21	473.24	824.8	473.95	825.06		
473.99	825.07	474.99	825.18	475.74	825.14	478.79	825.15	479.04	825.16		
479.77	825.12	480.78	825.02	482.05	824.96	482.84	824.86	483.74	824.74		
485.11	824.67	486.09	824.63	487.11	824.7	488.66	824.81	490.4	824.97		
490.5	824.97	490.7	824.98	492.49	825.08	493.25	825.02	493.55	825.01		
495.13	824.97	495.38	824.95	496.04	824.91	497.08	824.87	498.58	824.95		

183790Analysis.rep

500.74	825.63	500.88	825.72	502.04	826.33	504.72	827.79	505.53	828.25
505.88	828.51	506.35	829	510.01	832.35	511.66	833.77	514.02	835.77
516.94	838.27	520.2	840.99	521.88	842.45	522.72	843.08	525.77	845.25

Manning's n Values

num=	3		
Sta	n Val	Sta	n Val
0	.03	404.37	.04
		448.82	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	404.37	448.82		111	112.73		.1	.3

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 661.98

INPUT

Description:

Station Elevation Data			num=	334						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	839.18	7099915	838.81	449982	838.432	389984	837.936	419983	835.63	
6.820007	835.417	880005	834.8310	41998	833.4613	47998	831.8	15.69	830.54	
18.45999	829.17	19.87	828.4420	95999	827.9423	75998	826.5826	25998	825.56	
26.35999	825.5226	48999	825.4829	13998	824.4730	89999	823.9132	73999	823.49	
34.53	823.3738	91998	822.79	39.03	822.79	40.34	822.73	41.66	822.58	
42.82999	822.4645	41998	822.3247	70999	822.1750	60001	822.1551	26999	822.14	
51.81	822.1654	25998	822.45	58.03	822.4	58.19	822.38	58.62	822.32	
61.26999	822.19	61.56	822.2764	57999	821.8165	50998	821.8866	66998	821.99	
69.06	822.08	70.97	822.1372	10001	822.3274	70999	82276	17999	821.91	
77.35999	821.8478	72998	821.6979	85999	821.54	79.97	821.5381	94998	821.77	
83.39999	821.8983	73999	821.9186	41998	822.18	89.91	822.16	90.19	822.17	
90.38998	822.17	90.78	822.1	93.97	821.8396	51999	821.91	96.87	821.89	
98.81	822.04	101.09	822.16	102.9	822.29	104.12	822.39	106.85	822.43	
108	822.47	109.29	822.49	109.62	822.49	111.98	822.5	114.81	822.5	
115.68	822.5	118.88	822.53	122.07	822.58	122.44	822.58	122.92	822.59	
126	822.63	128.45	822.68	129.56	822.69	130.95	822.7	133.12	822.73	
134.84	822.73	136.24	822.66	137.29	822.65	138.49	822.7	141.23	822.81	
143.79	822.97	147.02	823.13	147.35	823.14	147.61	823.15	150.91	823.31	
154	823.42	154.39	823.43	155.06	823.43	158.03	823.45	160.39	823.46	
161.59	823.45	163.09	823.46	165.15	823.47	166.78	823.47	170.05	823.49	
171.13	823.49	172.26	823.49	173.16	823.5	176.22	823.5	179.16	823.5	
179.38	823.5	179.55	823.5	183.36	823.5	185.77	823.49	187.2	823.49	
190.06	823.48	192.33	823.47	194.21	823.47	194.65	823.46	195.59	823.41	
198.71	823.26	200.73	823.16	203.27	822.99	204.29	822.94	205.1	822.88	
207.85	822.74	211.31	822.57	211.39	822.56	211.49	822.56	212.69	822.54	
217.87	822.52	219.34	822.51	222.01	822.5	224.26	822.51	225.71	822.5	
226.07	822.5	229.05	822.5	229.83	822.5	232.8	822.49	235.07	822.48	
240	822.45	240.24	822.45	240.32	822.45	244.22	822.43	245.56	822.43	
246.48	822.44	247.24	822.44	248.8	822.53	250.8	822.65	252.19	822.74	
256.05	822.94	256.18	822.95	256.61	822.98	261.29	823.27	263.45	823.36	
266.53	823.5	271.11	823.54	271.77	823.54	272.7	823.55	274.41	823.56	
275.03	823.55	276.12	823.51	277.13	823.49	278.24	823.47	278.79	823.47	
280.28	823.47	281.2	823.49	282.28	823.54	283.08	823.57	283.29	823.59	
283.32	823.59	283.33	823.59	291.36	823.84	291.36	823.83	291.37	823.81	
291.37	823.8	291.37	823.77	291.91	821.31	293.05	820.82	294.18	820.33	
294.23	820.31	295.41	819.75	296.98	819	299.67	817.32	299.82	817.23	
300.96	817.19	301.92	817.24	305.31	817.42	305.6	817.43	305.7	817.44	
307.93	817.57	308.91	817.55	311.43	817.5	311.45	817.49	312.16	817.55	
312.71	817.6	317.21	817.96	317.43	817.98	318.39	818.3	319.46	818.67	
320.34	818.97	324.48	819.61	324.67	819.67	325.1	819.68	325.18	819.68	
325.4	819.68	325.44	819.67	325.45	819.67	325.62	819.68	325.78	819.68	
328.38	819.69	334.65	819.71	334.66	819.71	334.74	819.71	334.87	819.73	



183790Analysis.rep

334.89	819.73	336	819.82	336.03	819.82	337.38	819.88	338.5	820.04
339.81	819.97	339.91	819.97	340.04	819.95	343.01	819.78	343.39	819.81
345.18	819.74	347.59	819.92	349.77	819.99	350.42	820.01	351.88	820.08
355.57	820.09	355.88	820.07	356.28	820.06	359.03	819.95	360.32	819.9
360.99	819.88	361.32	819.87	362.53	819.88	366.22	819.86	366.99	819.92
368.82	819.98	371.58	820.11	372.65	820.22	373.72	820.19	376.27	820.08
377.94	819.88	378.43	819.86	379.45	819.82	380.24	819.78	381.16	819.84
382.24	819.86	382.89	819.89	383.49	819.93	385.27	819.91	385.65	819.91
385.92	819.9	387.64	819.95	389.53	819.84	389.65	819.83	390.52	819.76
391.75	819.64	392.27	819.59	392.68	819.57	393.61	819.62	395.57	819.73
396.21	819.83	396.9	819.87	397.89	819.88	398.27	819.9	399.45	819.93
400.82	820.01	402.31	820.12	405.17	820.53	405.22	820.54	405.23	820.54
405.24	820.54	405.38	820.56	408.82	820.92	411.2	821.57	415.03	822.66
415.41	822.76	415.73	822.86	415.91	822.89	416.08	822.92	417.39	823.17
419.84	823.69	420.06	823.73	420.74	823.75	422.39	823.75	422.92	823.73
425.56	823.63	425.86	823.63	426.29	823.65	427.18	823.69	429.11	823.76
430.19	823.72	431.81	823.63	432.54	823.6	433.89	823.49	433.96	823.48
434.41	823.43	435.53	823.33	436.3	823.3	438.34	823.43	439.19	823.49
440.33	823.62	441.81	823.82	443.7	824.11	444.71	824.23	445.87	824.6
447.41	825.08	447.77	825.11	449.7	825.49	450.68	825.48	450.84	825.49
451.22	825.49	453.05	825.49	455.4	825.49	456.96	825.49	458.93	825.48
460.79	825.49	462.35	826.36	462.99	826.78	465.85	828.44	469.53	830.39
469.62	830.44	469.64	830.45	472.6	832.7	473.6	833.57	474.95	834.67
477.05	836.33	480.21	838.77	480.66	839.12	480.95	839.35	484.26	841.92
486.95	843.95	488.91	845.35	489.26	845.61	491.15	847.01		

Manning's n Values

num=	3				
Sta	n Val	Sta	n Val		
0	.03	291.36	.04	324.48	.1

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	291.36	324.48		68	56.16	44		.1	.3

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork  
 RS: 605.82

INPUT

Description:

Station Elevation Data

num=	327								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	836.372	320007	835.952	640015	835.872	990021	835.768	279999	834.68
9.560028	834.2210	80002	833.77	11.88	833.3813	08002	832.9	15.75	831.75
16.93002	831.2818	40002	830.7220	48001	829.87	22.13	829.2124	04001	828.49
26.45001	827.5128	18002	826.9828	52002	826.8429	49002	826.4434	49002	825.52
34.72	825.4534	90002	825.4435	62003	825.3540	35001	824.59	41.28	824.44
41.84003	824.3642	54001	824.2845	40002	823.7147	67001	823.4348	86002	823.27
50.58002	822.9752	51001	822.6754	05002	822.5656	07001	822.36	58.63	822.02
59.63	821.9260	43002	821.8561	59003	821.7166	67001	821.27	66.75	821.27
66.81003	821.2670	31003	821.1373	20001	821.4573	87003	821.59	74.72	821.74
77.43002	822.1679	58002	822.4380	99002	822.5982	76001	822.6884	55002	822.77
85.96002	822.7988	10001	822.8590	81003	822.93	91.88	822.9492	34003	822.93
95.22	822.8898	73001	822.8	98.78	822.898	85001	822.899	08002	822.79
103.58	822.72	104.94	822.79	106.89	822.96	107	822.98	109.6	823.18
111.53	823.21	114.94	823.14	116.4	823.14	117.87	823.03	120.13	822.92
122.98	822.8	123.69	822.76	124.26	822.75	127.29	822.64	130.38	822.71
130.64	822.71	130.81	822.72	131.03	822.72	134.37	822.77	137.02	822.82
137.93	822.83	139.07	822.82	141.49	822.85	143.4	822.75	143.46	822.75
144.74	822.69	145.69	822.68	148.65	822.8	149.23	822.83	151.09	822.91
153.22	823.01	153.89	823.04	157.22	823.18	159.13	823.22	161.21	823.29
164.37	823.36	165.2	823.38	167.88	823.41	169.19	823.44	169.6	823.44

183790Analysis.rep

173.18	823.44	174.84	823.45	177.18	823.41	180.08	823.39	181.17	823.37
184.67	823.32	185.16	823.32	185.32	823.32	189.15	823.26	190.55	823.25
193.15	823.2	195.79	823.11	197.48	823.03	197.84	823.03	198.42	823.02
199.38	823.02	200.7	823.01	201.17	823.01	201.58	823.01	202.14	823.01
204.03	822.99	204.84	822.91	205.19	822.95	215.76	823.22	217.34	823.27
217.62	823.28	217.75	823.28	217.97	823.29	218.06	823.29	218.34	823.3
218.39	823.3	218.44	823.3	218.47	823.3	218.68	822.43	219.47	819.24
221.33	817.67	221.39	817.66	224.71	817.18	225.03	817.13	225.23	817.11
227.46	817.11	229.86	817.12	230.24	817.06	231.8	816.84	232.29	816.78
232.45	816.75	234.89	817.37	234.95	817.38	235.1	817.42	240.93	818.62
241.48	818.57	242.83	818.8	244.95	819.15	245.49	819.23	245.75	819.27
245.9	819.3	246.54	819.38	247.96	819.4	247.97	819.41	248.02	819.41
248.05	819.42	248.07	819.42	248.23	819.44	248.29	819.43	248.31	819.43
248.35	819.43	248.41	819.44	248.9	819.5	249.27	819.55	249.71	819.6
250.32	819.65	251.72	819.76	251.81	819.77	252.2	819.8	252.37	819.81
252.87	819.85	255.15	820.03	257.52	820.21	257.52	820.22	257.83	820.23
258.05	820.24	258.09	820.24	258.1	820.24	258.14	820.25	258.43	820.25
260.14	820.15	260.2	820.15	261.25	820.06	261.86	820.03	262.68	819.99
264.07	819.93	265.56	820.07	266.11	820.11	266.9	820.21	268.87	820.38
269.39	820.42	272.37	820.55	274.36	820.55	276.98	820.51	279.59	820.44
280.97	820.37	284.83	820.2	284.97	820.2	285.4	820.18	288.65	820.02
289.77	819.98	290.11	819.97	291.42	819.93	293.8	819.85	296.01	819.79
296.47	819.78	298.12	819.74	300.59	819.7	301.85	819.7	302.4	819.69
303.91	819.79	304.53	819.85	305.82	820.02	307.09	820.29	307.74	820.43
308.51	820.53	310.09	820.7	311.18	820.78	312.41	820.85	313.24	820.87
313.98	820.89	315.2	820.91	315.43	820.91	315.66	820.92	316.56	820.91
317.98	820.88	319.98	820.8	320.17	820.79	322.23	820.7	322.74	820.68
324.12	820.59	325.14	820.67	325.38	820.69	325.63	820.69	327.52	820.9
327.59	820.91	327.66	820.91	329.8	820.89	330.3	820.87	331.27	820.78
332	820.7	332.59	820.6	332.9	820.54	333.7	820.32	334.12	820.24
335.17	820.14	336.48	820.05	337.71	820.43	338.23	820.63	339.08	821.06
339.98	821.64	340.29	821.86	340.85	822.28	343.11	823.13	343.43	823.23
343.61	823.26	343.66	823.27	344.26	823.4	345.05	823.49	345.72	823.56
346.11	823.6	347.2	823.73	347.34	823.75	348.86	823.93	349.41	823.99
351.68	824	352.41	823.97	353.43	823.96	354.54	823.93	355.02	823.93
355.67	823.9	358.42	823.79	358.58	823.78	358.84	823.77	359.54	823.69
361.21	823.51	362.09	823.4	362.33	823.38	362.78	823.37	364.41	823.29
365.86	823.26	366.3	823.26	367.48	823.31	369.11	823.37	370.12	823.38
371.53	823.46	372.28	823.53	372.94	823.59	374.78	823.65	375.37	824.02
376.97	824.5	376.99	824.51	377.03	824.52	378.65	825.04	379.71	825.25
381.38	825.48	382.14	825.7	384.56	825.84	386.96	825.98	390.46	826.16
390.61	826.17	391.49	826.24	393.7	826.4	394.37	826.83	396.36	828.25
397.16	828.74	400.2	830.87	401.47	831.74	402.26	832.27	404.55	833.88
407.79	836.27	408.17	836.57	408.72	837.01	409.6	837.71	412.35	839.92
414.07	841.32	415.62	842.46	416.23	843.02	419.52	846.09	420.36	846.64
420.77	846.94	421.17	847.15						

Manning's n Values  
 Sta n Val Sta n Val  
 0 .03 218.47 .04 240.93 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 218.47 240.93 35 30.65 26 .1 .3  
 Blocked Obstructions num= 1  
 Sta L Sta R Elev  
 218.47 220.15 823.3

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 575.17

183790Analysis.rep

INPUT

Description:

Station Elevation Data

num= 288

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	837.07	5500183	836.92	950012	836.344	720001	835.886	980011	835.32
8.280029	834.979	290009	834.6811	84003	833.915	11002	833.0615	40002	832.98
15.64001	832.916	73001	832.6317	87003	832.3	20.91	830.9321	98001	830.47
22.53003	830.2223	23001	829.9427	03003	828.3728	33002	828.0329	65002	827.61
31.35001	827.2733	20001	826.8734	67001	826.5936	78003	826.239	48001	825.56
40.34003	825.3841	01001	825.23	43.94	824.4247	06003	824.0247	36002	823.99
47.38	823.9947	60001	823.9651	03003	823.5353	70001	823.2854	59003	823.18
55.73001	823.0859	45001	822.7560	40002	822.6862	11002	822.3563	85001	821.74
65.28003	821.466	39001	821.21	68.44	820.67	71.97	820.4572	52002	820.42
72.81003	820.55	73.75	820.6575	78003	821.5979	08002	822.0680	10001	822.21
83.09003	822.5685	42001	822.6286	65002	822.62	88.22	822.5789	01001	822.57
90.45001	822.5291	76001	822.593	77002	822.4496	34003	822.4297	34003	822.41
98.11002	822.42	100.9	822.4	104.45	822.47	104.46	822.47	104.47	822.47
108.02	822.5	110.8	822.5	111.49	822.5	112.59	822.5	115.15	822.5
117.14	822.5	118.71	822.5	120.72	822.5	122.27	822.5	123.48	822.5
125.83	822.5	128.84	822.5	129.39	822.5	129.83	822.5	130.11	822.5
133.12	822.5	136.17	822.5	137.65	822.5	137.79	822.5	137.96	822.5
142.52	822.5	143.64	822.5	145.09	822.5	147.21	822.51	148.61	822.51
148.84	822.51	150.8	822.51	153.81	822.51	154.41	822.51	154.8	822.51
158.03	822.51	160.76	822.51	161.64	822.51	163	822.53	164.93	822.55
165.8	822.55	166.72	822.57	172.19	822.68	172.68	822.69	173.08	822.7
177.61	822.82	179.02	822.86	179.4	822.86	180.07	822.86	180.93	822.87
182.07	822.88	182.4	822.89	183.47	822.9	184.38	822.91	184.4	822.91
184.53	822.92	184.91	822.93	186.61	823.01	187.77	823.05	187.9	823.06
188.53	823.07	188.62	823.07	191.99	823.16	197.48	823.29	197.78	823.3
197.88	823.3	197.9	823.3	197.95	823.31	198.03	823.31	198.07	823.31
198.13	823.31	198.17	823.31	198.19	823.31	198.2	823.31	198.36	823.32
198.46	823.32	198.61	823.32	200.43	817.37	200.53	817.03	202.86	816.7
203.49	816.62	206.43	816.96	206.45	816.96	206.47	816.97	206.59	816.97
209.73	817.03	209.77	817.03	209.85	817.03	211.68	817.88	211.76	817.91
211.93	817.99	212.87	818.03	213.16	818.05	213.71	818.07	224.69	818.56
225.66	818.56	227.43	818.8	230.55	819.23	231.39	819.28	231.94	819.35
232.85	819.46	242.02	820.56	242.03	820.55	242.06	820.54	242.48	820.66
243	820.79	244.36	821.02	245.11	821.17	246.09	821.34	247.71	821.27
249.91	821.4	252.92	821.16	253.25	821.12	254.88	821.02	255.63	820.95
256.12	820.94	259.25	820.72	262.08	820.58	263.27	820.52	264.07	820.47
266.48	820.33	268.04	820.25	270.09	820.11	273.26	819.96	273.97	819.92
276.99	819.82	279.96	819.84	281.76	819.85	282.76	819.87	284.37	819.93
285.72	819.94	286.39	819.95	288.15	820.13	288.73	820.16	288.97	820.17
290.18	820.36	291.29	820.49	291.72	820.55	292.02	820.58	293.54	820.74
294.62	820.82	295.41	820.85	296.75	820.96	297.47	821.01	299.23	821.18
299.45	821.19	299.85	821.22	300.83	821.21	302.8	821.09	303.73	820.95
304.47	820.84	305.75	820.62	306.04	820.58	306.29	820.55	307.45	820.46
308.02	820.46	309.29	820.5	309.7	820.51	309.81	820.51	310	820.49
313.09	820.35	313.17	820.34	315.73	819.93	316.14	819.89	316.74	819.99
317.13	820.03	318.09	820.05	319.15	820.46	321	821.11	322.54	821.95
323.16	822.29	323.51	822.46	325.67	823.31	327.3	823.89	327.54	823.9
329.06	823.97	329.76	824	329.9	824	329.96	824.01	330.37	824.02
331.35	824	333.82	823.89	334.46	823.85	335.2	823.78	338.49	823.51
338.77	823.48	340.45	823.4	340.93	823.36	341.81	823.31	343.59	823.23
345.36	823.15	346.76	823.2	350.18	823.14	351.48	823.28	353.52	823.44
355.33	823.46	356.3	823.59	356.85	823.77	357.43	823.86	360.47	824.69
363.39	825.35	364.06	825.52	365.14	825.63	366.75	825.86	368.87	826.13
369.35	826.15	371.31	826.28	374.33	826.39	374.93	826.4	375.31	826.41
375.39	826.41	376.91	826.43	379.06	827.87	381.27	829.3	382.16	829.89
383.52	830.83	385.77	832.37	387.23	833.46	388.47	834.3	392.7	838.07
393	838.32	393.19	838.47	396.62	840.98	399.15	843	400.23	843.75
401.89	844.96	404.46	847	404.64	847.1				

183790Analysis.rep

Manning's n Values num= 3  
 Sta n Val Sta n Val  
 0 .03 198.61 .04 211.93 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 198.61 211.93 35 30.69 26 .1 .3  
 Blocked Obstructions num= 1  
 Sta L Sta R Elev  
 198.61 206.26 823.32

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 544.48

INPUT

Description:

Station Elevation Data			num= 285						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	838.91	709991	838.333	220001	837.794	350006	837.335	289978	837
6.660004	836.38	059998	835.5110	079999	834.8210	289998	834.7810	60001	834.63
11.31	834.34	14.81998	832.3	16.41	831.3916	769999	831.2616	91998	831.21
18.35999	830.623	10999	828.65	25.53	827.6726	679999	827.3928	20999	826.85
29.35999	826.51	30.63	826.3835	00998	825.135	35999	825.01	35.62	824.95
38.92999	824.17	41.87	823.55	42.5	823.4443	32999	823.2747	75998	822.35
47.82999	822.3448	04999	822.3251	64999	821.9554	17999	821.66	54.38	821.66
55.63998	821.5359	97998	821.52	60.12	821.52	60.63	821.5163	91998	821.44
66.88998	821.3967	60001	821.4268	29999	821.172	32999	819.77	72.69	819.65
73.79999	820	76.62	820.6978	32999	821.1979	39999	821.24	82.44	821.52
84.94998	821.5185	35001	821.5185	64999	821.5188	91998	821.5191	89999	821.5
92.48999	821.593	26999	821.5	96.91	821.5	98.16	821.5198	47998	821.52
101.6	821.58	103.2	821.63	104.41	821.61	106.78	821.67	109.92	821.69
110.47	821.7	111.04	821.68	112.96	821.69	116.92	821.91	117.49	821.91
118.24	821.96	121.06	822.11	123.17	822.18	124.63	822.27	126.57	822.32
128.2	822.39	129.43	822.42	131.77	822.46	134.89	822.51	135.64	822.53
138.31	822.54	141.94	822.52	144.02	822.5	144.27	822.5	144.46	822.5
148.19	822.5	150.24	822.5	151.3	822.5	151.49	822.5	153.18	822.5
155.11	822.5	157.03	822.5	158.4	822.5	159.04	822.5	162.68	822.52
163.81	822.52	164.8	822.53	167.24	822.54	170.26	822.59	171	822.6
171.46	822.62	174.44	822.72	177.83	822.76	178.31	822.77	178.69	822.78
184.53	823.03	184.59	823.03	184.69	823.03	185.24	823.05	186.9	823.08
187.43	823.11	188.89	823.14	189.41	823.15	189.77	823.16	191	823.19
191.29	823.2	191.81	823.21	192.21	823.22	196.02	823.39	196.7	823.41
197.77	823.47	197.92	823.46	198.75	823.49	201.3	823.59	201.3	823.58
201.42	822.87	201.58	821.92	201.8	820.66	202.01	820.56	204.44	819.41
204.69	819.29	204.91	819.19	205.19	819.08	208.06	817.91	208.25	817.86
210	817.39	211.24	817.07	212.5	816.73	212.57	816.71	214	817
214.26	817.05	214.32	817.06	218.1	817.05	218.29	817.05	219	817.05
219.47	817.11	223.62	817.59	223.77	817.6	223.82	817.6	223.92	817.61
224.09	817.63	224.53	817.67	228	817.99	233.14	818.47	233.34	818.48
234.06	818.56	236.73	818.74	238.03	818.86	238.62	818.91	238.96	818.94
240.11	819.08	243.13	819.7	247.43	820.62	247.49	820.62	248.9	820.67
248.91	820.67	249.12	820.67	250.88	820.64	251.33	820.65	253.31	820.61
253.58	820.6	255.93	820.57	257.99	820.54	260.37	820.46	261.16	820.39
262.94	820.35	265.89	820.06	265.91	820.06	269.03	819.76	269.34	819.75
272.32	819.72	273.23	819.72	274.69	819.64	276.3	819.57	278.26	819.44
280.25	819.35	283.07	819.4	283.27	819.4	283.69	819.43	284.23	819.46
285.38	819.44	285.54	819.45	285.68	819.46	288.66	819.9	290.56	820.16
291.39	820.29	291.75	820.33	292.96	820.38	295.26	820.47	295.33	820.47
296.38	820.47	298.07	820.34	298.63	820.33	299.03	820.3	301.17	820.12
301.49	820.09	302.86	820.12	303.05	820.1	303.63	820.06	304.47	820
305.51	819.85	306.64	819.73	308.28	819.41	310.08	819.13	312.71	819.22

183790Analysis.rep

312.87	819.21	314.74	819.43	315.06	819.49	315.56	819.71	316.85	820.33
319.11	822.04	319.63	822.44	319.96	822.63	322.43	823.47	323.64	823.88
323.74	823.92	324.31	823.91	324.35	823.91	324.5	823.91	325.72	823.89
326.07	823.89	327.66	823.76	328.5	823.73	329.9	823.7	330.32	823.69
331.56	823.62	333.63	823.51	333.74	823.51	333.81	823.5	333.92	823.48
335.92	823.18	335.97	823.18	337.68	822.94	338.58	822.92	339.95	822.95
340.77	822.95	341.99	822.93	344.3	822.92	344.74	822.92	345.18	822.97
347.52	823.22	350.1	823.48	352.52	823.83	353.33	823.95	353.99	824.04
354.31	824.15	357.34	824.77	359.13	825.17	360.43	825.97	364.16	825.65
364.47	825.67	364.93	825.7	368.12	825.64	369.17	825.61	370.25	825.83
372.85	826.91	374.01	827.56	375.69	828.3	376.54	828.88	379.25	830.74
382.34	832.62	382.78	832.93	383.86	833.71	386.62	836.12	388.15	837.19
388.96	837.75	390.07	838.63	393.44	841.67	393.71	841.91	393.86	842.04
393.95	842.11	397.51	844.71	399.75	846.29	401.17	847.17	401.21	847.19

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .03 201.3 .04 228 .1		

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
201.3	228	65	56.28	48	.1	.3

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 488.2

INPUT

Description:

Station	Elevation	Data	num=	341
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev				
0 838.95 5800171 838.533.089996 836.854.679993 835.72 7.23999 833.84				
8.670013 833.119.209991 832.849.269989 832.812.82001 830.9 15.31 829.32				
16.41 828.72 17.97 827.821.04001 825.9 22.66 825.2124.17001 824.45				
25.95999 823.4626.07001 823.4427.20999 823.24 27.53 823.1930.76001 822.64				
33.64001 822.2434.67999 822.0735.36002 822.01 37.94 821.71 39.75 821.59				
41.92999 821.4742.11002 821.4742.42999 821.47 44.06 821.55 45.12 821.55				
45.86002 821.548.70999 821.551.98001 821.4852.29999 821.4752.76001 821.47				
55.89001 821.46 58.09 821.4559.48001 821.4661.45999 821.4663.07001 821.47				
64.20001 821.4965.79001 821.570.14999 821.57 70.28 821.57 70.41 821.57				
75.04001 821.4276.42001 821.09 77.81 820.8578.85001 820.8281.01001 820.41				
82.53 820.5385.23999 821.186.98999 821.3787.92999 821.5388.64001 821.62				
90.08002 821.8293.85001 822.28 94.75 822.13 95.37 822.1396.23999 822.04				
97.95001 821.68 100.86 821.62 102.55 821.58 104.94 821.56 105.59 821.54				
106.97 821.55 109.72 821.55 113.08 821.57 113.31 821.57 113.64 821.57				
119.2 821.63 120.52 821.64 120.85 821.61 122.33 821.67 124.08 821.73				
125.31 821.77 127.67 821.88 131.03 821.88 131.26 821.89 131.42 821.89				
134.85 821.96 137.53 822.01 138.17 822.01 139.73 822.1 142.02 822.2				
143.64 822.26 145.8 822.39 148.43 822.43 149.2 822.44 149.75 822.44				
150.48 822.45 153.03 822.48 155.86 822.51 156.38 822.52 157.12 822.52				
159.97 822.54 161.97 822.55 163.56 822.55 165.82 822.54 167.15 822.54				
168.08 822.54 171 822.53 174.08 822.53 174.19 822.53 174.33 822.53				
174.52 822.53 177.92 822.55 180.3 822.55 182.14 822.54 182.61 822.53				
184.89 822.72 184.92 822.72 185.04 822.72 187.2 822.57 189.35 822.58				
189.47 822.58 189.96 822.58 191.17 822.57 191.74 822.56 192.3 822.56				
192.63 822.56 193.6 822.56 195.19 822.58 196.9 822.58 197.5 822.59				
197.55 822.59 197.66 822.59 198.03 822.59 200.1 822.58 200.67 822.58				
201.68 822.59 203.56 822.54 204.34 822.53 206.14 822.56 206.52 822.55				
208.18 822.59 208.8 822.6 208.93 822.6 209.09 822.61 210.5 822.68				
211.23 822.73 211.79 822.78 213.09 822.86 214.09 822.91 215.34 822.94				
216.83 823 216.91 823 217.43 823.03 218.49 823.1 218.84 823.15				
220.61 823.39 221.15 823.46 221.74 823.52 223.98 823.79 224.07 823.79				

183790Analysis.rep

224.25	823.8	224.3	823.81	224.33	823.82	224.37	823.82	225	823.84
225.36	823.85	226.02	823.8	226.97	823.71	228.17	823.65	229.63	823.56
229.94	823.55	230.69	823.51	230.92	823.51	231.54	823.48	232.52	823.51
234.39	823.52	235.03	823.54	235.92	823.54	236.64	823.54	236.81	823.52
237.33	823.49	238.53	823.41	239.19	823.38	240.08	823.36	240.19	823.36
240.23	823.35	240.25	823.35	240.26	823.35	240.35	823.35	240.39	823.35
240.4	823.35	240.49	823.31	240.5	823.31	246.83	823.42	247.01	823.42
247.08	823.42	247.09	823.42	247.17	823.42	247.35	823.42	247.4	823.42
247.43	823.42	247.47	823.42	247.5	823.42	252.42	823.49	252.65	823.49
252.73	823.49	252.83	823.49	254.03	823.49	254.3	823.49	255.96	822.38
256.59	821.96	257.44	821.75	260.01	821.13	262.3	820.57	265.08	819.9
265.6	819.9	267.29	819.92	269.5	819.95	270.2	815.19	270.4	813.82
270.44	813.6	271.71	813.71	275.95	814.07	276.26	814.09	276.68	814.13
278.09	814.25	281	814.6	281.75	814.71	285.13	815.16	285.14	815.16
285.21	815.17	290.08	815.5	290.17	815.5	291.41	815.91	293.4	816.55
293.78	816.68	297.09	818.82	305.39	819.89	305.45	819.89	305.52	819.89
306.28	819.85	307.05	819.79	307.85	819.76	308.22	819.74	308.93	819.71
309.01	819.71	309.7	819.69	310.99	819.66	311.25	819.67	312.88	819.72
314.03	819.74	314.64	819.76	315.54	819.78	317.13	819.81	319.1	819.97
320.16	819.96	320.98	820.02	321.82	819.91	323.43	819.77	325.01	819.95
325.61	819.92	326.96	819.89	327.94	819.7	329.74	819.33	330.09	819.26
330.81	819.09	331.5	819.01	333.53	818.83	334.54	818.7	338.41	818.64
339.34	818.74	339.37	818.74	339.45	818.76	342.52	819.46	342.8	819.5
345.07	820.44	347.26	821.54	347.5	821.68	347.55	821.7	347.75	821.8
349.42	822.61	349.74	822.64	349.87	822.65	350.01	822.66	350.1	822.69
350.58	822.83	350.59	822.83	351.6	822.95	353.69	823.19	355.86	823.18
356.59	823.17	357.18	823.15	358.14	823.1	359.73	823.06	360.38	823.05
360.59	823.05	361.64	823.06	362.92	823.06	363.35	823.05	364.52	822.97
364.65	822.96	366.09	822.89	366.4	822.87	368.43	822.75	368.46	822.75
368.53	822.75	368.88	822.73	370.46	822.66	372.5	822.66	372.85	822.67
372.98	822.67	373.08	822.68	374.35	822.76	374.91	822.78	377.95	823.13
379.41	823.27	380.29	823.38	383.05	823.74	386.14	824.3	387.11	824.63
387.61	824.7	390.44	825.58	391.98	825.63	393.97	825.74	397.26	826.02
397.75	826.04	397.83	826.06	401.25	826.71	403.67	827.82	404.89	828.38
406.91	829.49	408.54	830.33	409.52	830.91	412.18	832.47	415.36	834.35
415.82	834.64	416.57	835.18	419.19	837.06	421.21	838.73	423.28	840.33
426.22	842.62	426.74	843.01	427.05	843.27	429.92	845.46	430.77	846.06
431.19	846.36								

Manning's n Values num= 3  
 Sta n Val Sta n Val  
 0 .03 269.5 .04 297.09 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 269.5 297.09 73 100.17 128 .1 .3

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 388.03

INPUT

Description:  
 Station Elevation Data num= 267

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	838.221	230011	837.481	700012	837.2	2.02002	8375.300018	835.02	
8.059998	833.199	190002	832.48	10.13	831.7813	77002	829.0714	17001	828.78
15.01001	828.38	18.91	826.5719	05002	826.4919	14999	826.45	20.16	825.96
23.30002	824.4326	2.0001	823.3326	73999	823.07	28.66	822.46	30.62	821.74
31.67001	821.66	32.25	821.74	34.09	821.7236	80002	822.01	37.69	822.07
38.30002	822.11	40.84	822.46	41.22	822.51	42.47	822.444	76001	822.21
45.69	822.05	48.31	821.6750	39001	821.6452	57001	821.5254	58002	821.55

183790Analysis.rep

55.69	821.58	56.44	821.6357.45999	821.6561.76001	821.8762.48001	821.91
62.70999	821.9263.48001		821.9366.48001	822 68.53	821.87 72.12	821.65
72.44	821.61 73.66		820.9974.58002	820.6776.60001	819.67 77.22	819.5
79.95001	820.180.76001		820.1981.26001	820.4284.48001	821.5986.67001	821.99
87.59	822.2490.14999		822.0692.23001	822 92.72	821.9795.73001	821.68
98.77002	821.6198.89001		821.699.04001	821.6 102.48	821.56 104.81	821.55
106.07	821.55 107.93		821.54 109.67	821.53 110.86	821.53 113.27	821.53
116.83	821.53 116.87		821.53 116.9	821.53 120.47	821.54 122.95	821.56
124.07	821.57 125.72		821.6 127.71	821.76 129	821.76 130.73	821.74
134.61	821.87 134.96		821.87 135.04	821.87 138.47	821.93 141.09	821.89
142.07	821.9 143.5		821.88 147.14	821.82 151.48	821.75 152.09	821.75
152.55	821.74 152.88		821.74 153.18	821.76 156.46	821.98 159.23	822.2
160.46	822.31 161.29		822.33 163.66	822.46 165.27	822.48 167.26	822.48
170.18	822.5 170.86		822.51 171.32	822.51 176.23	822.51 176.67	822.51
177.7	822.55 178.2		822.56 178.75	822.58 180.57	822.58 180.75	822.58
180.9	822.58 183.51		822.65 184.01	822.66 184.98	822.66 186.37	822.66
186.93	822.67 187.93		822.71 188.78	822.76 189.23	822.78 189.37	822.79
189.96	822.8 191.34		822.83 191.76	822.83 193.12	822.84 193.41	822.84
195.22	822.86 195.79		822.85 195.89	822.85 196.38	822.86 198.69	822.95
199.35	822.97 200.61		822.99 201.44	823.01 202.16	823.03 203.22	823.07
204.07	823.1 205.05		823.13 206	823.14 207.1	823.14 208.21	823.16
209.18	823.16 209.41		823.16 209.45	823.16 209.96	823.16 215.91	822.53
222.94	821.77 223.13		821.76 224.15	820.41 224.42	820.06 224.68	819.95
226.16	819.38 228.05		818.65 228.53	816.08 228.59	815.79 229.98	815.78
231.73	815.78 232.4		815.78 232.53	815.78 238.88	815.67 239.03	815.67
239.31	815.69 242.31		815.87 243.95	815.97 246.2	816.1 246.61	816.13
247.15	816.12 254.12		816 254.47	816 257.86	820.17 264.11	822.65
271	822.85 271.1		822.86 272.16	823.02 272.44	823.07 273.39	823.21
274.44	823.36 274.73		823.39 275.25	823.44 276.56	823.56 276.71	823.57
276.8	823.58 278.51		823.72 279.46	823.8 280.28	823.88 282.12	824.31
282.61	824.41 283.15		824.6 284.42	825.06 284.75	825.17 285.41	825.41
286.22	825.62 287.58		825.95 288.07	826.02 289.02	826.16 289.62	826.25
290.13	826.33 290.25		826.35 294.65	826.51 295.11	826.5 295.44	826.5
300.03	826.5 300.11		826.5 300.4	826.5 305.11	826.5 305.31	826.5
310.11	826.5 310.23		826.5 313.98	826.5 314.08	826.5 314.83	826.5
315.37	826.5 318.64		826.5 321.52	826.51 322	826.51 322.66	826.51
325.58	826.55 327.68		826.63 329.17	826.67 331.24	826.78 332.75	826.85
333.83	826.92 336.33		827.07 339.83	827.31 339.93	827.32 339.94	827.32
340.21	827.33 343.22		827.51 346.13	827.89 347.08	827.99 348.41	828.09
350.34	828.31 350.83		828.37 351.01	828.38 352.28	828.32 354.25	828.42
356.99	828.48 357.83		828.47 358.43	828.5 359.28	828.51 362.4	828.79
364.58	828.99 365		829.03 365.58	829.08 370.08	829.51 370.16	829.52
370.49	829.57 371.01		829.65 374.94	830.24 375.74	830.36 376.26	830.43
376.89	830.51 379.25		830.92 382.74	831.36 383.05	831.41 386.06	831.67
389.19	831.94 390.08		832.01 391.33	832.1 392.53	832.24 395.44	832.55
395.96	832.94 399.91		835.96 400.83	836.68 401.49	837.23 405	840.27
406.48	841.23 407.63		841.95			

Manning's n Values num= 3  
 Sta n Val Sta n Val  
 0 .03 222.94 .04 264.11 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 222.94 264.11 125 131.5 138 .1 .3

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 256.53

INPUT  
 Description:



Station Elevation Data

num= 299

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	838.97	7999878	838.56	1.929993	837.92	4.339996	836.59	7.01001	834.96
7.860016	834.49	8.670013	834.01	11.351999	830.81	14.47	830.67	14.95999	830.45
15.39999	830.34	20.06	829.72	20.39001	829.66	20.42999	829.65	20.78	829.42
21.94	828.67	22.14001	828.57	24.20001	827.23	26.98999	825.71	27.31	825.54
28.88	825.03	29.12	824.92	29.39999	824.84	34.16	823.59	35.61002	823.37
36.20001	823.27	36.86002	823.15	37.22	823.07	40.12	822.65	42.23999	822.55
44.32001	822.56	46.82001	822.49	49.09	822.33	50.37	822.3	51.78	822.2
55.04001	821.84	55.82001	821.82	57.44	821.79	59.23999	821.65	61.17001	821.66
62.57001	821.46	63.12	821.5	65.44	821.94	66.70001	821.61	68.06	821.58
69.29999	821.12	72.60001	819.65	74.16	819.81	75.01999	819.62	76.03	819.82
78.67999	820.36	81.62	821.28	82.89001	821.65	83.13	821.7	85.41	821.65
89.08002	821.57	89.29999	821.57	89.51001	821.56	92.84	821.53	94.45999	821.53
95.85001	821.52	98.70001	821.41	101.11	821.32	106.11	821.1	106.37	821.08
106.38	821.08	106.84	821.07	108.87	820.98	109.31	820.98	111.85	820.92
112.12	820.91	113.5	820.88	114.39	820.87	114.53	820.86	114.99	820.84
116.82	820.76	117.46	820.74	118.84	820.73	119.71	820.71	120.81	820.68
122.12	820.66	122.16	820.66	122.22	820.66	122.53	820.65	123.15	820.64
124.56	820.61	124.7	820.6	124.85	820.62	126.72	820.69	126.98	820.7
127.2	820.71	128.34	820.73	129.22	820.75	129.84	820.76	131.19	820.79
132.13	820.86	133.46	820.94	134.86	821	135.49	821.04	136.75	821.12
137.59	821.18	137.9	821.2	138.1	821.21	139.79	821.29	140.54	821.31
141.87	821.35	142.02	821.36	142.07	821.36	142.2	821.36	143.85	821.41
144.55	821.45	145.79	821.55	146.25	821.59	146.68	821.63	146.7	821.63
155.59	820.9	157.58	818.28	159.81	816.61	166.46	816.09	166.8	816.07
167.12	816.04	173.2	816	174.59	815.99	174.86	815.99	180.08	816.34
183.05	816.59	183.33	816.62	185.07	818.26	187.11	819.21	188.73	821.75
196.89	823.01	197.03	823.02	197.04	823.02	197.05	823.02	197.53	823.04
198.98	823.09	199.12	823.09	199.52	823.1	201.28	823.13	201.83	823.13
203.54	823.12	204.08	823.13	205.09	823.12	205.95	823.15	207.14	823.18
208.2	823.19	210.04	823.23	210.5	823.23	210.96	823.23	212.67	823.2
214.06	823.18	215.06	823.14	216.65	823.14	217.54	823.12	217.71	823.12
219.4	823.06	220.31	823.01	220.83	822.98	221.64	822.93	222.05	822.94
223.43	822.99	227.31	822.99	229.68	822.93	231.29	822.58	232.45	822.7
232.66	822.73	235.34	823.02	236.79	823.18	237.82	823.26	238.68	823.34
240.76	823.38	243.08	823.39	243.69	823.38	247.84	823.35	248.06	823.35
248.14	823.35	249.47	823.42	252.21	823.58	255.46	823.73	255.89	823.74
256.01	823.74	259.31	823.92	262.55	824.26	262.82	824.3	263.5	824.41
263.84	824.44	264.2	824.47	264.74	824.46	269.08	824.27	269.95	824.23
270.98	824.27	273.5	824.3	275.62	824.43	276.36	824.47	277.68	824.5
278.95	824.5	280.09	824.5	281.54	824.48	282.36	824.52	283.3	824.51
286.5	824.77	287.69	824.86	288.69	824.95	291.24	825.15	294.27	825.41
294.98	825.47	296.18	825.58	301.77	825.91	301.89	825.92	302.03	825.93
305.44	826.18	308.3	826.4	308.96	826.44	309.79	826.55	312.53	826.85
314.84	826.97	316.44	827.08	317.55	827.12	319.63	827.23	321.38	827.31
323.92	827.39	324.74	827.43	325.61	827.47	326.66	827.57	327.92	827.78
330.27	828.25	333.08	828.42	334.45	828.53	334.93	828.54	337.89	828.92
339.13	829.49	339.71	829.29	340.89	828.82	341.03	828.8	342.19	828.38
342.88	828.39	347.53	828.43	348.02	828.44	348.6	828.44	353.9	828.5
354.06	828.5	355.11	828.5	356.36	828.51	358.6	828.51	360.6	828.5
362.21	828.5	364.12	828.5	365.76	828.48	367.14	828.49	369.31	828.48
371.89	828.49	373.55	828.5	375.34	828.47	377.31	828.47	377.57	828.47
379.65	828.48	379.95	828.48	380.21	828.48	383.5	828.56	386.75	828.54
387.05	828.54	387.41	828.54	390.77	828.55	393.29	828.66	394.15	828.7
395.17	828.77	397.7	828.86	399.82	828.97	401.57	829.08	401.92	829.1
402.93	829.16	404.79	829.25	406.36	829.37	408.34	829.39	410.7	829.46
412.08	829.52	412.9	829.5	415.44	829.49	418.46	829.52	418.99	829.52
419.43	829.55	422.54	829.76	425.97	830.04	426.08	830.05	426.22	830.07
430.5	830.5	432.51	831.11	433.98	831.48	436.73	832.49	439.04	833.48
441.27	834.32	441.73	834.51	443.51	835.83	444.65	836.66	446.34	837.63
447.4	838.37	449.42	839.38	449.6	839.43	450.69	839.54		

183790Analysis.rep

Manning's n Values  
 Sta n Val Sta  
 0 .03 155.59

num= 3  
 n Val Sta n Val  
 .04 188.73 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 155.59 188.73 239 211.47 185 .1 .3

CROSS SECTION

RIVER: Robinson Fork  
 REACH: Robinson Fork RS: 45.06

INPUT

Description:

Station Elevation Data			num= 243						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	851.04	.07	850.95	3	847.553	920013	846.265	040009	844.45
6.649994	842.177	380005	840.878	290009	838.838	990021	837.519	820007	836.23
10.84	834.311	29001	832.66	14.13	830.571	5.24002	829.611	6.33002	828.46
17.45999	827.361	8.20999	826.591	9.57001	825.18	20.75	823.91	21.03	823.68
21.5	823.172	1.73001	823.022	5.04001	820.912	5.05002	820.925	0.08002	820.89
25.10001	820.882	5.11002	820.87	27.53	819.363	3.74002	817.073	3.82001	817.04
33.86002	817.033	3.92999	817	33.94	816.993	4.07001	816.953	8.17001	816.54
43.44	816.03	43.97	815.98	44.34	815.94	44.41	815.93	44.59	815.95
49.28	816.264	9.45999	816.27	49.84	816.31	50.22	816.345	6.29001	816.93
56.42001	816.935	9.67999	816.91	63.19	817.1	65.75	817.62	68.66	820.69
75.51001	821.187	5.57001	821.14	75.62	821.11	75.62	821.04	75.63	821.11
75.70999	821.127	5.82001	821.14	76.75	821.22	77.09	821.27	77.66	821.27
79.01001	821.31	79.66	821.34	80.88	821.398	1.49002	821.42	81.75	821.42
84.51001	821.586	6.7001	821.488	8.26001	821.52	89.34	821.629	2.17999	821.84
94.64999	821.95	95.72	821.99	96.94	821.98	98	822.01	101.29	821.89
102.81	821.86	104.53	821.79	106.35	821.72	107.94	821.66	109.89	821.59
112.13	821.55	113.44	821.5	114.58	821.48	117.57	821.5	119.07	821.46
120.18	821.56	121.22	821.67	124.07	821.96	127.32	822.25	127.61	822.28
127.86	822.31	131.15	822.65	134.51	823.02	134.7	823.04	134.91	823.07
138.24	823.43	141.15	823.71	141.78	823.78	142.51	823.84	145.33	824.07
147.79	824.24	148.93	824.34	150.1	824.36	152.41	824.46	154.44	824.52
155.96	824.55	157.7	824.56	159.5	824.59	161.08	824.6	163.04	824.63
165.29	824.61	166.59	824.62	167.72	824.63	168.45	824.63	173.2	824.74
173.56	824.74	174.06	824.75	174.36	824.76	177.22	824.89	180.48	824.93
180.76	824.93	181.01	824.93	184.31	824.95	187.65	824.95	187.85	824.95
188.08	824.96	192.32	824.92	194.29	825.02	194.94	825.02	195.67	825.08
198.48	825.29	198.63	825.3	200.44	825.44	200.92	825.52	204.04	825.5
205.67	825.47	206.47	825.47	209.12	825.45	210.86	825.42	210.94	825.47
213.35	825.7	216.12	825.9	218.5	826.08	221.35	826.3	223.15	826.43
224.41	826.53	226.42	826.68	226.57	826.69	230.52	826.98	231.8	827.06
236.36	827.46	237.06	827.51	240.14	827.76	242.25	827.93	242.6	827.98
243.49	828.05	246.55	828.29	247.48	828.36	248.54	828.44	252.17	828.65
252.7	828.66	254.56	828.75	257.93	828.87	258.57	828.9	260.68	829.03
262.58	829.14	263.16	829.18	266.58	829.37	268.38	829.52	270.59	829.64
273.61	829.83	274.6	829.88	277.86	830.09	278.61	830.13	278.83	830.14
282.61	830.32	284.06	830.38	286.62	830.4	289.29	830.48	290.63	830.48
294.51	830.5	294.64	830.5	295.04	830.5	298.58	830.5	299.74	830.51
302.65	830.53	304.96	830.66	307.85	830.75	310.21	830.87	312.23	831.01
314.67	831.17	315.42	831.2	318.98	831.41	319.47	831.44	320.64	831.54
322.69	831.71	325.87	831.99	326.7	832.06	329.41	832.29	330.93	832.42
332.05	832.5	332.22	832.5	332.78	832.51	336.32	832.63	338.72	832.76
341.55	832.92	343.08	833.04	346.6	833.34	346.73	833.35	346.77	833.35
348.5	833.53	348.98	833.54	352	833.5	354.97	833.48	356.99	833.47
357.91	833.5	362.45	833.78	362.76	833.8	363.78	833.86	366.77	834.03
367.68	834.08	370.78	834.25	372.9	834.37	373.67	834.43	376.58	834.46
378.13	834.46	379.98	834.48	380.97	834.49	382.8	834.5	383.36	834.51

183790Analysis.rep

386.81	834.56	388.58	834.59	390.81	834.7	393.81	834.9	394.82	834.96
398.15	835.19	398.83	835.23	399.03	835.25	402.84	835.53	404.26	835.7
406.84	835.93	409.49	836.14	411.6	836.33				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.125	04001	.04	68.66	.03

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	25.04001	68.66		.1	.3

SUMMARY OF MANNING'S N VALUES

River: Robinson Fork

Reach	River Sta.	n1	n2	n3
Robinson Fork	1516.61	.03	.04	.035
Robinson Fork	1310.94	.03	.04	.035
Robinson Fork	1075.5	.03	.04	.1
Robinson Fork	876.02	.03	.04	.1
Robinson Fork	774.71	.03	.04	.1
Robinson Fork	661.98	.03	.04	.1
Robinson Fork	605.82	.03	.04	.1
Robinson Fork	575.17	.03	.04	.1
Robinson Fork	544.48	.03	.04	.1
Robinson Fork	488.2	.03	.04	.1
Robinson Fork	388.03	.03	.04	.03
Robinson Fork	256.53	.03	.04	.03
Robinson Fork	45.06	.1	.04	.03

SUMMARY OF REACH LENGTHS

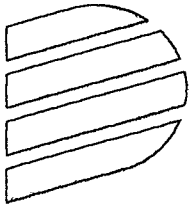
River: Robinson Fork

Reach	River Sta.	Left	Channel	Right
Robinson Fork	1516.61	228	205.67	179
Robinson Fork	1310.94	190	235.44	280
Robinson Fork	1075.5	194	199.48	204
Robinson Fork	876.02	99	101.31	103
Robinson Fork	774.71	111	112.73	115
Robinson Fork	661.98	68	56.16	44
Robinson Fork	605.82	35	30.65	26
Robinson Fork	575.17	35	30.69	26
Robinson Fork	544.48	65	56.28	48
Robinson Fork	488.2	73	100.17	128
Robinson Fork	388.03	125	131.5	138
Robinson Fork	256.53	239	211.47	185
Robinson Fork	45.06			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Robinson Fork

Reach	River Sta.	183790Analysis.rep	
		Contr.	Expan.
Robinson Fork	1516.61	.1	.3
Robinson Fork	1310.94	.1	.3
Robinson Fork	1075.5	.1	.3
Robinson Fork	876.02	.1	.3
Robinson Fork	774.71	.1	.3
Robinson Fork	661.98	.1	.3
Robinson Fork	605.82	.1	.3
Robinson Fork	575.17	.1	.3
Robinson Fork	544.48	.1	.3
Robinson Fork	488.2	.1	.3
Robinson Fork	388.03	.1	.3
Robinson Fork	256.53	.1	.3
Robinson Fork	45.06	.1	.3



**Dominion Energy**<sup>SM</sup>

NOV16 18 3:20PM

JOB TL-283 Stream Exposure  
 SHEET NO. 1 OF 1  
 CALCULATED BY J. Shockey DATE 9/20/2018  
 CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_  
 SCALE N/A

**Section 1: U.S. Army Corps of Engineers - NWP #13 PCN Conditions**

No.	Condition	Applicable	Comment
1	Will material be placed in excess of the minimum needed for erosion protection?	NO	
2	Is the activity more than 500 feet along the bank?	NO	
3	Will the bank stabilization result in more than one cubic yard per running foot, as measured along the length of the treated bank, below the ordinary high water mark?	NO	
4	Does the activity involve the discharge of dredged or fill material into special aquatic sites?	NO	
5	Will any material of any type be placed in any location, or in any manner, that will impair surface water flow into or out of any waters of the United States?	NO	
6	Will any material be placed in a manner that will be eroded by normal or expected high flows?	NO	
7	Will non-native plants inappropriate for current site conditions be used for bank stabilization?	NO	
8	Is the project a stream channelization activity?	NO	
<b>Are any conditions applicable?</b>		No -Proceed to Section 2	

**Section 2: NWP #13 Huntington and Pittsburgh Districts Permit-specific Regional Conditions**

No.	Condition	Applicable	Comment
a.	PCN in accordance with NWP General Condition 32 is required for any stabilization activity that involves all activities within the Ohio River and Kanawha River, activities in Section 10 waters that involve a discharge of greater than 10 cubic yards of dredged or fill material below the ordinary high water mark; and the use of any vertical bulkhead. (A vertical bulkhead is defined as any structure of fill, with a vertical face. It may be constructed of timber, steel, concrete, etc.)	NO	
<b>Are any conditions applicable?</b>		No PCN is required	

**Section 3: NWP #13 West Virginia 401 Water Quality Certification Special Conditions**

No.	Condition	Applicable	Comment
A.	<p>Except for activities under Section 14 of the 1946 Flood Control Act, Individual State Water Quality Certification is required for bank stabilization activities:</p> <p>i. Greater than 500 linear feet of perennial and intermittent stream bank authorized by the U.S. Army Corps of Engineers (this condition may be waived up to 1,000 linear feet for landowners working with West Virginia Conservation Agency);</p> <p>ii. Activities impacting greater than 200 linear feet on one or more of the streams identified in WQC Standard Condition 18 A, B, and C herein.</p>	NO	
B.	<p>Pre-construction notification shall be provided to the West Virginia Department of Environmental Protection, Division of Water and Waste Management allowing 45 days for a determination to be made as to whether the stabilization activity will negatively impact the nursery functions of an embayment, island back channel, or stream mouth on a Section 10 River, necessitating further review or an individual certification.</p>	NO	
C.	<p>Bank protection measures may not be extended into the bed of the stream except as necessary to provide proper footing of the bank stabilization measure.</p>	NO	
D.	<p>401 Water Quality Certification special conditions of NWP-13 are not satisfied if the stabilized streambanks, where possible and practicable, are not sloped and revegetated for erosion control purposes.</p>	NO	
E.	<p>The use of unconsolidated river gravel (river jack) for streambank stabilization is not allowed. Unconsolidated river material may be used to reconstruct streambanks or form bankfull benches provided they are stabilized by material and/or methods which prevent further erosion under normal or expected high flows. Acceptable material and/or methods are; quarried or shot rock, clean concrete rubble, gabions, cribbing, woody vegetation, and flow diversion structures such as rock vanes. All of the foregoing are to be used in combination with appropriate sloping and engineering specifications.</p>	NO	
<b>Are any conditions applicable?</b>		<b>No 401 WQ Certification required</b>	

Dominion Resources Services, Inc.  
445 West Main Street  
Clarksburg, West Virginia 26301



April 18, 2013

**BY U.S. MAIL, RETURN RECEIPT REQUESTED**  
**7010 2780 0000 4641 9919**

Mr. Randall Reid-Smith  
West Virginia Division of Culture and History  
The Culture Center  
1900 Kanawha Boulevard East  
Charleston, West Virginia 25305-0300

NOV16 16 3:20PM

**RE: "No Effect" Blanket Approval between Dominion Transmission, Inc. and WV DCH**

Dear Mr. Reid-Smith:

Enclosed is the executed copy of the "No Effect" Blanket Approval Agreement between Dominion Transmission, Inc., Dominion Hope, and the West Virginia Division of Culture and History (WV DCH). The Agreement will be in effect until March 15, 2018. The Agreement provides blanket approval under Section 106 of the National Historic Preservation Act, and its implementing regulations for minor projects involving maintenance and construction on an existing natural gas pipeline system.

If you have any questions, please do not hesitate to contact Richard Gangle at 304-627-3225 or by email at [Richard.B.Gangle@dom.com](mailto:Richard.B.Gangle@dom.com).

Sincerely,

A handwritten signature in cursive script that reads "Lisa C. Moerner".

Lisa Moerner  
Director, Environmental Sustainability and Gas Environmental Services  
Dominion Resources Services, Inc.

Enclosures



SENDER: COMPLETE THIS SECTION	COMPLETE THIS SECTION ON DELIVERY	
<ul style="list-style-type: none"> <li>■ Complete items 1, 2, and 3. Also complete Item 4 if Restricted Delivery is desired.</li> <li>■ Print your name and address on the reverse so that we can return the card to you.</li> <li>■ Attach this card to the back of the mailpiece, or on the front if space permits.</li> </ul>	A. Signature X <span style="float: right;"><input type="checkbox"/> Agent <input type="checkbox"/> Addressee</span>	
1. Article Addressed to:  <p style="text-align: center;">Mr. Randall Reid-Smith            WV Division of Culture &amp; History            The Culture Center            1900 Kanawha Blvd East            Charleston, WV 25305-0300</p>	B. Received by ( <i>Printed Name</i> )	C. Date of Delivery APR 19 2
	D. Is delivery address different from item 1? <input type="checkbox"/> Yes If YES, enter delivery address below: <input type="checkbox"/> No	
2. Article Number ( <i>Transfer from service label</i> )	3. Service Type <input type="checkbox"/> Certified Mail <input type="checkbox"/> Express Mail <input type="checkbox"/> Registered <input type="checkbox"/> Return Receipt for Merchandise <input type="checkbox"/> Insured Mail <input type="checkbox"/> C.O.D. 4. Restricted Delivery? ( <i>Extra Fee</i> ) <input type="checkbox"/> Yes	
7010 2780 0000 4641 9919		

Dominion Resources Services, Inc.  
445 West Main Street  
Clarksburg, West Virginia 26301



April 18, 2013

**BY U.S. MAIL, RETURN RECEIPT REQUESTED**  
**7010 2780 0000 4641 9483**

Ms. Barbara Sargent  
West Virginia Division of Natural Resources  
Wildlife Diversity Program  
P.O. Box 67  
Elkins, West Virginia 26241

NOV16 18 3:28PM

**RE: "No Effect" Blanket Approval between Dominion Transmission, Inc. and WV DNR**

Dear Ms. Sargent:

Enclosed is the executed copy of the "No Effect" Blanket Approval Agreement between Dominion Transmission, Inc., Dominion Hope, and the West Virginia Division of Natural Resources (WV DNR). The Agreement will be in effect until February 20, 2018. The Agreement provides blanket approval through the informal consultation process for minor projects involving maintenance and construction on an existing natural gas pipeline system.

If you have any questions, please do not hesitate to contact Richard Gangle at 304-627-3225 or by email at [Richard.B.Gangle@dom.com](mailto:Richard.B.Gangle@dom.com).

Sincerely,

A handwritten signature in cursive script that reads "Lisa C. Moerner".

Lisa Moerner  
Director, Environmental Sustainability and Gas Environmental Services  
Dominion Resources Services, Inc.

Enclosure

**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:

Ms. Barbara Sargent  
 WV Division of Natural Resources  
 Wildlife Resources Station  
 P O Box 67 Ward Rd  
 Elkins, WV 26241

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature  
 X *[Handwritten Signature]*  Agent  Addressee

B. Received by (Printed Name) *[Handwritten Name]* C. Date of Delivery *[Handwritten Date]*

D. Is delivery address different from item 1?  Yes  No  
 If YES, enter delivery address below:

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) **7010 2780 0000 4641 9483**

**"NO EFFECT" BLANKET APPROVAL**  
**BETWEEN**  
**DOMINION RESOURCES, INC.**  
**AND**  
**WEST VIRGINIA STATE HISTORIC PRESERVATION OFFICE**  
**FOR**  
**EXISTING NATURAL GAS PIPELINE ACTIVITIES**

NOV 16 10 3:19 PM

**1.0 INTRODUCTION**

Dominion Resources, Inc. (Dominion) and subsidiary companies have planned maintenance and construction projects on their existing natural gas pipeline systems within the State of West Virginia. Dominion believes that maintenance activities and construction of these minor projects is insignificant and will not affect historic properties on, or eligible, or potentially eligible for listing, on the National Register of Historic Places. Therefore, Dominion wishes to enter into a "No Effect" Blanket Approval with the West Virginia State Historic Preservation Office (SHPO) for the maintenance, modification, and construction at its existing facilities as required by Section 106 of the Historic Preservation Act.

This "No Effect" Blanket Approval/Clearance of such minor work on the Dominion existing natural gas pipeline system shall be implemented in accordance with the following sections of this document.

**2.0 ACTIVITIES COVERED UNDER THIS AGREEMENT**

**2.1** Activities conducted above ground and/or requiring no ground disturbance within areas of Dominion's existing assessments or at established facilities.

**a. Compressor Station** – Modification or installation of equipment within existing buildings as well as fenced and maintained yards.

**b. Above-ground Facilities** – Installation of equipment or appurtenance, including conversion or modification of existing valves, monitoring, measuring, communications, cleaning or regulatory devices.

**c. In-place Abandonments** – Discontinuation of service and/or retirement of a pipeline segment or facility which will not require ground disturbing activities (i.e. pipe and/or appurtenances will be left in place).

**d. Changes** – Changes in service points or storage capacity.

**e. Minor Above Ground Pipe Replacement** – Modifications within an existing Compressor Station or facility for valves, monitoring, cleaning regulating or measurement.

**2.2** Activities requiring ground disturbance within Dominion existing or maintained right-of-ways (ROW).

**a. Taps** – The installation of pipe connections which range of 1" to 36" in diameter and are installed on an existing pipeline.

**b. Above-Ground Facilities** – Installation, removal, abandonment, replacement, modification, or maintenance of equipment or appurtenances including valves, monitoring devices, measuring devices, communications devices, cleaning devices or regulatory devices within existing, predominantly disturbed, and generally fenced compressor and measuring & regulatory (M&R) station, field office locations, and previously disturbed and generally maintained unfenced well sites. For projects that involve significant disturbance (more than 80% of the Dominion permanent ROW) Dominion will submit these projects to the SHPO for review. For projects that significantly alter or rehabilitate a structure or building 50 years or greater in age, Dominion will submit these projects to the SHPO for review.

**c. Inspections** – Regular and routine inspection and investigation of the condition of the pipeline and subsurface appurtenances at specific locations requiring excavation to expose a short length of existing pipeline to assess the integrity of the pipeline.

**d. Pipe Replacements** – Replacement of existing lengths of pipeline. Replacement is defined as one of the following: the removal of an existing pipeline and construction of a new pipeline within the same trench; or, abandoning the extant line and installing a replacement line at an off-set (adjacent to the abandoned line) within the existing or maintained ROW. However, replacement does not include construction of parallel lines for system expansion.

**e. Pipe Rearrangements, Crossovers, and Interconnects** – Minor modifications of existing lengths of pipeline. Excavation activities may require the removal of an existing pipeline and/or installation of new pipe within existing or maintained ROW.

**f. Abandonments** – Discontinuation of service and/or retirement of a pipeline segment or facility which requires ground disturbing activities to remove piping or appurtenances.

**g. Pipe Casing Modifications** – At locations where existing pipelines cross roads or highways, modification, addition to or replacement of an existing casing within the road. (Pipelines may be contained within a sleeve, also called a casing, at road crossing).

**h. Pipeline Lowering** – Relocating an existing line to a lower depth to establish greater cover over the line, while maintaining the same horizontal position of the line within the existing or maintained ROW.

**i. Appurtenance Modification** – Regular service and maintenance within existing Compressor Stations and/or above-ground facilities.

**j. Points of Delivery and Points of Receipt** – Installation removal, abandonment, or relocation of Points of Delivery (PODs) and Points of Receipt (PORs). To establish a new POD or POR, an existing pipeline is tapped at a point along our previously disturbed and generally maintained Right-Of-Way (ROW), and generally no more than 200 feet of small diameter pipe is installed within the ROW. Limited above-ground facilities such as valves, separators, meters and small shelters may also be installed. To relocate or abandon a POD or POR, an existing pipeline is cut and capped adjacent to the existing tap within the previously disturbed and generally maintained ROW. For a relocated POD or POR, a new POD or POR is then installed on an existing pipeline as previously described at a different location.

**k. Cathodic Protection** – (1) Cathodic protection installations along existing predominantly disturbed and generally maintained ROW. These minor projects consist of burying a thin cable (normally ½ inch in diameter) with sacrificial anodes (approximately 8 inches in diameter and 48 inches long) attached to the structures. These protection items are installed with a ditch-witch and/or small backhoe. Two (2) minor cathodic protection installations as described are installed perpendicular to Dominion's ROW, within areas that have been previously cleared and predominantly disturbed by others (i.e. power-line ROW's)

**l. Erosion and Slip Repairs** - Repair of eroded sections of existing ROW and where required, eroded areas immediately adjacent to the existing ROW. This would include such activities as re-contouring eroded stream banks and installing vegetative blankets, rip-rap or gabion baskets or stabilizing small slips or steep slopes.

**m. Use of Existing Access** - Use of existing access roads and existing ROW as access to all construction and/or maintenance projects. Minor upgrades such as adding gravel, regarding the existing, previously disturbed area, and side trimming of tree branches would be included in this activity.

**2.3** Activities that involve ground disturbance in areas previously disturbed by other entities (i.e. modified by clearing or grading activities due to residential, industrial, pipeline construction or commercial development). These activities would allow Dominion to use access roads, workspace, contractor/staging yards or construction corridors within areas adjacent to their existing or maintained ROW. Commercial or industrial areas are areas of obvious development (i.e. concrete surface, graded and graveled surfaces) and/or areas with a documented history of previous commercial or industrial uses (s).

**a. Taps** – The installation of pipe connections which are generally 1" to 30" in diameter and are installed on an existing pipeline.

**b. Above-ground Facilities** – Installation of equipment or appurtenances, including conversion or modification of existing valves, monitoring, measuring, communications, clearing or regulatory devices.

**c. Pipe Replacement** – Replacement of existing lengths of pipeline. Replacement is defined as the removal of an existing pipeline and construction of a new pipeline within the same trench. Replacement does not include construction of parallel lines for system expansion.

**d. Pipe Rearrangements, Crossover, and Interconnects** – Minor modifications of existing lengths of pipeline. Excavation activities may require the removal of an existing pipeline and/or installation of new pipe within the existing or maintained ROW.

**e. Extra Workspaces and Contractor Yards** – Areas used for staging construction activities, including parking and pipe equipment storage, including use of areas subjected to similar past use as staging areas or storage yards.



**2.4** Activities within areas that have been subjected to archaeological survey, meeting state and federal guidelines, and do not contain historic properties, including corridors previously surveyed by Dominion, other utility companies, or State and Federal entities:

**a. Compressor Station and Above-ground Facilities** – Modification, replacement or addition involving new construction within existing Compressor Station property and/or above-ground facilities, including valves and monitoring, measuring, communications, cleaning or regulating devices.

**b. Pipe Replacement** – Replacement of existing lengths of pipe. Replacement is defined as the removal of an existing pipeline and construction of a new pipeline within the same trench. Replacement does not include construction of parallel lines for system expansion.

**c. Pipe Rearrangements, Crossovers, and Interconnects** – Minor modification of existing lengths of pipeline. Excavation activities may require the removal of an existing pipeline and installation of new pipe within the existing or maintained ROW or new ROW.

**d. Extra Workspaces** – Areas used for staging construction activities, including parking and pipe and equipment storage.

**e. Use of Existing Access** – Use of existing access roads and existing ROW as access to all construction and/or maintenance projects. Minor upgrades such as adding gravel, regarding the existing, previously disturbed area, and side trimming of tree branches would be included in this activity.

All other activities not exempted from SHPO review under this agreement will be coordinated with SHPO in accordance with provisions of 36 CFR 800

### **3.0 UNANTICIPATED DISCOVERIES**

In the event of the discovery of a property during implementation of this agreement (including any finding which may be a property), Dominion shall report the finding to SHPO as soon as feasible, and (under provisions at 36 CFR 800.13) agree to treat the newly discovered property or finding as eligible for inclusion in the National Register of Historic Places pending the outcome of the completion of Section 106 review with SHPO. If an unanticipated discovery is made, work will stop immediately in the affected area.

**4.0 TERMINATION OF THIS "NO EFFECT" BLANKET APPROVAL**

This agreement shall be in effect for five years from the date of execution. At the written request of either party, this agreement may be reviewed for possible modification at any time.

**5.0 AGREEMENT EXECUTION**

Execution of this agreement evidences that Dominion Transmission, Inc. agrees to follow the review procedure and that the West Virginia State Historic Preservation Office finds the procedure complies with Section 106 of the National Historic Preservation Act (16 U.S.C. 470) and its implementing regulations "Protection of Historic and Cultural Properties "[36 CRF 800]. It is our opinion as a consulting party that the activities categorized in this agreement will have no effect on properties included in or eligible for inclusion in the National Register of Historic Places.

**West Virginia State Historic Preservation Office:**

Susan M Pierce      3/15/13      Deputy State Historic  
Signature                      Date                      Title Preservation Officer

**Dominion Transmission, Inc.:**

[Signature]                      03-26-13                      Vice President  
Signature                      Date                      Title Operations

**Dominion Hope:**

[Signature]                      4-9-13                      Director, Gas Operations  
Signature                      Date                      Title

**"NO EFFECT" BLANKET APPROVAL**  
**BETWEEN**  
**DOMINION RESOURCES, INC.**  
**AND**  
**WEST VIRGINIA DIVISION OF NATURAL RESOURCES WILDLIFE DIVERSITY UNIT**  
**FOR**  
**EXISTING NATURAL GAS PIPELINE ACTIVITIES**

NOV16 10 3:16PM

**1.0 INTRODUCTION**

Dominion Resources, Inc. (Dominion) and subsidiary companies have planned minor maintenance and construction projects on their existing natural gas pipeline systems within the State of West Virginia. Dominion believes that maintenance activities and construction of these minor projects is insignificant and would be non-consequential to threatened and endangered species or their habitat. Therefore, Dominion wishes to enter into a "No Effect" Blanket Approval with the West Virginia Division of Natural Resources Wildlife Diversity Program (DNR) for the minor maintenance, modification, and construction activities for its existing natural gas pipeline system.

This "No Effect" Blanket Approval will establish the categorical agreement through the informal consultation process for certain minor maintenance, modification, and construction activities that, as categorized by this document, would have no effect on or would not likely adversely affect federally listed endangered or threatened species or their critical habitat.

**2.0 LOCATION OF ACTIVITIES COVERED UNDER THIS AGREEMENT**

Exhibit 1, attached to and made part of this agreement, provides a listing of the counties within the State of West Virginia in which this "No Effect" Blanket Approval for Dominion's existing natural gas pipeline system is applicable.

**3.0 ACTIVITIES COVERED UNDER THIS AGREEMENT**

The following activities are included under the terms of this categorical exclusion and may be undertaken without prior review by the DNR:

**3.1** Activities conducted above ground and/or that require **NO GROUND DISTURBANCE** within areas of Dominion existing or maintained right-of-way (ROW) for existing facilities:

**a. Above-ground Facilities** – Installation of equipment or appurtenances, including conversion or modification of existing valves, monitoring, measuring, communications, cleaning or regulatory devices. These facilities include all of the fenced and maintained property and the structures located therein for compressor stations, meter stations and valve sites.

**b. In-place Abandonments** – Discontinuation of service and/or retirement of a pipeline segment or facilities which will not require ground disturbing activities (i.e. pipe and/or appurtenances will be left in-place).

**c. Changes** – Changes in service points or storage capacity.

**d. Minor Above-ground - Pipe Replacement** – Modification within and existing above-ground facility for valves, monitoring, cleaning, regulating or measurement.

**3.2** Activities requiring ground disturbance which are located within existing Graveled or regularly maintained yards by clearing and/or mowing at an existing Dominion above-ground facility (these facilities include all of the maintained property, including fenced areas, and the structures located therein for compressor stations, meter stations, and valve sites).

**a. Taps** – Installation of pipe connections which are generally 1" or 30" in diameter and occasionally 2" to a maximum of 30" in diameter are installed on an existing pipeline.

**b. Appurtenances** – Installation or maintenance of equipment or appurtenances, including conversion or modification of existing valves, monitoring, measuring, communications, cleaning or regulatory devices.

**c. Inspections** – Regular and routine maintenance and investigation of the condition of the pipeline and subsurface appurtenances at specific locations requiring excavation to expose a short length of existing pipeline and assess the integrity of the pipeline.

**d. Pipe Replacements** – Replacement of existing lengths of pipeline is defined as one of the following: the removal of an existing pipeline and construction of a new pipeline

within the same trench; or, abandoning the extant line and installing a replacement line at an off-set (adjacent to the abandoned line) within the existing or maintained ROW.

**e. Pipe Rearrangement - Crossovers and Interconnects** – Minor modification of existing lengths of pipeline. Excavation activities may require the removal of an existing pipeline and/or installation of new pipe.

**f. Abandonments** – Discontinuation of service and/or retirement of a pipeline segment or facility which requires ground disturbing activities to remove piping or modify appurtenances.

**g. Above-ground Facilities** – Installation of equipment or appurtenances, including conversion or modification of existing valves, monitoring, measuring, communications, cleaning or regulatory devices, installation, removal, abandonment, replacement and/or maintenance projects within existing, predominantly disturbed, and generally fenced compressor and measuring & regulatory (M&R) stations, field office locations, and previously disturbed and generally maintained unfenced well sites.

**h. Pipeline Lowering** – Relocating and existing line to a lower depth to establish greater cover over the line while maintaining the same horizontal position of the line within the existing or maintained ROW.

**3.3** Activities requiring ground disturbance within Dominion existing or maintained ROW:

**a. Taps** – The installation of pipe connections which are generally 1" to 30" in diameter and occasionally 2" to a maximum of 30" in diameter, and are installed on an existing pipeline.

**b. Inspections** – Regular and routine maintenance and investigation of the condition of pipeline and subsurface appurtenances at specific location requiring excavation to expose a short length of existing pipeline and assess the integrity of the pipeline.

**c. Pipe Replacement** – Replacement of existing lengths of pipeline. Replacement is defined as one of the following: the removal of an existing pipeline and construction of a new pipeline within the same trench; or, abandoning the extant line and installing a replacement line at an off-set (adjacent to the abandoned line) within the existing or maintained ROW. However, replacement does not include construction of parallel lines for system expansion.

**d. Pipe Rearrangements** - Crossovers and Interconnects – Minor modifications of existing lengths of pipeline. Excavation activities may require the removal of an existing pipeline and/or installation of new pipe.

**e. Abandonments** – Discontinuation of service and/or retirement of a pipeline segment or facility which requires ground disturbing activities to remove piping or modify appurtenances.

**f. Pipeline Lowering** – Relocating an existing line to a lower depth to establish greater cover over the line while maintaining the same horizontal position of the line within the existing or maintained ROW.

**g. Pipe Casing Modifications** – At locations where existing pipelines cross roads or highways, modification, addition to or replacement of an existing casing within the road. (Pipelines may be contained within a sleeve, also called a casing, at road crossing).

**h. Appurtenance Modifications** – Regular service and maintenance within existing Compressor Station and/or above-ground facilities.

**i. Points of Delivery and Points of Receipt** – Installation, removal, abandonment, or relocation of Points of Delivery (PODs) and Points of Receipt (PORs). To establish a new POD or POR, an existing pipeline is tapped at a point along our previously disturbed and generally maintained Right-Of-Way (ROW), and generally no more than 200 feet of small diameter pipe is installed within the ROW. Limited above-ground facilities such as valves, separators, meters and small shelters may also be installed. To relocate or abandon a POD or POR, an existing pipeline is cut and capped adjacent to the existing tap within the previously disturbed and generally maintained ROW. For a relocated POD or POR, a new POD or POR is then installed on an existing pipeline as previously described at a different location.

**j. Cathodic Protection** – (1) Cathodic protection installations along existing, predominantly disturbed and generally maintained ROW. These minor projects consist of burying a thin cable (normally ½ inch in diameter) with sacrificial anodes (approximately 8 inches in diameter and 48 inches long) attached to the structures. These protection items are installed with a ditch-witch and/or small backhoe. Two (2) minor cathodic protection projects as described are installed perpendicular to Dominion's ROW, within areas that have been previously cleared and predominantly disturbed by others (i.e. power-lines ROW's)

**k. Erosion and Slip Repairs** – Repair of eroded sections of existing ROW and where required, eroded areas immediately adjacent to the existing ROW. This would include such activities as re-contouring eroded stream banks and installing vegetation blankets, rip-rap or gabion baskets or stabilizing small slips or steep slopes.

**l. Appurtenances** – Installation or maintenance of equipment or appurtenances, including conversion or modification of existing valves, monitoring, measuring, communications, clearing or regulatory devices.

**m. Use of Existing Access** – Use of existing access roads and existing ROW as access to all construction and/or maintenance projects. Minor upgrades such as adding gravel, regarding the existing, previously disturbed area, and side-trimming of tree branches would be included in this activity.

**3.4** Activities that involve ground disturbance within areas adjacent to Dominion existing or maintained ROW previously disturbed by other entities (i.e. modified by clearing and/or grading activities due to residential, agricultural, industrial, pipeline construction and commercial development). [Commercial or industrial areas are locations of obvious development (i.e. paved surfaces, graded and graveled surfaces) and/or locations with a documented history of previous commercial or industrial use(s).] The following activities are included in this category:

**a. Taps** – Installation of taps, which are generally 1" to 30" in diameter, and are installed on an existing pipeline.

**b. Pipe Replacement** – Replacement of existing lengths of pipe. Replacement is defined as the removal of an existing pipeline and construction of a new pipeline within the same trench. Replacement does not include construction of parallel lines of system expansion.

**c. Pipe Rearrangements - Crossovers and Interconnections** – Minor modifications of existing lengths of pipeline. Excavation activities may require the removal of an existing pipeline and/or installation of new pipe within the existing or maintained ROW.

**d. Extra Workspace and Contractor Yards** – Areas used for staging construction activities, include spoil storage, parking and pipe and equipment storage, including use of areas subjected to similar past use as staging areas or storage yards.



**e. Above-ground Facilities** – Installation of equipment or appurtenances, including conversion or modification of existing valves, monitoring, measuring, communications, cleaning or regulatory devices.

**f. Access Roads** – Use of existing access roads. These roads will not be widened, but maintenance (grading) or improvements by adding gravel or reinforced bridges are permitted. The existing access roads routes will be unaltered and maintained within their same limits.

**g. Appurtenances** – Installation or maintenance of equipment or appurtenances, including conversion or modification or existing valves, monitoring, measuring, communications, cleaning or regulatory devices.

**3.5** Small scale activities which are outside of Dominion's existing or maintained ROW and outside commercial or industrial areas where surveys conducted previously by Dominion, other utility companies or State and Federal entities that revealed no known threatened or endangered species, with these surveys conducted within twenty-four (24) months prior to the planned disturbance:

**a. New Points of Service (POS)** – Installation of taps, meters and pipe for POS to pipeline customers including excavation of the trench for pipe 12" diameter or smaller, provided that no more than 250 feet of trench is required and provided that no more than ten (10) installations are to be made for a single undertaking.

**b. Points of Service Modifications** – Replacement or modification to an existing POS, provided that no more than 150 feet of trench excavation is required.

**c. Minor Pipe Additions** – Construction of up to 150 feet of new pipeline.

**d. Access Road** – Use of existing roads to the pipeline ROW, staging areas or storage yards. Access roads may be maintained (grading) or improved by adding gravel. The existing access roads routes will be unaltered and maintained within their same limits.

**e. Extra Workspaces** – Areas used for staging construction activities, including spoil storage, parking, pipe storage and equipment storage.

All other activities not exempted from further review under the categorical agreement will be coordinated with the West Virginia Division of Natural Resources Wildlife Diversity Program.

#### 4.0 EXCEPTIONS

The following exceptions are included and made part of this "No effect Blanket Approval" for any category of projects outlined by this document. The exceptions are for streams crossed that would require DNR-approved mussel surveys. These exceptions are detailed by the following:

4.1 Exhibit 2 provides a listing by county and by perennial streams that will require mussel surveys or DNR consultation, for any category of projects outlined by this document that involve the crossing of any stream or any activities within the defined banks of a perennial stream.

a. **Listed Streams** - Dominion will notify DNR of the stream(s) to be disturbed, type of activity, location of planned disturbance, and approximate timing, for determination by the DNR whether or not a mussel survey is required.

When a mussel survey is required by the DNR Wildlife Diversity Program, the DNR will provide the mussel survey requirements and conditions to which the survey must conform, and the identity of to whom the completed survey is to be provided for clearance for the planned disturbance. The DNR clearance and any conditions that may be stipulated within will be incorporated into the planned disturbance activity, and the planned activity will commence in accordance with this clearance and the general conditions of this document.

b. **Non-Listed Streams** - No notification will be provided to DNR for any perennial stream(s) not listed and the activities planned will continue in accordance with the general conditions of this document.

#### 5.0 REGIONAL CONDITIONS

Dominion recognizes that certain considerations must be made for potentially environmentally sensitive locations within the jurisdictional area of the West Virginia Division of Natural Resources Wildlife Diversity Program. Dominion will continue to consult your office on any proposed project that will require ground disturbance in previously undisturbed areas that have not been surveyed and are outside of Dominion's existing or maintained right-of-way.

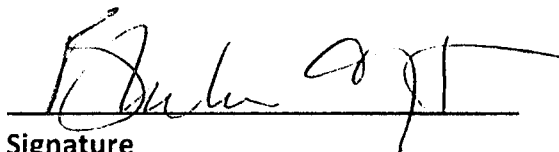
#### 6.0 TERMINATION OF THIS AGREEMENT

This agreement shall be in effect beginning for the five years following the date of execution. At the written request of either party, this agreement may be reviewed for possible modification at any time.

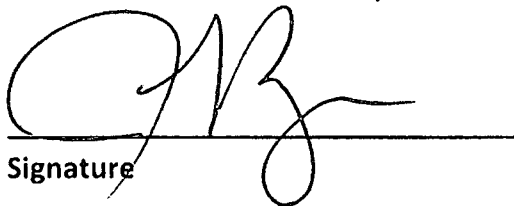
**7.0 AGREEMENT EXECUTION**

Execution of this agreement evidences that if the above-referenced categorized activities are conducted in accordance with this agreement, these activities would have no effect on or would not likely adversely affect state listed endangered or threatened species or their critical habitat. In addition, for projects which meet these conditions, no further consultation with the West Virginia Division of Natural Resources Wildlife Diversity Program.


**West Virginia Division of Natural Resources Wildlife Diversity Program:**

  
Signature \_\_\_\_\_ Date 2/20/2013 Title Environmental Resources Specialist

**Dominion Transmission, Inc.:**

  
Signature \_\_\_\_\_ Date 3/26/13 Title Vice President - Operations

**Dominion Hope:**

  
Signature \_\_\_\_\_ Date 4-9-2013 Title Director, Gas Operations

# EXHIBIT 1

## DOMINION RESOURCES, INC. EXISTING NATURAL GAS PIPELINE ACTIVITIES LISTING OF WEST VIRGINIA COUNTIES

### LIST OF COUNTIES

Barbour  
Boone  
Braxton  
Brooke  
Calhoun  
Clay  
Doddridge  
Gilmer  
Harrison  
Jackson  
Kanawha  
Lewis  
Lincoln  
Logan  
Marion  
Marshall  
McDowell  
Mercer

### LIST OF COUNTIES

Mingo  
Monongalia  
Nicholas  
Ohio  
Pleasants  
Preston  
Raleigh  
Randolph  
Ritchie  
Roane  
Taylor  
Tucker  
Tyler  
Upshur  
Wetzel  
Wirt  
Wood  
Wyoming



## EXHIBIT 2

COUNTY	STREAM	STREAM STATUS
Barbour	Pleasants Creek	High Quality Streams with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Sandy Creek	
	Teter Creek	
	Laurel Creek	
	Sugar Creek	
	Laurel Run	
	Buckhannon River	
	Elk Creek	
Boone	Coal River	Surveys required.
	Little Coal River	
	Mud River	
Braxton	Elk River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Little Kanawha River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Strange Creek	Surveys required.
	Birch River	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Little Birch River	Surveys required at mouth.
	Rockcamp Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Wolf Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.

	Holly River	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Knawls Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Cedar Creek	Surveys required.
	Oil Creek	Surveys required.
	Saltlick Creek	Surveys required.
	Tom Hughes Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Left Fork Steer Creek	Surveys required.
	Right Fork Steer Creek	Surveys required.
Brooke	Ohio River	Surveys required.
	Buffalo Creek	Surveys required.
	Castleman Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Cross Creek	High Quality Streams with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Kings Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
Calhoun	Little Kanawha River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.

	Leading Creek	Surveys required in lower ½ mile only; endangered species potential; WVDNR and USFWS coordination required.
	Yellow Creek	Surveys required.
	Pine Creek	Surveys required in lower ½ mile only; endangered species potential; WVDNR and USFWS coordination required.
	Steer Creek	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	West Fork Little Kanawha River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Beech Fork	Surveys required.
	Left Fork West Fork Little Kanawha River	Surveys required.
Clay	Elk River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Laurel Creek	Surveys required in lower ½ mile only; endangered species potential; WVDNR and USFWS coordination required.
	Sycamore Creek	First ½ mi is High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Leatherwood Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Lilly Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.



	Beech Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Sand Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Flat Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Robinson Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Otter Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Grove Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Strange Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
Doddridge	South Fork Hughes River	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	Middle Fork South Fork Hughes River	Surveys required.

	Middle Island Creek	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	McElroy Creek	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Flint Run	Surveys required.
	Talkington Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Arnold Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Bluestone Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Meathouse Fork	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Toms Fork	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Indian Fork	Surveys required.
	Buckeye Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
Gilmer	Little Kanawha River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.

	Tanner Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Cedar Creek	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Leading Creek	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Cove Creek	Surveys required.
	Fink Creek	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	Sand Fork	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Steer Creek	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	Left Fork Steer Creek	Surveys required.
	Bear Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Right Fork Steer Creek	Surveys required
Harrison	West Fork River	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	Tenmile Creek	Surveys required upstream of Little Tenmile Creek.
	Jones Creek	Surveys required.

	Rockcamp Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Jacobs Fork	Surveys required.
	Salem Fork	Surveys required.
	Elk Creek	Surveys required.
	Brushy Fork of Elk Creek	Surveys required.
	Gnatty Creek	Surveys required.
	Lost Creek	Surveys required.
	Isaacs Creek	Surveys required.
	Corbin Branch	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Hackers Creek	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Kincheloe Creek	Surveys required.
	Bingamon Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Jackson	Pocatalico Creek (Left Fork)
Middle Fork Pocatalico Creek		Surveys required below dam.
Ohio River		Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
Little Mill Creek (of Ohio River)		Surveys required.
Mill Creek		Surveys required.
Cow Run		Surveys required.
Parchment Creek		Surveys required.
Tug Fork		Surveys required.
Grasslick Creek		Surveys required.
Bear Fork		Surveys required.
Elk Fork	Surveys required.	

	Little Mill Creek (of Mill Creek)	Surveys required.
	Sandy Creek	Surveys required.
	Crooked Fork	Surveys required.
	Left Fork Sandy Creek	Surveys required.
	Nesselroad Run	Surveys required.
	Little Sandy Creek	Surveys required.
	Little Pond Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
Kanawha	Kanawha River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Coal River	Surveys required.
	Little Coal River	Surveys required.
	Elk River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Blue Creek	Surveys required in lower ½ mile only; endangered species potential; WVDNR and USFWS coordination required.
	Big Sandy Creek	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	King Shoals Run	Surveys required.
	Little Sandy Creek	Surveys required.
	Pocatalico River	Surveys required.
Pocatalico Creek (Left Fork)	Surveys required.	
Lewis	Sand Fork	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.

	Right Fork Little Kanawha	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Leading Creek	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	Fink Creek	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	West Fork River	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	Hackers Creek	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Jesse Run	Surveys required.
	Kincheloe Creek	Surveys required.
	Freemans Creek	Surveys required.
	Right Fork Freemans Creek	Surveys required.
	Stonecoal Creek	Surveys required.
	Right Fork Stonecoal Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Right Fork West Fork River	Surveys required.
Lincoln	Coal River	Surveys required.
	Little Coal River	Surveys required.
	Guyandotte River	Surveys required.
	Twomile Creek	Surveys required.
	Tenmile Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.

	Fourteenmile Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required if crossing is lower mile.
	Big Ugly Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required if crossing is near mouth.
	Hart Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required if crossing is near mouth.
	Mud River	Surveys required.
	Trace Fork	Surveys required.
	Buffalo Creek	Surveys required.
	Middle Fork Mud River	Surveys required.
	Big Laurel Creek	Surveys required.
	Guyandotte River	Surveys required.
Logan	Big Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Big Huff Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
Marion	Monongahela River	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.

	Prickett Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Whiteday Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Little Paw Paw Creek	Surveys required.
	Paw Paw Creek	Surveys required.
	Tygart Valley River	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Laurel Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Wickwire Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	West Fork River	Surveys required.
	Booths Creek	Surveys required; Acid Mine Drainage in lower reaches, coordinate with WVDNR regarding location - survey may be waived.
	Corbin Branch	Surveys required.
	Hustead Fork	Surveys required.
Marshall	Ohio River	Surveys required.
	Fish Creek	Surveys required; endangered species potential; WVDNR and USFWS coordination required.



	Whetstone Creek	Lower mile is a High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Valley Run	Surveys required.
	WV Fork Fish Creek	Surveys required.
	PA Fork Fish Creek	Surveys required.
	Grave Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Middle Grave Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Wheeling Creek	Surveys required.
	Turkey Run	Surveys required.
	Enlow Fork	Surveys required.
	Dunkard Fork	Surveys required.
McDowell	Tug Fork River	Surveys required.
	Panther Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Dry Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Jacob Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.

	Clear Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
Mercer	New River	Surveys required.
	East River	Surveys required.
	Pigeon Creek	Surveys required.
	Bluestone River	Surveys required.
	Camp Creek	Surveys required.
Mingo	Tug Fork River	Surveys required.
	Pigeon Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	West Fork Twelvepole Creek	Surveys required.
Monongalia	Monongahela River	Surveys required in 2mi zone below dams.
	Dunkard Creek	Endangered mussel stream; killed in 2009 and is slated for restoration; coordination with the WVDNR and USFWS is required.
	Blacks Run	Surveys required at mouth.
	Whiteday Creek	Surveys required.
	Indian Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required if crossing is near mouth.
	Days Run	Surveys required.
	Miracle Run	Surveys required.
	Right Branch Miracle Run	Surveys required.
	WV Fork Dunkard Creek	Surveys required.
	North Fk WV Fk Dunkard Creek	Surveys required.
	Camp Run	Surveys required at lower ½ mile only.

	South Fk WV Fk Dunkard Creek	Surveys required.
	Cobun Creek	Surveys required at mouth.
Nicholas	Strange Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Birch River	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Anthony Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Gauley River	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Meadow River	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Anglins Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Collison Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.

	Hominy Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Deer Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Muddlety Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Panther Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Taylor Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Cherry River	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Twentymile Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
Ohio	Ohio River	Surveys required.
	Wheeling Creek	Surveys required.
	Little Wheeling Creek	Surveys required.
	Middle Wheeling Creek	Surveys required.

Pleasants	Ohio River	Surveys required; reach downstream of Willow Island Dam is endangered mussel stream; Willow Island pool has the potential for endangered species; WVDNR and USFWS coordination required
	Bull Creek	Surveys required.
	Cow Creek	Surveys required.
	French Creek	Surveys required.
	Middle Island Creek	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	McKim Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Sugar Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
Preston	Big Sand Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Laurel Run	
	Little Sandy Creek	
	Saltlick Creek	
	Spruce Run	
	Buffalo Creek	
	Little Buffalo Creek	
Wolf Creek		
Raleigh	Marsh Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	New River	Surveys required.

	Piney Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required if crossing is in lower reaches.
Randolph	Glady Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	West Fork Glady Fork	Surveys required.
	East Fork Glady Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Big Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Horsecamp Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Gandy Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Taylor Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.

	Upper Pond Lick	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Tygart Valley River	Surveys required upstream of Aggregates only.
	Becky Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required if crossing is near mouth.
	Laurel Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Little Laurel Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Leading Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Chenoweth Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Beaver Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.

	Mill Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required if crossing is near mouth.
	Riffle Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required if crossing is near mouth.
	Elkwater Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required if crossing is near mouth.
	Windy Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Right Fork Buckhannon River	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Left Fork Buckhannon River	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
Ritchie	Hughes River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Addis Run	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.



	Gillespie Run	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	North Fork Hughes River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Devilhole Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Bonds Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Hushers Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Goose Creek	Surveys required.
	South Fork Hughes River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Middle Fork Hughes River	Surveys required.
	Indian Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Leatherbark Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.

	Spruce Creek	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	Slab Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Bone Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Otterslide Creek	Surveys required in lower ½ mile only; endangered species potential; WVDNR and USFWS coordination required.
Roane	Big Sandy Creek	Surveys required.
	Left Hand Creek	Surveys required.
	Pigeon Run	Surveys required.
	Granny Creek	Surveys required.
	Middle Fork Big Sandy Creek	Surveys required.
	Hollywood Trace Fork	Surveys required.
	Pocatalico River	Surveys required.
	Flat Fork	Surveys required.
	Cox Fork	Surveys required.
	Big Lick	Surveys required.
	Rush Creek	Surveys required.
	Cranes Nest Run	Surveys required.
	Reedy Creek	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	Left Fork Reedy Creek	Surveys required.
	Middle Fork Reedy Creek	Surveys required.
	Spring Creek	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
Right Fork Spring Creek	Surveys required.	
Left Fork Spring Creek	Surveys required.	

	West Fork Little Kanawha River	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	Henrys Fork	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Laurel Run	Surveys required.
	Beech Fork	Surveys required.
Taylor	Pleasants Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Corbin Branch	Surveys required.
	Hustead Fork	Surveys required.
Tucker	Clover Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Minear Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Horseshoe Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Elklick Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Blackwater River	Surveys required upstream of Blackwater Falls.
	Sand Run	Surveys required.
	Freeland Run	Surveys required.
	Club Run	Surveys required

	Glade Run	Surveys required.
	Glady Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Big Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
Tyler	Ohio River	Surveys required.
	Middle Island Creek	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Sancho Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Point Pleasant Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Pursley Creek	Surveys required.
	Elk Fork	Surveys required.
	Indian Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	McElroy Creek	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Sugar Creek	Surveys required.
Upshur	Little Kanawha River	Surveys required.

	Right Fork Little Kanawha River	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Buckhannon River	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Right Fork Buckhannon River	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Left Fork Buckhannon River	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Sand Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Hackers Creek	Surveys required.
	Right Fork West Fork River	Surveys required.
Wetzel	Ohio River	Surveys required.
	Fishing Creek	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	Little Fishing Creek	Surveys required.
	South Fork Fishing Creek	Surveys required.
	North Fork Fishing Creek	Surveys required.
	Proctor Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	WV Fork Fish Creek	Surveys required.

	Sugar Run	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Long Drain Creek	Surveys required.
Wirt	Little Kanawha River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Standingstone Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Tucker Creek	Surveys required in lower ½ mile only; endangered species potential; WVDNR and USFWS coordination required.
	Reedy Creek	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	Right Reedy Creek	Surveys required.
	Spring Creek	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
	Straight Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Hughes River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	North Fork Hughes River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.

	Goose Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	West Fork Little Kanawha River	Surveys required; endangered species potential; WVDNR and USFWS coordination required.
Wood	Little Kanawha River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Walker Creek	Surveys required.
	Slate Creek	Surveys required full length of stream; endangered species potential in first ½ mile; WVDNR and USFWS coordination required.
	Worthington Creek	Surveys required.
	Tygart Creek	Surveys required.
	Stillwell Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Ohio River	Surveys required; endangered mussel stream; WVDNR and USFWS coordination required.
	Little Sandy Creek	Surveys required.
	Little Pond Creek	Surveys required.
	Pond Creek	Surveys required.
	Lee Creek	Surveys required.
	Middle Fork Lee Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	South Fork Lee Creek	Surveys required.
	North Fork Lee Creek	Surveys required.
	Bull Creek	Surveys required.
Wyoming	Guyandotte River	Surveys required.

	Indian Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Big Huff Creek	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Clear Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.
	Laurel Fork	High Quality Stream with no or limited surveys for mussels, mussel potential; WVDNR notification is required.

Source: 1/25/2013 WVDNR – Wildlife Resources Section – Wildlife Diversity Unit





**DIVISION OF NATURAL RESOURCES**  
324 Fourth Avenue, Room 200  
South Charleston, West Virginia 25303-1228  
Telephone (304) 558-3225  
Fax (304) 558-6048  
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TDD 1-800-354-6087

Stephen S. McDaniel  
Director

November 7, 2018

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Division of Natural Resources  
Office of Land and Streams  
**LICENSE and RIGHT of ENTRY**

Re: **R-18-VI/09-2277**

Dominion Energy Transmission, Inc.  
c/o Dominion Energy Services, Inc.  
Attention: Laurie Deitz  
5000 Dominion Blvd.  
Glen Allen, VA 23060-

Dear Sir or Madam :

The West Virginia Division of Natural Resources (WVDNR) hereby grants to you for a term of one (1) years, from the date hereof, a License and Right of Entry for the purpose of installing a sixty foot by four foot by eight foot (60'x4'x8') gabion basket wall for a total of fifty foot by one-hundred-twenty foot (50'x120') bank work along Robinson Fork near Canter Point in Doddridge County, West Virginia.

The issuance of this License and Right of Entry by the WVDNR does not preclude the necessity to obtain permits from the U.S. Army Corps of Engineers (USACE), W.V. Department of Environmental Protection (WVDEP), or the W.V. Division of Homeland Security and Emergency Management (WVDHSEM). The Right of Entry does not negate the need to comply with the West Virginia Water Pollution Control Act and/or the State Environmental Quality Board's administrative regulations.

The applicant must contact the following agencies and abide by the following conditions:

1. The USACE may require either an Individual Clean Water Act 404 permit or a Nationwide Permit. Contact the Huntington District (304-399-5210) or the Pittsburgh District (412-395-7155) from *more information. Information can also be found at* <http://www.lrh.usace.army.mil/Missions/Regulatory.aspx>
2. The WVDEP (304-926-0499) may require the following permits:
  - a. A Clean Water Act Section 401 Water Quality Certification  
<http://www.dep.wv.gov/WWE/Programs/Pages/401Certification.aspx>
  - b. Construction Stormwater Site Registration and Notice of Intent. Not needed if disturbance less than 1-acre [http://dep.wv.gov/WWE/Programs/stormwater/Pages/sw\\_home.aspx](http://dep.wv.gov/WWE/Programs/stormwater/Pages/sw_home.aspx)

3. The WVDEP Erosion and Sediment Control Best Management Practice Manual, Revised 2016, must be followed. Copies of those guidelines are available from the Division of Water and Waste Management, (304) 926-0495 or at [http://www.dep.wv.gov/WWE/Programs/stormwater/csw/Pages/ESC\\_BMP.aspx](http://www.dep.wv.gov/WWE/Programs/stormwater/csw/Pages/ESC_BMP.aspx)
4. The WVDHSEM may require a Floodplain Permit. WVDHSEM can be contacted at: (304) 957-2571
5. No in-stream work during the cold water and warm water fish spawning seasons (September 15-March 31 and April 1- June 30, respectively). If in-stream impacts cannot be avoided during the applicable fish spawning season, contact the WVDNR Environmental Coordination Unit at (304) 637-0245.
6. Threatened or Endangered aquatic species identified by the U.S. Fish and Wildlife Service are listed in Appendix A of the 2017 USACE Nationwide Permits. The U.S. Fish and Wildlife Service Field Office should be contacted (304) 636-6568 for any activity in waterways listed in Appendix A. <http://www.lrp.usace.army.mil/Portals/72/docs/regulatory/2017%20Public%20Notices/West%20Virginia%20-%20NWP%20March%202017%20PN.pdf?ver=2017-03-22-095505-870>
7. Survey requirements for streams with mussel populations are described in the West Virginia Mussel Survey Protocols. Contact the WVDNR Environmental Coordination Unit for information concerning mussels at (304) 637-0245. <http://www.wvdnr.gov/Mussels/West%20Virginia%20Mussel%20Survey%20Protocols%20APR2016.pdf>

Additionally, this Right of Entry does not provide for the applicant to work outside the requested boundaries. The State does not assume any liability for the applicant's/landowner's construction activities. By accepting this Right of Entry, the applicant/landowner assumes liability for any/all damages caused by this activity to both upstream and downstream landowners. This License and Right of Entry does not grant any rights or privileges, or permission to enter upon, or to cross the property of any other person, nor is permission granted to remove any material that lies upon the property of any other persons. Work should be completed in as brief a period as possible and within one year from the date of this letter. **In the event the applicant fails or refuses to comply with any of the terms or conditions herein, this License and Right of Entry will be canceled and considered null and void and the WVDNR may reject further applications.**

Your check in the amount of \$100.00 is now due and payable to the Division of Natural Resources covering the one-time fee for this agreement. Your agreement will be effective upon receipt of your payment in full.

Sincerely,

  
Joe T. Scarberry, Supervisor  
Office of Land and Streams

JTS:cb

pc: DNR Fish Biologist  
Jeremy Bandy, Environmental Enforcement  
DNR Conservation Officers  
Danielle Elliot, WV DNR Coordination Unit

**NATIONWIDE PERMITS FOR THE STATE OF WEST VIRGINIA**

**U.S. ARMY CORPS OF ENGINEERS (CORPS) REGULATORY PROGRAM  
REISSUANCE AND ISSUANCE OF NATIONWIDE PERMITS WITH WVDEP WATER  
QUALITY CERTIFICATION**

**NWP 13**

***Bank Stabilization.*** Bank stabilization activities necessary for erosion control or prevention, such as vegetative stabilization, bioengineering, sills, rip rap, revetment, gabion baskets, stream barbs, and bulkheads, or combinations of bank stabilization techniques, provided the activity meets all of the following criteria:

- (a) No material is placed in excess of the minimum needed for erosion protection;
- (b) The activity is no more than 500 feet in length along the bank, unless the district engineer waives this criterion by making a written determination concluding that the discharge will result in no more than minimal adverse environmental effects (an exception is for bulkheads – the district engineer cannot issue a waiver for a bulkhead that is greater than 1,000 feet in length along the bank);
- (c) The activity will not exceed an average of one cubic yard per running foot, as measured along the length of the treated bank, below the plane of the ordinary high water mark or the high tide line, unless the district engineer waives this criterion by making a written determination concluding that the discharge will result in no more than minimal adverse environmental effects;
- (d) The activity does not involve discharges of dredged or fill material into special aquatic sites, unless the district engineer waives this criterion by making a written determination concluding that the discharge will result in no more than minimal adverse environmental effects;
- (e) No material is of a type, or is placed in any location, or in any manner, that will impair surface water flow into or out of any waters of the United States;
- (f) No material is placed in a manner that will be eroded by normal or expected high flows (properly anchored native trees and treetops may be used in low energy areas);
- (g) Native plants appropriate for current site conditions, including salinity, must be used for bioengineering or vegetative bank stabilization;
- (h) The activity is not a stream channelization activity; and
- (i) The activity must be properly maintained, which may require repairing it after severe storms or erosion events. This NWP authorizes those maintenance and repair activities if they require authorization.

This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to construct the bank stabilization activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. After construction, temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

**Notification:** The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if the bank stabilization activity: (1) involves discharges into special aquatic sites; or (2) is in excess of 500 feet in length; or (3) will involve the discharge of greater than an average of one cubic yard per running foot as measured along the length of the treated bank, below the plane of the ordinary high water mark or the high tide line. (See general condition 32.) (Authorities: Sections 10 and 404)

**Corps NWP 13 Specific Regional Conditions:**

- a. PCN in accordance with NWP General Condition 32 is required for the following activities:
  - i. All regulated activities in the Ohio River and the Kanawha River;
  - ii. All activities in Section 10 waters that involve a discharge of greater than 10 cubic yards of dredged or fill material below the ordinary high water mark; and
  - iii. The use of any vertical bulkhead. A vertical bulkhead is defined as any structure of fill, with a vertical face. It may be constructed of timber, steel, concrete, etc.

**NWP 13 West Virginia 401 Water Quality Certification Special Conditions:**

- A. Except for activities under Section 14 of the 1946 Flood Control Act, Individual State Water Quality Certification is required for bank stabilization activities:
  - i. Greater than 500 linear feet of perennial and intermittent stream bank authorized by the U.S. Army Corps of Engineers (this condition may be waived up to 1,000 linear feet for landowners working with West Virginia Conservation Agency);
  - ii. Activities impacting greater than 200 linear feet on one or more of the streams identified in Standard Condition 18 A, B, and C herein.
- B. Pre-construction notification shall be provided to the West Virginia Department of Environmental Protection, Division of Water and Waste Management allowing 45 days for a determination to be made as to whether the stabilization activity will negatively impact the nursery functions of an embayment, island back channel, or stream mouth on a Section 10 River, necessitating further review or an individual certification.

- C. Bank protection measures may not be extended into the bed of the stream except as necessary to provide proper footing of the bank stabilization measure.
- D. Stabilized streambanks, where possible and practicable, should be sloped and revegetated for erosion control purposes.
- E. The use of unconsolidated river gravel (river jack) for streambank stabilization is not allowed. Unconsolidated river material may be used to reconstruct streambanks or form bankfull benches provided they are stabilized by material and/or methods which prevent further erosion under normal or expected high flows. Acceptable material and/or methods are; quarried or shot rock, clean concrete rubble, gabions, cribbing, woody vegetation, and flow diversion structures such as rock vanes. All of the foregoing are to be used in combination with appropriate sloping and engineering specifications.

### **Nationwide Permit General Conditions**

**Note:** To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/or Coastal Zone Management Act consistency for a NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR §§ 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR § 330.5 relating to the modification, suspension, or revocation of any NWP authorization.

1. **Navigation.** (a) No activity may cause more than a minimal adverse effect on navigation.  
  
(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.  
  
(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. **Aquatic Life Movements.** No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound

water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species. If a bottomless culvert cannot be used, then the crossing should be designed and constructed to minimize adverse effects to aquatic life movements.

**3. Spawning Areas.** Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

**4. Migratory Bird Breeding Areas.** Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

**5. Shellfish Beds.** No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

**6. Suitable Material.** No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see section 307 of the Clean Water Act).

**7. Water Supply Intakes.** No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

**8. Adverse Effects From Impoundments.** If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

**9. Management of Water Flows.** To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

**10. Fills Within 100-Year Floodplains.** The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

**11. Equipment.** Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

**12. Soil Erosion and Sediment Controls.** Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil

and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow, or during low tides.

**13. Removal of Temporary Fills.** Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

**14. Proper Maintenance.** Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

**15. Single and Complete Project.** The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

**16. Wild and Scenic Rivers.** (a) No NWP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.

(b) If a proposed NWP activity will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the permittee must submit a pre-construction notification (see general condition 32). The district engineer will coordinate the PCN with the Federal agency with direct management responsibility for that river. The permittee shall not begin the NWP activity until notified by the district engineer that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status.

(c) Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: <http://www.rivers.gov/>.

**17. Tribal Rights.** No NWP activity may cause more than minimal adverse effects on tribal rights (including treaty rights), protected tribal resources, or tribal lands.

**18. Endangered Species.** (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such

species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless ESA section 7 consultation addressing the effects of the proposed activity has been completed. Direct effects are the immediate effects on listed species and critical habitat caused by the NWP activity. Indirect effects are those effects on listed species and critical habitat that are caused by the NWP activity and are later in time, but still are reasonably certain to occur.

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. If pre-construction notification is required for the proposed activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the pre-construction notification must include the name(s) of the endangered or threatened species that might be affected by the proposed activity or that utilize the designated critical habitat that might be affected by the proposed activity. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete pre-construction notification. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the activity, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification that the proposed activity will have "no effect" on listed species or critical habitat, or until ESA section 7 consultation has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species-specific permit conditions to the NWPs.

(e) Authorization of an activity by an NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word "harm" in the definition of "take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.



(f) If the non-federal permittee has a valid ESA section 10(a)(1)(B) incidental take permit with an approved Habitat Conservation Plan for a project or a group of projects that includes the proposed NWP activity, the non-federal applicant should provide a copy of that ESA section 10(a)(1)(B) permit with the PCN required by paragraph (c) of this general condition. The district engineer will coordinate with the agency that issued the ESA section 10(a)(1)(B) permit to determine whether the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation conducted for the ESA section 10(a)(1)(B) permit. If that coordination results in concurrence from the agency that the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation for the ESA section 10(a)(1)(B) permit, the district engineer does not need to conduct a separate ESA section 7 consultation for the proposed NWP activity. The district engineer will notify the non-federal applicant within 45 days of receipt of a complete pre-construction notification whether the ESA section 10(a)(1)(B) permit covers the proposed NWP activity or whether additional ESA section 7 consultation is required.

(g) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the FWS and NMFS or their world wide web pages at <http://www.fws.gov/> or <http://www.fws.gov/ipac> and <http://www.nmfs.noaa.gov/pr/species/esa/> respectively.

**19. Migratory Birds and Bald and Golden Eagles.** The permittee is responsible for ensuring their action complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting appropriate local office of the U.S. Fish and Wildlife Service to determine applicable measures to reduce impacts to migratory birds or eagles, including whether "incidental take" permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

**20. Historic Properties.** (a) In cases where the district engineer determines that the activity may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of section 106 of the National Historic Preservation Act. If pre-construction notification is required for the proposed NWP activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation is not submitted, then additional consultation under section 106 may be necessary. The respective federal agency is responsible for fulfilling its obligation to comply with section 106.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the NWP activity might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties might have the potential to be

affected by the proposed NWP activity or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of, or potential for, the presence of historic properties can be sought from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or designated tribal representative, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted in the PCN and these identification efforts, the district engineer shall determine whether the proposed NWP activity has the potential to cause effects on the historic properties. Section 106 consultation is not required when the district engineer determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). Section 106 consultation is required when the district engineer determines that the activity has the potential to cause effects on historic properties. The district engineer will conduct consultation with consulting parties identified under 36 CFR 800.2(c) when he or she makes any of the following effect determinations for the purposes of section 106 of the NHPA: no historic properties affected, no adverse effect, or adverse effect. Where the non-Federal applicant has identified historic properties on which the activity might have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects to historic properties or that NHPA section 106 consultation has been completed.

(d) For non-federal permittees, the district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA section 106 consultation is required. If NHPA section 106 consultation is required, the district engineer will notify the non-Federal applicant that he or she cannot begin the activity until section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(e) Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. 306113) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

**21. Discovery of Previously Unknown Remains and Artifacts.** If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by this permit, you must immediately notify the district engineer of what you have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

**22. Designated Critical Resource Waters.** Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.

(a) Discharges of dredged or fill material into waters of the United States are not authorized by NWP's 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, and 52 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

(b) For NWP's 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38, and 54, notification is required in accordance with general condition 32, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWP's only after it is determined that the impacts to the critical resource waters will be no more than minimal.

**23. Mitigation.** The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre-construction notification, the district engineer may determine

on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects.

(d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation to ensure that the activity results in no more than minimal adverse environmental effects. Compensatory mitigation for losses of streams should be provided, if practicable, through stream rehabilitation, enhancement, or preservation, since streams are difficult-to-replace resources (see 33 CFR 332.3(e)(3)).

(e) Compensatory mitigation plans for NWP activities in or near streams or other open waters will normally include a requirement for the restoration or enhancement, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, the restoration or maintenance/protection of riparian areas may be the only compensatory mitigation required. Restored riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to restore or maintain/protect a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or maintaining/protecting a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of minimization or compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(f) Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in no more than minimal adverse environmental effects. For the NWPs, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-lieu fee program credits (see 33 CFR 332.3(b)(2) and (3)). However, if an appropriate number and type of mitigation bank or in-lieu credits are not available at the time the PCN is submitted to the district engineer, the district engineer may approve the use of permittee-responsible mitigation.

(2) The amount of compensatory mitigation required by the district engineer must be sufficient to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see 33 CFR 330.1(e)(3)). (See also 33 CFR 332.3(f)).

(3) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, aquatic resource restoration should be the first compensatory mitigation option considered for permittee-responsible mitigation.

(4) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) through (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)).

(5) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan only needs to address the baseline conditions at the impact site and the number of credits to be provided.

(6) Compensatory mitigation requirements (e.g., resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan (see 33 CFR 332.4(c)(1)(ii)).

(g) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any NWP activity resulting in the loss of greater than 1/2-acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that an NWP activity already meeting the established acreage limits also satisfies the no more than minimal impact requirement for the NWPs.

(h) Permittees may propose the use of mitigation banks, in-lieu fee programs, or permittee-responsible mitigation. When developing a compensatory mitigation proposal, the permittee must consider appropriate and practicable options consistent with the framework at 33 CFR 332.3(b). For activities resulting in the loss of marine or estuarine resources, permittee-responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

(i) Where certain functions and services of waters of the United States are permanently adversely affected by a regulated activity, such as discharges of dredged or fill material into waters of the United States that will convert a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse environmental effects of the activity to the no more than minimal level.

**24. Safety of Impoundment Structures.** To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been

independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

**25. Water Quality.** Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

**26. Coastal Zone Management.** In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

**27. Regional and Case-By-Case Conditions.** The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

**28. Use of Multiple Nationwide Permits.** The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

**29. Transfer of Nationwide Permit Verifications.** If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

“When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.”

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(Transferee)

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(Date)

**30. Compliance Certification.** Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and implementation of any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:

(a) A statement that the authorized activity was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;

(b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and

(c) The signature of the permittee certifying the completion of the activity and mitigation.

The completed certification document must be submitted to the district engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later.

**31. Activities Affecting Structures or Works Built by the United States.** If an NWP activity also requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers (USACE) federally authorized Civil Works project (a "USACE project"), the prospective permittee must submit a pre-construction notification. See paragraph (b)(10) of general condition 32. An activity that requires section 408 permission is not authorized by NWP until the appropriate Corps office issues the section 408 permission to alter, occupy, or use the USACE project, and the district engineer issues a written NWP verification.

**32. Pre-Construction Notification.** (a) **Timing.** Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. The request must specify the information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not

commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

(1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

(2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or are in the vicinity of the activity, or to notify the Corps pursuant to general condition 20 that the activity might have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)) has been completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) Contents of Pre-Construction Notification: The PCN must be in writing and include the following information:

(1) Name, address and telephone numbers of the prospective permittee;

(2) Location of the proposed activity;

(3) Identify the specific NWP or NWP(s) the prospective permittee wants to use to authorize the proposed activity;

(4) A description of the proposed activity; the activity's purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no



more than minimal and to determine the need for compensatory mitigation or other mitigation measures. For single and complete linear projects, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other waters for each single and complete crossing of those wetlands, other special aquatic sites, and other waters. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the activity and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

(5) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. Furthermore, the 45 day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

(6) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(7) For non-Federal permittees, if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed activity or utilize the designated critical habitat that might be affected by the proposed activity. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act;

(8) For non-Federal permittees, if the NWP activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, the PCN must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with section 106 of the National Historic Preservation Act;

(9) For an activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the PCN must identify the Wild and Scenic River or the "study river" (see general condition 16); and

(10) For an activity that requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, the pre-construction notification must include a statement confirming that the project proponent has submitted a written request for section 408 permission from the Corps office having jurisdiction over that USACE project.

(c) Form of Pre-Construction Notification: The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is an NWP PCN and must include all of the applicable information required in paragraphs (b)(1) through (10) of this general condition. A letter containing the required information may also be used. Applicants may provide electronic files of PCNs and supporting materials if the district engineer has established tools and procedures for electronic submittals.

(d) Agency Coordination: (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the activity's adverse environmental effects so that they are no more than minimal.

(2) Agency coordination is required for: (i) all NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States; (ii) NWP 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52 activities that require pre-construction notification and will result in the loss of greater than 300 linear feet of stream bed; (iii) NWP 13 activities in excess of 500 linear feet, fills greater than one cubic yard per running foot, or involve discharges of dredged or fill material into special aquatic sites; and (iv) NWP 54 activities in excess of 500 linear feet, or that extend into the waterbody more than 30 feet from the mean low water line in tidal waters or the ordinary high water mark in the Great Lakes.

(3) When agency coordination is required, the district engineer will immediately provide (e.g., via e-mail, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (FWS, state natural resource or water quality agency, EPA, and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to notify the district engineer via telephone, facsimile transmission, or e-mail that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse environmental effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure the net adverse environmental effects of the proposed activity are no more than minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37

authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(4) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

(5) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of pre-construction notifications to expedite agency coordination.

### **District Engineer's Decision**

1. In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. If a project proponent requests authorization by a specific NWP, the district engineer should issue the NWP verification for that activity if it meets the terms and conditions of that NWP, unless he or she determines, after considering mitigation, that the proposed activity will result in more than minimal individual and cumulative adverse effects on the aquatic environment and other aspects of the public interest and exercises discretionary authority to require an individual permit for the proposed activity. For a linear project, this determination will include an evaluation of the individual crossings of waters of the United States to determine whether they individually satisfy the terms and conditions of the NWP(s), as well as the cumulative effects caused by all of the crossings authorized by NWP. If an applicant requests a waiver of the 300 linear foot limit on impacts to streams or of an otherwise applicable limit, as provided for in NWPs 13, 21, 29, 36, 39, 40, 42, 43, 44, 50, 51, 52, or 54, the district engineer will only grant the waiver upon a written determination that the NWP activity will result in only minimal individual and cumulative adverse environmental effects. For those NWPs that have a waivable 300 linear foot limit for losses of intermittent and ephemeral stream bed and a 1/2-acre limit (i.e., NWPs 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52), the loss of intermittent and ephemeral stream bed, plus any other losses of jurisdictional waters and wetlands, cannot exceed 1/2-acre.

2. When making minimal adverse environmental effects determinations the district engineer will consider the direct and indirect effects caused by the NWP activity. He or she will also consider the cumulative adverse environmental effects caused by activities authorized by NWP and whether those cumulative adverse environmental effects are no more than minimal. The district engineer will also consider site specific factors, such as the environmental setting in the vicinity of the NWP activity, the type of resource that will be affected by the NWP activity, the functions provided by the aquatic resources that will be affected by the NWP activity, the degree or magnitude to which the aquatic resources perform those functions, the extent that aquatic resource functions will be lost as a result of the NWP activity (e.g., partial or complete loss), the duration of the adverse effects (temporary or permanent), the importance of the aquatic resource functions to the region (e.g., watershed or ecoregion), and mitigation required by the district engineer. If an appropriate functional or condition assessment method is available and practicable to use, that assessment method may be used by the district engineer to assist in the

minimal adverse environmental effects determination. The district engineer may add case-specific special conditions to the NWP authorization to address site-specific environmental concerns.

3. If the proposed activity requires a PCN and will result in a loss of greater than 1/10-acre of wetlands, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for NWP activities with smaller impacts, or for impacts to other types of waters (e.g., streams). The district engineer will consider any proposed compensatory mitigation or other mitigation measures the applicant has included in the proposal in determining whether the net adverse environmental effects of the proposed activity are no more than minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse environmental effects are no more than minimal, after considering mitigation, the district engineer will notify the permittee and include any activity-specific conditions in the NWP verification the district engineer deems necessary. Conditions for compensatory mitigation requirements must comply with the appropriate provisions at 33 CFR 332.3(k). The district engineer must approve the final mitigation plan before the permittee commences work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the proposed compensatory mitigation plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure the NWP activity results in no more than minimal adverse environmental effects. If the net adverse environmental effects of the NWP activity (after consideration of the mitigation proposal) are determined by the district engineer to be no more than minimal, the district engineer will provide a timely written response to the applicant. The response will state that the NWP activity can proceed under the terms and conditions of the NWP, including any activity-specific conditions added to the NWP authorization by the district engineer.

4. If the district engineer determines that the adverse environmental effects of the proposed activity are more than minimal, then the district engineer will notify the applicant either: (a) that the activity does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (b) that the activity is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal; or (c) that the activity is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal adverse environmental effects, the activity will be authorized within the 45-day PCN period (unless additional time is required to comply with general conditions 18, 20, and/or 31, or to evaluate PCNs for activities authorized by NWPs 21, 49, and 50), with activity-specific conditions that state the mitigation requirements. The authorization will include the necessary conceptual or detailed mitigation plan or a requirement that the applicant submit a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal. When compensatory mitigation is required, no work in waters of the United States may occur until the district engineer has

approved a specific mitigation plan or has determined that prior approval of a final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation.

### **Further Information**

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.
2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.
3. NWPs do not grant any property rights or exclusive privileges.
4. NWPs do not authorize any injury to the property or rights of others.
5. NWPs do not authorize interference with any existing or proposed Federal project (see general condition 31).

### **Nationwide Permits Regional General Conditions**

1. ***Full Agency Pre-Construction Notification (PCN):*** To the extent possible, applicants are encouraged to submit a complete compact disc (CD) copy for any PCN package greater than 15 pages and/or includes maps, drawings, spreadsheets or other similar materials which are larger than 8.5 inches by 11 inches. All files saved on CDs should be in .pdf format. A hard copy of any oversized maps, drawings, spreadsheets etc. in the PCN package should be submitted and accompany the complete CD. An index or table of contents should be provided and correspond with each file saved on the CD and/or within the PCN hard copy.
2. ***United States Fish & Wildlife Service (USFWS):*** Due to the potential presence of federally listed endangered and threatened (T&E) species or their habitats, including critical habitat, within the state of West Virginia, PCN in accordance with Nationwide Permit Condition 32 is required for any activity in the waterways listed in Appendix A. Sufficient information must be provided in the PCN to determine the proposed activity's compliance with NWP General Condition 18. Applicants are encouraged to contact the USFWS, West Virginia Field Office, Ecological Services by phone at (304) 636-6586 or by writing to 694 Beverly Pike, Elkins, West Virginia, 26241 prior to the submittal of a PCN. The USFWS can provide information to assist in complying with NWP General Condition 18 pertaining to endangered species and NWP General Condition 19 pertaining to migratory birds and bald and golden eagles. All relevant information obtained from the USFWS should be submitted with the PCN. The current list of waterways supporting federally listed T&E species in West Virginia is provided as Appendix A. Perspective applicants are encouraged to contact the USFWS West Virginia Field Office to obtain the most updated information regarding potential locations known to inhabit T&E species.

3. All regulated activities located in the waterways listed below require PCN in accordance with NWP General Condition 32:

- New River;
- Bluestone River from the upstream boundary of Pipestem Park to Bluestone Reservoir;
- Meadow River from an area near the US 19 Bridge to its junction with the Gauley River;
- All streams within the Monongahela National Forest designated as National Wild and Scenic Study Rivers;
- All streams and other bodies of water in State and National Forests and Recreation Areas (included are streams and bodies of water located within the Spruce Knob, Seneca Rocks and Gauley River National Recreation Areas); and
- Streams and their tributaries as contained within the boundaries of the designated National Wilderness Areas or the headwaters of such rivers and their tributaries; Cranberry River, Red Creek, Laurel Fork and Otter Creek.

The Corps will consult with National Park Service and/or the United States Forest Service upon receipt of the PCN.

4. Due to the ecological significance of the following waterways, all regulated activities located in these waterways require PCN in accordance with NWP General Condition 32:

- Greenbrier River from its confluence with Knapps Creek to its confluence with the New River;
- Anthony Creek from its headwaters to its confluence with the Greenbrier River;
- Cranberry River from its headwaters to its confluence with the Gauley River;
- Birch River from Cora Brown Bridge in Nicholas County to its confluence with the Elk River; and
- New River from its confluence with the Greenbrier River to its confluence with the Gauley River.

5. **Historic Properties:** Sufficient information must be provided in the PCN to determine the proposed activity's compliance with NWP General Condition 20. To ensure compliance with NWP General Condition 20, the following project information should be provided:

- A detailed description of the project site in its current condition (i.e. prior to construction activities) including information on the terrain and topography of the site, the acreage of the site, the proximity of the site to major waterways, and any known disturbances within the site. Photographs and mapping are also needed which show the site conditions and all buildings or structures within the project site and on adjacent parcels.
- A detailed description of past land uses in the project site. Photographs and maps supporting past land uses should be provided as available.
- A detailed description of the construction activities proposed to take place on the site and

a description of how the site will look after completion of the project compared to how it looked before the project.

- Information regarding any past cultural resource studies or coordination pertinent to the project area, if available.
- Any other data the applicant deems pertinent.

The applicant is encouraged to consult with professionals meeting the Professional Qualification Standards as set forth in the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (48 FR 44716) during this data gathering process. These professionals can assist with compiling the project information discussed above and should provide recommendations as to whether the proposal has the potential to affect historic properties and if further effort is needed to identify or assess potential effects to historic properties. These professionals can also compile preliminary review information to submit to the district engineer. A preliminary review encompasses a search radius of 2 miles from the project area, and consists of the following:

- United States Geological Survey (USGS) 7.5' series topographic maps;
- West Virginia Division of Culture and history files including:
- Historic Property Inventory (HPI) Form;
- Archaeological Site Forms;
- Cemetery Inventory Forms;
- National Register of Historic Places (NRHP) nomination forms including Historic Districts; and
- County atlases, histories and historic USGS 15' series topographic map(s).

As an alternative to submitting the information described above, the applicant may choose to request comments from the West Virginia Division of Culture and History (State Historic Preservation Office) and the District Engineer on specific requirements appropriate to the particular circumstances of the project. Be advised, undertaking identification efforts prior to consideration of the potential of the proposed activity to affect historic properties by the Corps is not without risk. It is possible that previous efforts could be determined insufficient or even potentially unnecessary once reviewed by the Corps and other consulting parties.

Upon receipt and review of the information listed above, the Corps will evaluate the submittal. If the Corps determines the proposed activity has the potential to cause effects to a historic property, the Corps will seek consulting parties. In consultation with those parties, the Corps will scope appropriate historic property identification efforts and take into account the effect of the proposed activity on historic properties.

#### **Appendix A**

#### **Aquatic Habitats Supporting Federally listed Endangered and Threatened Species, and Proposed Endangered Species in West Virginia**

There are seventeen federally listed endangered and threatened or proposed endangered species that are associated with specific aquatic habitats in West Virginia. These include ten endangered freshwater mussels - clubshell (*Pleurobema clava*), fanshell (*Cyprogenia stegaria*), James spinymussel (*Pleurobema collina*), northern riffleshell (*Epioblasma torulosa rangiana*), pink mucket pearlymussel (*Lampsilis abrupta*), rayed bean (*Villosa fabilis*), sheepnose (*Plethobasus cyphus*), snuffbox (*Epioblasma triquetra*), spectaclecase (*Cumberlandia monodonta*), and tubercled-blossum pearlymussel (*Epioblasma torulosa torulosa*); two endangered plants - Harperella (*Ptilimnium nodosum*) and northeastern bulrush (*Scirpus ancistrochaetus*); one threatened plant - Virginia spiraea (*Spiraea virginiana*); two threatened crustaceans - Madison Cave isopod (*Antrolana lira*) and Big Sandy crayfish (*Cambarus callainus*); one endangered crustacean - Guyandotte River crayfish (*Cambarus veteranus*); and one endangered fish - diamond darter (*Crystallaria cincotta*). Nine other listed species not associated with specific aquatic habitats also occur in West Virginia. Those species are not addressed here.

***U.S. Army Corps of Engineers Huntington District***

1. Big Sandy Creek: Kanawha County: Snuffbox.
2. Bluestone River: Mercer and Summers Counties (Bluestone Gorge to slackwater of Bluestone Reservoir): Virginia spiraea.
3. Cedar Creek: Braxton and Gilmer Counties: Snuffbox.
4. Clear Fork: Wyoming County: Guyandotte River crayfish
5. Cove Creek: Monroe County: James spinymussel.
6. Elk River: Braxton, Clay, and Kanawha Counties (Sutton Dam to slackwater below Coonskin Park), including the lower one-half mile reaches of its tributaries Birch River, Blue Creek, and Laurel Creek: Clubshell, pink mucket pearlymussel, northern riffleshell, rayed bean, and snuffbox. The Elk River also contains the diamond darter (endangered). Critical habitat for this species is from King Shoals to slackwater below Coonskin Park.
7. Gauley River: Fayette and Nicholas Counties (Summersville Dam to Swiss): Virginia spiraea.
8. Greenbrier River: Greenbrier and Pocahontas Counties: *Virginia spiraea*.
9. Henry Fork: Calhoun and Roane Counties: Snuffbox.
10. Hughes River: Ritchie and Wirt Counties, including the lower one-half mile reach of



its tributary Goose Creek: Snuffbox.

11. Kanawha River: Fayette, Kanawha, Mason, and Putnam Counties: Fanshell, pink mucket pearlymussel, sheepnose, spectaclecase, and tubercled-blossum pearlymussel.
12. Leading Creek: Gilmer and Lewis Counties, including the lower one-half mile reach of its tributary Fink Creek: Snuffbox.
13. Little Kanawha River: Braxton, Calhoun, Gilmer, Wirt, and Wood Counties, including the lower one-half mile reaches of its tributaries Leading Creek (Calhoun County), Pine Creek, Sand Fork, Slate Creek, Straight Creek, Tanner Creek, Tucker Creek, and Walker Creek: Clubshell and snuffbox.
14. Marsh Fork River including Dingess Branch and Millers Camp Branch and associated palustrine emergent and scrub-shrub wetlands: Raleigh County: Virginia spiraea.
15. McElroy Creek: Doddridge and Tyler Counties: Snuffbox.
16. Meadow River: Fayette, Greenbrier, and Nicholas Counties: Virginia spiraea.
17. Meathouse Fork of Middle Island Creek: Doddridge County, including the lower one-half mile reach of its tributary Toms Fork: Clubshell and snuffbox.
18. Middle Island Creek: Doddridge, Pleasants, and Tyler Counties, including the lower one-half mile reaches of its tributaries Arnold Creek, Bluestone Creek, Buckeye Creek, Indian Creek, McKim Creek, Point Pleasant Creek, and Sancho Creek: Clubshell and snuffbox.
19. New River (Lower): Fayette County (Route 19 to Gauley Bridge): Virginia spiraea.
20. North Fork Hughes River: Ritchie and Wirt Counties, including the lower one-half mile reaches of its tributaries Addis Run, Bonds Creek, Devilhole Creek, and Gillespie Run: Snuffbox.
21. Ohio River: Cabell, Jackson, Mason Pleasants, Tyler, Wetzel, and Wood Counties: Fanshell, pink mucket pearlymussel, sheepnose, and snuffbox.
22. Pinnacle Creek: Wyoming County: Guyandotte River crayfish
23. Potts Creek and South Fork of Potts Creek: Monroe County: James spiny mussel.
24. Reedy Creek: Roane and Wirt Counties: Snuffbox.

25. South Fork Hughes River: Doddridge, Ritchie, and Wirt Counties, including the lower one-half mile reaches of its tributaries Bone Creek, Indian Creek, Leatherbark Creek, Otterslide Creek, Slab Creek, and Spruce Creek: Clubshell and snuffbox.
26. Spring Creek: Roane and Wirt Counties: Snuffbox.
27. Steer Creek: Calhoun and Gilmer Counties: Snuffbox.
28. Sugar Creek: Pleasants County: Snuffbox.
29. Tug Fork River and tributaries including Dry Fork: McDowell and Mingo Counties: Big Sandy crayfish
30. West Fork Little Kanawha River: Calhoun, Roane, and Wirt Counties: Snuffbox.

***U.S. Army Corps of Engineers Pittsburgh District***

1. Back Creek: Berkeley County: Harperella.
2. Cacapon River: Morgan County: Harperella.
3. Dunkard Creek: Monongalia County: Snuffbox.
4. Fish Creek: Marshall County: Snuffbox.
5. Fishing Creek: Wetzel County: Snuffbox. Note – the mouth of Fishing Creek at the Ohio River is regulated by the Huntington District.
6. Hackers Creek (of the West Fork River): Harrison and Lewis Counties: Clubshell and snuffbox.
7. Potomac River: Morgan County (from the mouth of the Cacapon River to the mouth of Sleepy Creek): Harperella.
8. Sleepy Creek: Morgan County: Harperella.
9. West Fork River: Harrison, Lewis, and Marion Counties: Snuffbox.
10. Streams, springs, and wetlands connected to the groundwater system including caves, areas near sinkholes, and other groundwater/surface interfaces, from the Potomac River west to Opequon Creek, especially in the Rippon and Leetown Areas, and the Evitts Run Watershed: Jefferson and Berkeley Counties: Madison Cave isopod.
11. Wetlands: Berkeley and Hardy Counties: Northeastern bulrush.

**\*Note 1:** Applicants must ensure they are referencing the latest version of Appendix by contacting the USFWS since federally-listed species are continuously listed, proposed for listing, and/or de-listed.

**\*Note 2:** Please also note that freshwater mussels which are not federally listed are protected and managed by the State of West Virginia, Division of Natural Resources (WVDNR). Non-listed freshwater mussels may occur in the streams listed above as well as additional streams throughout the State. For information on the distribution of freshwater mussel species and their protections contact the West Virginia Division of Natural Resources by phone at (304) 637-0245.

**Standard Conditions of State 401 Water Quality Certification Applicable to Nationwide Permits**

1. Any permitted activity for which U.S. Army Corps of Engineers (ACOE) requires pre-construction notification (PCN) in accordance with Nationwide Permit General Condition 32 requires the same information to be sent by the applicant, prior to construction, to West Virginia Department of Environmental Protection, Division of Water and Waste Management (WV DEP DWWM).
2. The applicant must provide proof of compensatory mitigation (as outlined in Standard Condition 19 below) to WV DEP DWWM prior to construction for a project with permanent stream impacts greater than 300 linear feet or causing the loss of greater than 1/10 acre of wetlands.
3. Culverted crossings should be sized and installed in a manner to allow the passage of aquatic life and freely pass bankfull flows. Exceptions to this requirement would be when culvert placement is on bedrock, or when stream gradient is equal to or greater than 4%, or when bankfull elevation is greater than final surface elevation.
4. The permittee will investigate for the presence of water supply intakes or other activities within 1/2 mile downstream, which may be affected by suspended solids and turbidity increases caused by work in the watercourse. The permittee will give notice to operators of any such water supply intakes and such other water quality dependent activities as necessary before beginning work in the watercourse in sufficient time to allow preparation for any change in water quality.
5. Excavation, dredging or filling in the watercourse will be done only to the extent necessary to achieve the project's purpose, and at each wetland crossing the top 12 inches of topsoil shall be removed and stockpiled separately from other excavated material. In addition, at each stream crossing, substrate in the channel is to be removed and stockpiled separately from other excavated material. This native material must be re-used in restoration of the wetland and/or stream bed.
6. Spoil materials from the watercourse or onshore operations, including sludge deposits, will

not be dumped in the watercourse, or deposited in wetlands or other areas where the deposit may adversely affect the surface or ground waters of the state.

7. The permittee will employ measures to prevent or control spills from fuels, lubricants or any other materials used in connection with construction and restrict them from entering the watercourse. Storage areas for chemicals, explosives, lubricants, equipment fuels, etc., as well as equipment refueling areas, must include containment measures (e.g., liner systems, dikes, etc.) to ensure that spillage of any material will not contact surface or ground waters. Storage areas and refueling areas shall be a minimum distance of 100 feet from any surface water body. All spills shall be promptly reported to the State Center for Pollution, Toxic Chemical and Oil Spills, 1-800-642-3074.
8. Upon completion of in-stream operations all disturbances below the ordinary high water mark will be properly stabilized within 24 hours to prevent soil erosion. Where possible, stabilization shall incorporate revegetation using bioengineering as an alternative to rip rap. If rip rap is utilized, it is to be of such weight and size that bank stress or slump conditions will not be created due to its placement. Fill is to be clean, nonhazardous and of such composition that it will not adversely affect the biological, chemical or physical properties of the receiving waters. Unsuitable materials include but are not limited to: copper chromium arsenate (CCA) and creosote treated lumber, car bodies, tires, large household appliances, construction debris, and asphalt. To reduce potential slope failure and/or erosion behind the material, fill containing concrete must be of such weight and size that promotes stability during expected high flows. Loose large slab placement of concrete sections from demolition projects greater than thirty-six inches in its longest dimension and tires are prohibited. Rebar or wire in concrete should not extend further than one (1) inch. All activities require the use of clean and coarse non-erodible materials with 15% or less of like fines that is properly sized to withstand expected high flows.
9. Runoff from any storage areas or spills will not be allowed to enter storm sewers without acceptable removal of solids, oils and toxic compounds. Discharges from retention/detention ponds must comply with permit requirements of the National Pollutant Discharge Elimination System permit program of the West Virginia Department of Environmental Protection, Division of Water and Waste Management.
10. Land disturbances, which are one (1) acre or greater in total area, must comply with the National Pollutant Discharge Elimination System or other state stormwater permit requirements as established by the WV DEP DWWM, if applicable. Any land disturbances are required to use Best Management Practices for Sediment and Erosion Control, as described in the latest West Virginia Department of Environmental Protection's Erosion and Sediment Control Best Management Practice Manual, or similar documents prepared by the West Virginia Division of Highways. These handbooks are available from the respective agency offices.
11. Concrete will not be permitted to enter the watercourse unless contained by tightly sealed forms or cells. Concrete handling equipment shall not discharge waste washwater into wetlands or watercourses at any time without adequate wastewater treatment as approved

by the WV DEP DWWM.

12. In stream work in designated warm water streams and their adjacent tributaries during the fish spawning season, April - June and trout waters and their adjacent tributaries during the trout water fish spawning season September 15 to March 31 requires a spawning season waiver from the West Virginia Division of Natural Resources (WV DNR) Coordination Unit, at (304) 637-0245. For information about specific stream designations contact West Virginia Department of Environmental Protection, Water Quality Standards Section at (304) 926-0495. In-stream work may occur during the respective spawning season in ephemeral waters without a waiver if all reasonable measures are taken to minimize turbidity and sedimentation downstream associated with the proposed project.
13. Removal of well-established riparian vegetation not directly associated with the project construction is prohibited. Disturbance and removal of vegetation from project construction area is to be avoided, where possible, and minimized when necessary. Removal of vegetation shall not be allowed where stream bank stability under normal flow conditions would be compromised.
14. Operation of equipment instream is to be minimized and accomplished during low flow periods when practical. Ingress and egress for equipment shall be within the work site. Location of ingress and egress outside the immediate work area requires prior approval of the WV DEP DWWM in concurrence with the WV DNR.
15. The permittee will comply with water quality standards as contained in the West Virginia Requirements Governing Water Quality Standards, Title 47 of Code of State Regulations, Series 2.
16. Stream activities permitted under the Nationwide Permit Program require that a West Virginia Public Lands Corporation Right of Entry be obtained. Application for Stream Activity should be made to the WV DNR, Office of Lands and Streams, at <http://www.wvdnr.gov/REM/default.shtm> or (304) 558-3225. In addition, any activity within the Federal Emergency Management Agency delineated 100-year floodplain requires approval from the appropriate Floodplain Manager. The following website provides a statewide listing of Floodplain Managers in West Virginia: <http://www.dhsem.wv.gov/MitigationRecovery/Pages/Floodplain-Management.aspx>  
[www.dhsem.wv.gov/mitigation/floodplain/Pages/default.aspx](http://www.dhsem.wv.gov/mitigation/floodplain/Pages/default.aspx)
17. If applicable, the permittee must measure and report Large Quantity Water use pursuant to §22-26-1et seq of the West Virginia Code.
18. Prior notification describing the project location and impacts must be given to the WV DEP DWWM for use of any of the Nationwide Permits for all work in streams set forth in Sections A, B, and C below.
  - A. Tier 3 Protection. West Virginia Code of State Regulations, Requirements Governing Water Quality Standards, Title 47, Series 2. **Outstanding**

**National Resource Waters:** Outstanding National Resource Waters include, but are not limited to, all streams and rivers within the boundaries of Wilderness Areas designated by The Wilderness Act (16 U.S.C. §1131 et seq.) within the State, all Federally designated rivers under the Wild and Scenic Rivers Act, 16 U.S.C. §1271 et seq.; all streams and other bodies of water in state parks which are high quality waters or naturally reproducing trout streams; waters in national parks and forests which are high quality waters or naturally reproducing trout streams; waters designated under the National Parks and Recreation Act of 1978, as amended; and pursuant to subsection 7.1 of 60CSR5, those waters whose unique character, ecological or recreational value, or pristine nature constitutes a valuable national or state resource. The listing of Tier 3 streams is located at: [http://www.dep.wv.gov/WWE/Programs/wqs/Documents/Tier%203%20Info/WVTier\\_3\\_Nov2013\\_web.xlt](http://www.dep.wv.gov/WWE/Programs/wqs/Documents/Tier%203%20Info/WVTier_3_Nov2013_web.xlt)

- B. All naturally-reproducing trout streams. For information about specific streams contact WV DNR, Wildlife Resource Section, Trout Fisheries Program at 304-637-0245.
- C. West Virginia Natural Stream Preservation Act. The following streams or rivers are protected from activities that would impound, divert or flood the body of water: Greenbrier River from its confluence with Knapps Creek to its confluence with the New River, Anthony Creek from its headwaters to its confluence with the Greenbrier River, Cranberry River from its headwaters to its confluence with the Gauley River, Birch River from Cora Brown Bridge in Nicholas County to the confluence of the river with the Elk River, and New River from its confluence with the Greenbrier River to its confluence with the Gauley River.

19. Wetland and stream mitigation guidelines. The discharge of dredged or fill material into a stream or wetland is authorized based upon the following criteria:

- A. One-tenth to ½ acre of permanent impact to wetland(s) (including wetland type conversion) requires prior notification describing the project location and impacts and plan for mitigation to be submitted to the WV DEP DWWM along with the proposed plan for mitigation provided to the state for approval.
- B. The amount of fill in a wetland, wetland complex or wetland system without mitigation is not to cumulatively exceed 1/10 acre.
- C. West Virginia Stream Wetland Valuation Metric (SWVM) is the preferred method to assist with the determination of required mitigation. The metric is available at the Huntington and Pittsburgh ACOE web sites.

In all instances, mitigation for all impacts incurred through use of these Nationwide Permits must first be directed to elimination of the impacts, then minimization of the impacts and lastly

through compensatory mitigation. In many cases, the environmentally preferable compensatory mitigation may be provided through an approved mitigation bank or the West Virginia In-Lieu Fee Program. Permittee responsible compensatory mitigation may be performed using the methods of: restoration, enhancement, establishment and in certain circumstances preservation. In general, the required compensatory mitigation should be located in the same watershed as the impact site, and located where it is most likely to successfully replace lost functions and services as the impacted site. However, the use of mitigation banks or in-lieu fee for in-kind replacement is not restricted to the major watershed in which the impact has occurred until such time as mitigation banks or in-lieu projects are developed in each major watershed.

**Wetlands.** When permittee responsible in-kind replacement mitigation is used, it is to be accomplished at the following ratios until such time an approved functional assessment methodology is established for the state of West Virginia:

Permanent impacts to open water wetlands are to be one (1) acre replaced for one (1) acre impacted.

Permanent impacts to wet meadow/emergent wetlands are to be two (2) acres replaced for one (1) acre impacted.

Permanent impacts to scrub-shrub and forested wetlands are to be three (3) acres replaced for one (1) acre impacted.

In instances where compensatory in-kind mitigation is completed 12 months prior to the impact of the resource, the replacement ratio may be reduced to as low as one (1) acre created/restored to every one (1) acre impacted.

NOTE: The ratio of created/restored wetlands to impacted wetlands not only ensures no net loss, but assures the adequate replacement of the impacted wetlands functions and values at the level existing prior to the impact. For many of the more complicated type wetlands, such as scrub-shrub and forested, the values and functions cannot readily be replaced through creation. Furthermore, not all wetland creation is successful.

In certain instances, the West Virginia Department of Environmental Protection, Division of Water and Waste Management may consider the acquisition of existing wetlands. Acquisition ratios are the following:

- 5 to 1 for open water wetlands
- 10 to 1 for wet meadow/emergent wetlands
- 15 to 1 for scrub-shrub and forested wetlands

Under extenuating circumstances the director may accept lower ratios for high quality wetlands under significant threat of development.

All wetlands acquired, using the acquisition method of mitigation, will either be deeded to the WV DNR Public Land Corporation for management by the Wildlife Resources Section or

placed under a conservation easement and be protected from disturbance by the permittee or their designee. Third party oversight of the conservation easement by a non-profit conservation organization is preferred.

**Streams.** Compensatory mitigation projects for permanent stream impacts should attempt to replace lost functions. Mitigation will be determined on a case-by-case basis based on the pre- and post- condition stream quality and complexity of the mitigation project preferably utilizing the SWVM worksheets. Compensatory mitigation may require protection through deed restrictions or conservation easements by the permittee or their designee.

20. Streams with Mussel populations.

A. Should native freshwater mussels be encountered during the use of any Nationwide Permit, all activity is to cease immediately and the WV DNR Wildlife Resources Section, Wildlife Diversity Program is to be contacted (304-637-0245) to determine significance of the mussel population and the action to be taken.

B. Work in streams known to have protected “no take” mussel populations or contain protected habitat of mussels on the Federal Endangered Species list must be approved by the WV DNR, Wildlife Diversity Program. Applicants wishing to conduct projects in such streams should contact the program at (304) 637-0245. The most current list of these waters and other mussel information can be found here: <http://www.wvdnr.gov/Mussels/Main.shtm>.

C. Applicants should also consider utilizing WV DNR Wildlife Data Base Inquiry process. This resource is designed for the applicant as an informative preplanning tool. It allows the applicant to know, in advance, if they will be encountering any federally listed endangered species (ES), state species of concern and high quality fish and wildlife habitats such as trout streams, warm water fisheries, wetlands, karst and cave habitats. This inquiry can be obtained from the: Wildlife Data Base Coordinator, PO Box 67, Elkins West Virginia 26241. Information on what to submit to receive an inquiry should be directed to data base coordinator at 304-637-0245.

21. Isolated State Waters. In some cases, the ACOE may determine that an activity will not impact waters of the United States because the water is an isolated wetland or stream, and therefore does not require a 404 permit. However, under West Virginia Code §22-11-8(b)(3), a permit is needed to place a waste into any water of the State. Accordingly, any applicant proposing to impact an isolated water must contact WV DEP DWWM to obtain all necessary approvals for activities impacting any isolated State waters.

## **H. Definitions**

**Best management practices (BMPs):** Policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects on surface water quality resulting from development. BMPs are categorized as structural or non-structural.



**Compensatory mitigation:** The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

**Currently serviceable:** Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

**Direct effects:** Effects that are caused by the activity and occur at the same time and place.

**Discharge:** The term “discharge” means any discharge of dredged or fill material into waters of the United States.

**Ecological reference:** A model used to plan and design an aquatic habitat and riparian area restoration, enhancement, or establishment activity under NWP 27. An ecological reference may be based on the structure, functions, and dynamics of an aquatic habitat type or a riparian area type that currently exists in the region where the proposed NWP 27 activity is located. Alternatively, an ecological reference may be based on a conceptual model for the aquatic habitat type or riparian area type to be restored, enhanced, or established as a result of the proposed NWP 27 activity. An ecological reference takes into account the range of variation of the aquatic habitat type or riparian area type in the region.

**Enhancement:** The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

**Ephemeral stream:** An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

**Establishment (creation):** The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area.

**High Tide Line:** The line of intersection of the land with the water’s surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.

**Historic Property:** Any prehistoric or historic district, site (including archaeological site), building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).

**Independent utility:** A test to determine what constitutes a single and complete non-linear project in the Corps Regulatory Program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

**Indirect effects:** Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.

**Intermittent stream:** An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

**Loss of waters of the United States:** Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the United States is a threshold measurement of the impact to jurisdictional waters for determining whether a project may qualify for an NWP; it is not a net threshold that is calculated after considering compensatory mitigation that may be used to offset losses of aquatic functions and services. The loss of stream bed includes the acres or linear feet of stream bed that are filled or excavated as a result of the regulated activity. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States. Impacts resulting from activities that do not require Department of the Army authorization, such as activities eligible for exemptions under section 404(f) of the Clean Water Act, are not considered when calculating the loss of waters of the United States.

**Navigable waters:** Waters subject to section 10 of the Rivers and Harbors Act of 1899. These waters are defined at 33 CFR part 329.

**Non-tidal wetland:** A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. Non-tidal wetlands contiguous to tidal waters are located landward of the high tide line (i.e., spring high tide line).

**Open water:** For purposes of the NWPs, an open water is any area that in a year with normal patterns of precipitation has water flowing or standing above ground to the extent that an

ordinary high water mark can be determined. Aquatic vegetation within the area of flowing or standing water is either non-emergent, sparse, or absent. Vegetated shallows are considered to be open waters. Examples of "open waters" include rivers, streams, lakes, and ponds.

**Ordinary High Water Mark:** An ordinary high water mark is a line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas.

**Perennial stream:** A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

**Practicable:** Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

**Pre-construction notification:** A request submitted by the project proponent to the Corps for confirmation that a particular activity is authorized by nationwide permit. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Pre-construction notification may be required by the terms and conditions of a nationwide permit, or by regional conditions. A pre-construction notification may be voluntarily submitted in cases where pre-construction notification is not required and the project proponent wants confirmation that the activity is authorized by nationwide permit.

**Preservation:** The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

**Protected tribal resources:** Those natural resources and properties of traditional or customary religious or cultural importance, either on or off Indian lands, retained by, or reserved by or for, Indian tribes through treaties, statutes, judicial decisions, or executive orders, including tribal trust resources.

**Re-establishment:** The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

**Rehabilitation:** The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

**Restoration:** The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation.

**Riffle and pool complex:** Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a coarse substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

**Riparian areas:** Riparian areas are lands next to streams, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects riverine, lacustrine, estuarine, and marine waters with their adjacent wetlands, non-wetland waters, or uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. (See general condition 23.)

**Shellfish seeding:** The placement of shellfish seed and/or suitable substrate to increase shellfish production. Shellfish seed consists of immature individual shellfish or individual shellfish attached to shells or shell fragments (i.e., spat on shell). Suitable substrate may consist of shellfish shells, shell fragments, or other appropriate materials placed into waters for shellfish habitat.

**Single and complete linear project:** A linear project is a project constructed for the purpose of getting people, goods, or services from a point of origin to a terminal point, which often involves multiple crossings of one or more waterbodies at separate and distant locations. The term "single and complete project" is defined as that portion of the total linear project proposed or accomplished by one owner/developer or partnership or other association of owners/developers that includes all crossings of a single water of the United States (i.e., a single waterbody) at a specific location. For linear projects crossing a single or multiple waterbodies several times at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

**Single and complete non-linear project:** For non-linear projects, the term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete non-linear project must have independent utility (see definition of "independent utility"). Single and complete non-linear projects may not be "piecemealed" to avoid the limits in an NWP authorization.

**Stormwater management:** Stormwater management is the mechanism for controlling stormwater runoff for the purposes of reducing downstream erosion, water quality degradation, and flooding and mitigating the adverse effects of changes in land use on the aquatic environment.

**Stormwater management facilities:** Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and best management practices, which retain water for a period of time to control runoff and/or improve the quality (i.e., by reducing the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

**Stream bed:** The substrate of the stream channel between the ordinary high water marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.

**Stream channelization:** The manipulation of a stream's course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized stream remains a water of the United States.

**Structure:** An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

**Tidal wetland:** A tidal wetland is a jurisdictional wetland that is inundated by tidal waters. Tidal waters rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are located channelward of the high tide line.

**Tribal lands:** Any lands title to which is either: 1) held in trust by the United States for the benefit of any Indian tribe or individual; or 2) held by any Indian tribe or individual subject to restrictions by the United States against alienation.

**Tribal rights:** Those rights legally accruing to a tribe or tribes by virtue of inherent sovereign authority, unextinguished aboriginal title, treaty, statute, judicial decisions, executive order or agreement, and that give rise to legally enforceable remedies.

**Vegetated shallows:** Vegetated shallows are special aquatic sites under the 404(b)(1) Guidelines. They are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as seagrasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems.

**Waterbody:** For purposes of the NWP, a waterbody is a jurisdictional water of the United States. If a wetland is adjacent to a waterbody determined to be a water of the United States, that waterbody and any adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)). Examples of “waterbodies” include streams, rivers, lakes, ponds, and wetlands.

**Revised Programmatic Agreement for Minor  
Natural Gas Transmission Activities in West Virginia**

**Between**

**Dominion Resources, Inc.  
445 West Main Street  
Clarksburg, West Virginia 26301**

**And**

NOU16 18 4:27PM

**The U.S. Fish and Wildlife Service  
West Virginia Field Office  
694 Beverly Pike  
Elkins, WV 26241**

**Revised September 2013**



## **I. History**

The U.S. Department of the Interior Fish and Wildlife Service (Service) and Dominion Resources, Inc. (Dominion) have worked together to streamline the coordination process required under provisions of Section 7(a)(2) of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U. S. C. 1531 *et seq.*) for minor maintenance and construction activities associated with Dominion's natural gas transmission system in West Virginia which are permitted under the authority of the U.S. Army Corps of Engineers (Corps) Nationwide Permit Program (NWP) [Clean Water Act 404(e) (33 U.S.C 1344)]. As part of this partnership, the Service and Dominion have signed an agreement regarding the effects of Dominion's minor projects on federally listed threatened and endangered species and their designated critical habitats. This agreement will allow Dominion to conduct activities associated with their natural gas production, gathering, and transmission systems in West Virginia without prior notification to the Service for those activities which the Service and Dominion have determined will have no effect on federally listed species or designated critical habitats. This Revised Programmatic Agreement addresses that topic and provides updates on the status and distribution of federally listed endangered, threatened and candidate species and designated critical habitats in West Virginia.

## **II. Purpose**

Dominion and subsidiary companies routinely conduct construction, operational, and maintenance activities along its existing natural gas pipeline systems in West Virginia to facilitate the transmission of natural gas. Dominion maintains control of the rights of way (ROWs) associated with its natural gas pipelines and associated structures. Dominion also conducts certain routine maintenance activities within its original ROWs along its natural gas pipeline system in West Virginia.

The Service, within the Department of the Interior, is responsible for assisting other Federal agencies and the public in the conservation, protection, and enhancement of fish, wildlife, plants, and their habitats, pursuant to the Fish and Wildlife Coordination Act (FWCA; 16 U.S.C. *et seq.*) and the ESA. The Service has principal trust responsibility to protect and conserve migratory birds, threatened and endangered species, certain marine mammals, and inter-jurisdictional fishes. In particular, Section 7 of the ESA requires that Federal agencies insure that the actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or destroy or adversely modify their designated critical habitat. In addition, Section 9 of the ESA prohibits the "taking" of species designated as threatened or endangered under Section 4 of the ESA without either an incidental take statement provided under Section 7 of the ESA or an incidental take permit issued under Section 10 of the ESA.

The purpose of this document is to facilitate agreement on processes that will be used to develop a program that Dominion can use to: (1) assist in designing its activities in manners that reduce the potential for adverse effects to Service trust resources; (2) assist in determining whether activities associated with minor maintenance and construction projects, as listed below, will affect federally listed species and designated critical habitats; and (3) assist in meeting the requirements of the ESA in an efficient and expedited manner. The process addressed by this Programmatic Agreement is designed to address relatively minor, but frequent and/or recurring, activities associated with Dominion's gas pipeline system in West Virginia.



### **III. Authorities**

This Programmatic Agreement is for use by Dominion in its application for NWP's 3, 6, 12, 13, 14, 20, 39 and 43, as authorized by the Clean Water Act 404(e) (33 U.S.C. 1344). Section 7(a)(2) of the ESA requires that each Federal agency, or their designated representatives, with the assistance of the Service, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Under Section 404 of the Clean Water Act, Corps permits are required for the discharges of dredged or fill material into waters of the United States (U.S.). Nation Wide Permits (NWP's) provide an expedited form of authorization, provided the project proponent meets all terms and conditions of the NWP's. Another requirement is that NWP's authorize only those activities that result in minimal adverse environmental effects, individually and cumulatively.

As part of the NWP program, no activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the ESA, or which will destroy or adversely modify the designated critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless Section 7(a)(2) consultation addressing the effects of the proposed activity has been completed. Non-Federal permittees shall notify the Corps district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, and shall not begin work on the activity until notified by the Corps district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. Authorization of an activity by a NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA.

The program developed under this Agreement will assist Dominion, as the non-Federal permittee, in its responsibility as part of the NWP application process, or other Federal permit process, to determine whether federally listed species and bald eagles are likely to be affected by the proposed activities. In addition, if federally listed species may be affected by a proposed activity, the program developed under this Agreement will facilitate an expedited Section 7(a)(2) consultation with the Corps or other Federal agency.

In addition, Section 9(a)(1)(B) of the ESA states that "with respect to any endangered species of fish or wildlife listed...it is unlawful for any person subject to the jurisdiction of the United States to take any such species within the United States..." Take is defined as to harass, harm pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct. Threatened species were included in Section 9 by regulation. Therefore, even without a Federal permit, funding or authorization, it is illegal for any citizen or company of the U.S. to take threatened and endangered species. This Agreement does not cover activities lacking a Federal permit (Section 7(a)(2) nexus). However, Dominion may choose to use the recommendations set forth in this Agreement to avoid and minimize impacts to federally listed species for activities that do not require a Federal permit. Dominion may include such activities

in its annual report, if it so chooses. If a federally listed species may be impacted by any activity that is not covered by a Federal permit, Dominion may choose to apply for a Section 10(a)(1)(B) incidental take permit to allow for take of a federally listed species.

The Bald and Golden Eagle Protection Act (Eagle Act; 16 U.S.C. 668-668d) prohibits the take of bald and golden eagles unless pursuant to regulations (and take can only be authorized under a permit). The Eagle Act defines the "take" of an eagle to include a broad range of actions: "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest or disturb"; the broadest of these terms is "disturb." "Disturb" has now been defined by the Service in regulations at 50 CFR 22.3 as: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." Bald and golden eagles are also protected by the Migratory Bird Treaty Act (MBTA; 16 U.S.C. 703-712), which prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted by regulation.

#### **IV. Action Area**

This Programmatic Agreement covers maintenance and minor construction activities that require a Federal permit at Dominion's natural gas pipeline systems and associated structures in West Virginia except those that occur within the habitat buffers for federally listed species illustrated in Appendix A and B and those that occur within 0.25 mile of the aquatic habitats illustrated in Appendix B and listed in Appendix C. Maintenance and minor construction activities in those areas will require additional consultation under Section 7 of the ESA with the Service's West Virginia Field Office (WVFO).

The habitat and waterway buffers may change as additional information on federally listed species becomes available. The WVFO may amend the data at any time if new information so warrants. Amendments will be provided in writing to Dominion, and any new restrictions on the applicability of the Agreement related to such amendments will become effective immediately upon Dominion's receipt of the amendment(s). The WVFO will review the data at least annually and provide updates, if any, to Dominion.

#### **V. Proposed Activities**

Listed below are the activities proposed for inclusion in this program. These activities are limited to the impacts outlined by NWP General and Regional Conditions and the West Virginia 401 Water Quality Certification Special Conditions, and they are subject to the exceptions listed in Section VI.

- A. Activities conducted above ground and/or that require no ground disturbance within areas of Dominion existing or maintained facilities:
  1. Above-ground Facilities  
Installation or maintenance of equipment or appurtenances, including conversion or modification of existing valves, monitoring, measuring, communications, cleaning or regulatory devices. These facilities include all of the fenced and

maintained property and the structures located therein for compressor stations, well sites, meter stations, regulator stations and valve sites.

2. In-place Abandonments  
Discontinuation of service and/or retirement of a pipeline segment, well, or other facility which will not require ground disturbing activities (i.e., pipe and/or appurtenances will be left in place).
  3. Changes  
Changes in service points or storage capacity.
  4. Minor Above-ground Pipe Replacement  
Modifications within an existing above-ground facility for valves, monitoring, cleaning, regulating or measurement.
  5. Right-of-Way Maintenance  
Mowing and maintenance of the existing ROW.
- B. Activities requiring ground disturbance which are located within existing graveled or yards regularly maintained by clearing and/or mowing at an existing Dominion above-ground facility (these facilities include all of the maintained property, including fenced areas, and the structures located therein for compressor stations, meter stations, regulator stations and valve sites):
1. Taps  
Installation of pipe connections up to 36-inch diameter installed on an existing pipeline.
  2. Appurtenances  
Installation or maintenance of equipment or appurtenances, including conversion or modification of existing valves, monitoring, measuring, communications, cleaning or regulatory devices.
  3. Inspections  
Maintenance and investigation of the condition of the pipeline and subsurface appurtenances at locations requiring excavation to expose a short length of existing pipeline and assess the integrity of the pipeline.
  4. Pipe Replacements  
Replacement of existing lengths of pipeline including: the removal of an existing pipeline and construction of a new pipeline within the same trench; or, abandoning the extant line and installing a replacement line at an off-set (adjacent to the abandoned line) within the existing or maintained ROW.
  5. Pipe Rearrangements, Crossovers, and Interconnects

Minor modifications of existing lengths of pipeline. Excavation activities may require the removal of an existing pipeline and/or installation of new pipe.

6. Abandonments

Discontinuation of service and/or retirement of a pipeline segment or facility which requires ground disturbing activities to remove piping or modify appurtenances.

7. Above-ground Facilities

Installation or maintenance of equipment or appurtenances, including conversion or modification of existing valves, monitoring, measuring, communications, cleaning or regulating devices, installation, removal, abandonment, replacement, and/or maintenance projects within existing, predominately disturbed, and generally fenced compressor and measuring & regulatory (M&R) stations, field office locations, and previously disturbed and generally maintained unfenced well sites.

8. Pipeline Lowerings

Relocating an existing line to a lower depth to establish greater cover over the line

C. Activities requiring ground disturbance within Dominion existing or maintained ROW:

1. Taps

Installation of pipe connections up to 36-inch diameter installed on an existing pipeline.

2. Inspections

Maintenance and investigation of the condition of pipeline and subsurface appurtenances at specific locations requiring excavation to expose a short length of existing pipeline and assess the integrity of the pipeline.

3. Pipe Replacements

Replacement of existing lengths of pipeline including: the removal of an existing pipeline and construction of a new pipeline within the same trench; or, abandoning the extant line and installing a replacement line at an off-set (adjacent to the abandoned line) within the existing or maintained ROW. Replacement does not include construction of parallel lines for system expansion.

4. Pipe Rearrangements, Crossovers, and Interconnects

Minor modifications of existing lengths of pipeline. Excavation activities may require the removal of an existing pipeline and/or installation of new pipe.

5. Abandonments

Discontinuation of service and/or retirement of a pipeline segment or facility which requires ground disturbing activities to remove piping or modify appurtenances.

6. Pipeline Lowerings  
Relocating an existing line to a lower depth to establish greater cover over the line.
7. Pipe Casing Modifications  
At locations where existing pipelines cross roads or highways, modification, addition to or replacement of an existing casing within the road. (Pipelines may be contained within a sleeve, also called a casing, at road crossings.)
8. Appurtenance Modifications  
Service and maintenance within existing compressor stations and/or above-ground facilities.
9. Points of Delivery and Points of Receipt  
Installation, removal, abandonment, or relocation of Points of Delivery (PODs) and Points of Receipt (PORs). To establish a new POD or POR, an existing pipeline is tapped at a point along Dominion's previously disturbed and generally maintained ROW, and generally no more than 200 feet of small diameter pipe is installed within the ROW. Limited above-ground facilities such as valves, separators, meters, and small shelters may also be installed. To relocate or abandon a POD or POR, an existing pipeline is cut and capped adjacent to the existing tap within the previously disturbed and generally maintained ROW. For a relocated POD or POR, a new POD or POR is then installed on an existing pipeline as previously described at a different location.
10. Cathodic Protection  
Cathodic protection installations along existing, predominately disturbed and generally maintained ROW. These minor projects consist of burying a thin cable (normally ½ inch in diameter) with sacrificial anodes (approximately 8 inches in diameter and 48 inches long) attached to the structures. These protection items are installed with a ditch-witch and/or small backhoe. Minor cathodic protection projects as described are installed perpendicular to Dominion's ROW within areas that have been previously cleared and predominately disturbed by others (i.e., powerline ROWs).
11. Erosion and Slip Repairs  
Repair of eroded sections of existing ROW and where required, eroded areas immediately adjacent to the existing ROW. This would include such activities as recontouring eroded stream banks and installing vegetative blankets, rip-rap or gabion baskets or stabilizing small slips or steep slopes.
12. Appurtenances  
Installation or maintenance of equipment or appurtenances, including conversion or modification of existing valves, monitoring, measuring, communications, cleaning or regulatory devices.

13. Use of Existing Access

Use of existing access roads and existing ROW as access to all construction and/or maintenance projects. Minor upgrades such as adding gravel, regrading the existing, previously disturbed area, and side-trimming of tree branches would be included in this activity. This use does not include widening of the road.

D. Activities that involve ground disturbance within areas adjacent to Dominion's existing or maintained ROW previously disturbed by other entities (i.e., modified by clearing and/or grading activities due to residential, agricultural, silvicultural, industrial, pipeline construction or commercial development). [Commercial or industrial areas are locations of obvious development (i.e., paved surfaces, graded and graveled surfaces) and/or locations with a documented history of previous commercial or industrial use(s).] The following activities are included in this category:

1. Taps

Installation of pipe connections up to 36-inch diameter installed on an existing pipeline.

2. Pipe Replacements

Replacement of existing lengths of pipeline is defined as: the removal of an existing pipeline and construction of a new pipeline within the same trench. Replacement does not include construction of parallel lines of system expansion.

3. Pipe Rearrangements, Crossovers, and Interconnects

Minor modifications of existing lengths of pipeline. Excavation activities may require the removal of an existing pipeline and/or installation of new pipe within the existing or maintained ROW.

4. Extra Workspaces and Contractor Yards

Areas used for staging construction activities, including spoil storage, parking and pipe and equipment storage, including use of areas subjected to similar past use as staging areas or storage yards.

5. Above-ground Facilities

Installation or maintenance of equipment or appurtenances, including conversion or modification of existing valves, monitoring, measuring, communications, cleaning or regulatory devices.

6. Access Roads

Use of existing access roads as access to all construction and/or maintenance projects. Minor upgrades such as adding gravel, regrading the existing, previously disturbed area, side-trimming of tree branches, and bridge reinforcement would be included in this activity. This use does not include widening of the road.

7. Appurtenances

Installation or maintenance of equipment or appurtenances, including conversion or modification of existing valves, monitoring, measuring, communications, cleaning or regulating devices.

E. Activities which are outside of Dominion's existing or maintained ROW and outside commercial or industrial areas where surveys conducted previously by Dominion, other utility companies or State and Federal entities, including the Service, revealed no known threatened or endangered species:

1. New Points of Service (POS)  
Installation of taps, meters, and pipe for POS to pipeline customers including excavation of the trench for pipe 12" diameter or smaller, provided that no more than 250 feet of trench is required and provided that no more than ten (10) installations are to be made for a single undertaking.
2. Points of Service Modifications  
Replacement or modification to an existing POS, provided that no more than 150 feet of trench excavation is required.
3. Minor Pipe Additions  
Construction of up to 150 feet of new pipeline.
4. Access Road  
Use of existing roads to the pipeline ROW, staging areas or storage yards. Access roads may be maintained, regraded, or improved by adding gravel, regrading the existing, previously disturbed area, or side-trimming tree branches. This use does not include widening of the road.
5. Extra Workspace  
Areas used for staging construction activities, including spoil storage, parking, pipe storage and equipment storage.

F. Activities requiring ground disturbance which are outside of Dominion's existing or maintained ROW and outside commercial or industrial areas where no surveys exist, but will not result in clearing of greater than 17 acres of trees greater than five-inch diameter at breast height.

1. Pipeline Construction  
Construction of new pipeline including new ROW construction and construction of parallel lines for system expansion.
2. Extra Work Space  
The use and clearing of extra work space for road crossings, stream crossings, soil stockpiles, bore pits, pipeline route adjustments, and truck/equipment turn outs.
3. Cathodic Protection

Cathodic protection installations perpendicular to pipeline ROW.

4. Appurtenances  
Installation or maintenance of equipment or appurtenances, including conversion or modification of existing valves, monitoring, measuring, communications, cleaning or regulatory devices.
5. Access Roads  
Use and widening of existing roads or construction of new roads as access to construction and/or maintenance projects. Upgrades such as adding gravel, grading, cutting trees, and bridge reinforcement would be included in this activity.

#### **VI. Exceptions**

To ensure that the activities as listed above under Section V will have no effect on federally listed threatened or endangered species in West Virginia, the following activities will **not** be covered under this Agreement.

- A. Activities which will occur within ¼-mile of aquatic habitats that are known to support federally listed species in West Virginia (refer to section IV above and Appendix C).
- B. Activities involving the removal or trimming of trees on a total of greater than 17 acres.
- C. Activities within 5 miles of a known Indiana bat hibernaculum, within 2.5 miles of a known Indiana bat maternity colony, within 5 miles of a known Indiana bat capture site or within 6 miles of a Virginia big-eared bat hibernaculum or maternity colony (see Appendices A and B).
- D. Drilling or boring into known abandoned mine workings during the winter, unless a habitat assessment or survey has been conducted prior to the drilling or boring.
- E. Activities in counties not listed in Appendices A, B, and C.

#### **VII. Measures to Further Avoid and Minimize Impacts to Listed Species**

The following measures will be implemented to further avoid and minimize impacts to federally listed species.

- A. Dominion will coordinate with the Service on a project-specific basis when construction, maintenance, or other ground disturbing activities are proposed within any of the exception areas listed above or within any counties not listed in Appendices A, B, and C;
- B. Sediment barriers, catch basins, or other available methods should be constructed to ensure that minimal erosion and sedimentation occurs as a result of any construction or maintenance work along streams and rivers. Dominion will also implement Best Management Practices, including minimizing clearing, installing sediment and erosion control barriers, mulching and seeding disturbed areas immediately after each portion of construction is complete or within one week of a stop in operations, weather permitting, and re-vegetating any disturbed banks with



native, non-invasive species, to ensure that any indirect impacts to federally listed species downstream are avoided;

C. All conditions of the appropriate National Pollutant Discharge Elimination System (NPDES) permits will be followed;

D. All holes bored or drilled into abandoned mines will be sealed as soon as possible with materials that will prevent air flow and temperature changes in the mine.

### **VIII. Federally Listed Species in West Virginia**

There are 22 federally listed endangered and threatened species that are known to occur in West Virginia, including 11 mollusks (10 freshwater mussels and one land snail), six plants, two mammals (bats), one amphibian (a salamander), one fish, and one crustacean (a cave isopod). Another, the endangered eastern cougar (*Felis concolor cougar*), has not been documented in West Virginia in over 100 years and is considered extinct.

Appendix A and B illustrate the known occurrences of federally listed species in West Virginia, including associated habitat buffers, and the aquatic habitats known or with the potential to support aquatic or aquatic-dependent listed species. Appendix C provides a list and the locations, by county, of the aquatic habitats known or with the potential to support federally listed species in West Virginia. Additional information on West Virginia's federally listed species is provided below.

**Indiana bat (*Myotis sodalis*)** - The Indiana bat was listed as an endangered species in 1967 due to large numbers of deaths associated with human disturbance at winter hibernacula. Since then, its numbers have declined by more than 50 percent, with additional threats that include commercialization of caves, loss of summer habitats, pesticides and other contaminants and, more recently, the disease white nose syndrome. In West Virginia, Indiana bats typically hibernate from mid-November until early April in caves or abandoned mine openings that are connected to larger underground tunnels. They emerge from these hibernacula in the spring and migrate to summer habitats. Indiana bat foraging habitat is generally defined as riparian, bottomland, or upland forest, as well as old fields or pastures with scattered trees. Summer roosting and maternity habitats consist primarily of live or dead hardwood trees which have exfoliating bark that provides space for bats to roost between the bark and the bole of the tree. Tree cavities, crevices, splits, or hollow portions of tree boles and limbs also provide roost sites. Forested areas containing trees > 5 inches in diameter at breast height provide suitable summer roosting and maternity habitat for the Indiana bat, and all such areas in West Virginia are considered potential habitat for this species.

**Virginia big-eared bat (*Corynorhinus townsendii virginianus*)** - The Virginia big-eared bat was listed as endangered in 1979, also largely due to human disturbance at winter hibernacula. This species uses caves year-round as roost sites. During the winter, most populations hibernate in a few cold caves that provide optimum temperatures for hibernation. During the summer, females congregate in warmer maternity caves to raise their young. These bats are very intolerant of human disturbance and will abandon caves and young in response to human activity. A substantial portion of the species population winters in a small number of caves in West Virginia.

**Cheat Mountain salamander (*Plethodon nettingi*)** - The Cheat Mountain salamander was listed as threatened in 1989 because of habitat loss associated with historic and current logging of high-elevation spruce-hardwood forests, road construction, pipeline ROWs, and other human development within the species' limited range. This salamander is endemic to West Virginia; it occurs only in the higher elevations in the east-central part of the state. Historically, the species was probably restricted to the red spruce forests of West Virginia's higher mountains. Since most of these forests were extensively logged by 1920, several populations today occur in mixed deciduous forests that have replaced red spruce stands - most likely as a result of fire. These forests include yellow birch, American beech, sugar maple, striped maple, and Eastern hemlock trees. Typically, this species is found in cool, moist red spruce forests with a ground cover comprised of a liverwort called *Bazzania* and an abundance of leaf litter, fallen logs, and sticks.

Cheat Mountain salamanders spend the winter underground where temperatures remain above freezing. When the weather warms up, usually around May, these salamanders emerge from underground. Woodland salamanders seldom leave their territories and, as a result, move only a few meters during their lives. Like all amphibians, salamanders lack an external covering of scales, hair, or feathers. Instead, their skin is slimy and must stay moist. Lungless salamanders, such as the Cheat Mountain salamander, breathe through their skin and the lining of their mouths and, therefore, require a habitat that is moist and cool. The main threat to the species is degradation of high-elevation red spruce and spruce/northern hardwood forests. Habitat protection on public lands may not be sufficient to minimize threats to populations from habitat fragmentation. Any disturbance that exposes the forest floor to sunlight, such as tree-clearing, changes the cool, moist conditions on which these animals depend for nest sites as well as food and oxygen procurement. Alterations as minor as clearing service roads or hiking trails can fragment and isolate populations, as these salamanders do not cross bare surfaces.

**Diamond Darter (*Crystallaria cincotta*)** - The diamond darter was listed as endangered in 2013. The diamond darter is an extremely rare fish species in the perch family that inhabits medium to large, warm water streams with clean sand and gravel substrates and moderate current. It once inhabited streams throughout the Ohio River Basin, but is currently only known to exist in the Elk River in West Virginia. Critical habitat has been designated for the diamond darter in the Elk River in Clay and Kanawha Counties, West Virginia, and in the Green River in Edmonson, Hart and Green Counties, Kentucky. The critical habitat ruling took effect on September 22, 2013. Threats to the species include: water quality degradation, habitat loss, siltation, a small population size, loss of genetic fitness, and catastrophic events in the way of oil and other toxic spills.

**Flat-spined three-toothed land snail (*Triodopsis platysayoides*)** - This species, considered one of the world's rarest land snails, was listed as threatened in 1978. It also is endemic to West Virginia, known only from a 14-mile segment of the Cheat River Gorge in the north-central part of the state. While there appears to be a strong correlation between the presence of the snail and sandstone outcrops, cliff line features, emergent boulders and/or talus, it also occurs at the mouth of Cornwell Cave in Greenbrier Limestone. It is typically found in very close proximity to rock, often near or within crevices. Leaf litter, stick litter, and rocks provide cover for the snail. Although this snail is usually associated with the presence of red maple, sweet birch, and

rhododendron, it may be coincidental. Rock structure is likely a better indicator of habitat than vegetative composition or the age of the trees. Little is known of the life history of this animal, but some information has been obtained from a captive colony. Small clusters of eggs are laid in the spring and summer. The eggs are usually buried in the soil or leaf litter. Flat-spined three-toothed land snails appear to be most active during the spring and early summer. Threats to the species are related to human disturbance within its small range, including logging, road-building, hiking, rock climbing and the potential for human-started fires.

**Madison Cave isopod (*Antrolana lira*)** - This species, which inhabits underground lakes and deep karst aquifers where it lives in the groundwater, was listed as threatened in 1982. Karst habitat includes areas of irregular limestone in which erosion has produced fissures, sinkholes, underground streams, and caverns. The Madison Cave isopod has been observed in a few caves that descend to the groundwater table. In West Virginia, this species is currently known to occur within caves and wells in Jefferson County. This animal probably occurs in pockets of ground water that extend beyond the sites where it has been observed. Contamination of groundwater is the major threat to the Madison Cave isopod. Sources of contaminants include runoff from agriculture and industrial and urban developments.

**Freshwater mussels** - Ten species of freshwater mussels that inhabit medium to large streams and rivers in West Virginia were listed as endangered between 1976 and 2012. These include the Clubshell (*Pleurobema clava*), Fanshell (*Cyprogenia stegaria*), James spinymussel (*Pleurobema collina*), Northern riffleshell (*Epioblasma torulosa rangiana*), Pink mucket pearlymussel (*Lampsilis abrupta*), Rayed bean (*Villosa fabilis*), Sheepnose (*Plethobasus cyphus*), Snuffbox (*Epioblasma triquetra*), Spectaclecase (*Cumberlandia monodonta*), and Tubercled-blossum pearlymussel (*Epioblasma torulosa torulosa*). Many are found in gravelly substrates with moderate current. Freshwater mussels feed by filtering food particles from the water column. Juvenile and adult freshwater mussels have been documented to feed on detritus, diatoms, phytoplankton, and zooplankton. Freshwater mussels rely on fish to complete their life histories. When mussel larvae (glochidia) are released into the water by adult females, they must attach themselves within a few days to the gills of an appropriate fish host, which they then parasitize for a short time while developing into juvenile mussels. The loss of many historic populations was likely due to the impacts of impoundments, navigation projects, water quality degradation from agricultural and industrial wastes, deforestation and other forms of habitat alteration, including gravel and sand dredging. Impacts that directly affected the species also include reduction or elimination of fish hosts.

**Running buffalo clover (*Trifolium stoloniferum*)** - This species, which was listed as endangered in 1987, occurs in mesic habitats of partial to filtered sunlight, where there is a prolonged pattern of moderate periodic disturbance, such as mowing, trampling, or grazing. It is most often found in regions underlain with limestone or other calcareous bedrock. In West Virginia, running buffalo clover seems to prefer old logging roads, off-road vehicle (ORV) trails, hawthorne thickets, grazed woodlands, jeep trails, railroad grades, game trails, and old fields succeeding to mesic woodlands. The larger occurrences exist within a matrix of mesophytic deciduous forest. All populations are associated with light to moderate disturbance such as occasional ORV or foot traffic, stream scour, or grazing. The primary threat to running buffalo clover is habitat alteration including natural forest succession and subsequent canopy closure,

competition by invasive plant species, and catastrophic disturbance such as development or road construction. The elimination of bison and other large herbivores from its range also may have contributed to the decline of this species. These animals were sources of the periodic habitat disturbances required by the species and also played a role in seed germination and dispersal.

**Harperella (*Ptilimnium nodosum*)** - This water-associated annual herb was listed as endangered in 1988. Flowering of in-pond populations begins in May, while riverine populations flower much later, beginning in late June or July and continuing until frost. In West Virginia, harperella typically occurs in riverine habitat types such as rocky or gravel shoals and margins of clear, swift-flowing stream sections. This plant tolerates and may actually require a very specific and unusual water regime, which includes moderately intensive spring floods, which may reduce or eliminate competing vegetation. Harperella is readily eliminated from its habitat by alterations of the water regime resulting from impoundments, water withdrawal, and drainage or deepening of ponds. Siltation, pollution, and shoreline development also threaten harperella populations. Over half the historically-known populations have been eliminated by such factors.

**Northeastern bulrush (*Scirpus ancistrochaetus*)** - This tall perennial sedge with narrow leaves was listed as endangered in 1991. It is characterized by a drooping flower head with chocolate-brown florets and yellow-brown fruits. This species has been found in open, tall herb-dominant wetlands or sinkhole ponds underlain with sandstone. Beaver-influenced wetlands also provide suitable habitat for the plant. Activities such as filling, ditching, or draining wetlands or altering the local hydrology can impact Northeastern bulrush. Residential development, use of ORVs through ponds and other wetlands, agricultural runoff, and water chemistry changes can also impact this plant.

**Shale barren rock cress (*Arabis serotina*)** - This biennial herb of the mustard family was listed as endangered in 1989. It is one of several endemic species restricted to the mid-Appalachian shale barrens of the Ridge and Valley province of the Appalachian Highlands. Shale barren vegetation occurs on eroding shale formations. Mid-Appalachian shale barren is a designation for a shale formation of the region with an open, scrubby growth of pine, oak, red cedar, and other woody species adapted to xeric conditions. Shale barren rock cress is threatened by drought, nonnative invasive plants, and anthropogenic habitat degradation. Grazing by herbivores, such as deer, also threatens the species.

**Virginia spiraea (*Spiraea virginiana*)** - This clonal shrub of the rose family, found in early-successional habitats that do not have a closed canopy, was listed as threatened in 1990. It has been found along streams and rivers, as well as roadside wet areas and wet marshy meadows. In West Virginia, it can be found among large boulders, flatrock, and flood debris along scoured streambanks. Virginia spiraea requires periodic flood scouring to eliminate taller woody competitors and to create river-wash deposits and early successional habitats. Threats to the species include roadside maintenance, deer browse, ORV use in suitable habitats, long-term flooding, water stabilization efforts, and nonnative invasive plants.

**Small whorled pogonia (*Isotria medeoloides*)** - This perennial member of the orchid family, generally known from open, dry, deciduous woods with acid soil, was listed as threatened in 1993. It flowers from about mid-May to mid-June, typically with only one flower per plant,

which lasts only a few days to a week. Individual plants may not flower every year and extended dormancy, although not scientifically documented, is purported to occur under certain conditions. This plant is believed to be self-pollinating by mechanical processes; no evidence of insect pollination has been observed. The current status of small whorled pogonia is attributed to loss of habitat and overutilization for scientific and private collections. However, some populations observed for a number of years have also declined for unknown reasons.

**Bald Eagle (*Haliaeetus leucocephalus*)**

The bald eagle, a North American species that historically occurred throughout the contiguous United States and Alaska, was listed in 1967 as endangered south of the 40<sup>th</sup> parallel. In 1978, it was listed under the ESA as endangered throughout most of the lower 48 states. This segment of the population was down-listed to threatened in 1995, and in 2007 it was deemed recovered and removed from the list of threatened and endangered species. Bald eagles continue to receive Federal protection under the Eagle Act and the MBTA.

Bald eagle distribution varies seasonally; eagles that nest in southern latitudes frequently move northward in late spring and early summer, often summering as far north as Canada. Most eagles that breed at northern latitudes migrate southward during winter or to coastal areas where waters remain unfrozen. Migrants frequently concentrate in large numbers at sites where food is abundant and they often roost together communally. In some cases, concentration areas are used year-round: in summer by southern eagles and in winter by northern eagles.

Bald eagles may occur throughout West Virginia during the winter. Active nest sites, while most numerous in the Eastern Panhandle, have been documented in Grant, Greenbrier, Hampshire, Hancock, Hardy, Jefferson, Mineral, Morgan, Pendleton, Pocahontas, Summers, and Taylor counties. During the breeding season, bald eagles are sensitive to a variety of human activities. However, not all bald eagle pairs react to human activities in the same way. Some pairs nest successfully just dozens of yards from human activity, while others abandon nest sites in response to activities much farther away. This variability may be related to a number of factors, including visibility, duration, noise levels, extent of the area affected by the activity, prior experiences with humans, and tolerance of the individual nesting pair.

In most of West Virginia, nest building typically occurs between early December and early March, followed by egg laying/incubation between late January and early May, hatching/rearing of young between late February and early July, and fledging of young between late May and late August. These breeding stages may occur up to two weeks earlier in the Eastern Panhandle of West Virginia. The species' relative sensitivity during various stages of the breeding season, and recommendations for avoiding or minimizing impacts to nesting bald eagles are outlined in Appendix D. If bald eagle nests are found in the vicinity of any activities carried out under this agreement, the WVFO should be notified of the location and status of the nest, and Dominion should coordinate with the WVFO in implementing the Service's *Bald Eagle Management Guidelines* (see Appendix D).

While the Service's goal is to avoid take of eagles, we recognize that take may occur despite efforts to avoid it. Toward that end, the Service published new regulations for eagle permits on September 11, 2009 (74 *Federal Register* 46836-46879), which became effective on November

10, 2009. The new regulations allow for applications for permits for the types of take anticipated by particular projects or activities. The WVFO is available to work with Dominion to develop appropriate avoidance, minimization and mitigation options or to respond to permit requests, if needed.

#### **IX. Effects of the Action**

Effects of the action must be considered to determine the impact of the proposed activities on the conservation and recovery of federally listed species. Effects of the action include the direct, indirect, and cumulative effects of an action on the species or critical habitat. Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur. Cumulative effects are those effects of future State or private activities, not involving Federal activities that are reasonably certain to occur within the action area.

This program is designed to address gas pipeline activities permitted by the Corps' NWP program, which may only authorize projects that result in minimal adverse environmental effects, individually and cumulatively. Activities that result in "may affect" determinations are not authorized under the NWP program unless a Section 7(a)(2) consultation addressing the effects of the proposed activity has been completed. The activities listed in Section V, in combination with the exceptions and conditions listed in Section VI, will result in only minimal adverse environmental effects. Any activities that may result in greater than minimal adverse environmental effects may require another permit from the Corps. If this is the case, then Section 7(a)(2) consultation can occur as part of that permit process. In addition, if any activity may affect a federally listed species, then a separate consultation must be conducted.

#### **X. Annual Reporting**

Dominion shall provide the Service with an annual report for all projects conducted under this Agreement so that the Service may evaluate the effects of these activities, if any, on federally listed species in West Virginia. All projects conducted under this Agreement should be reported to the Service's WVFO by September 15 of each year the Agreement is in place.

The annual report should be submitted in a spreadsheet format and shall include the following information:

1. Dominion's Project Number and Name;
2. Type of project;
3. County in which the project occurred and the name of the nearest town;
4. Date the project was completed;
5. Names of aquatic resources (wetlands or streams) impacted by or immediately adjacent to the project, if any;
6. Acreage of forested habitat removed by the project, if any; and,
7. Total number of projects completed under this program during the reporting period.

#### **XI. Expiration Date**

This Programmatic Agreement will be valid for the period of 5 years from its full execution. Either the Service or Dominion may revisit this Agreement at any time and update it if new information becomes available.

**XII. Signatures of Authorizing Officials**

*Laura Hill*  
for \_\_\_\_\_  
John E. Schmidt, Field Supervisor  
West Virginia Field Office  
U.S. Fish and Wildlife Service

9-17-2013  
Date

*JL Barger*  
\_\_\_\_\_  
Jeffrey L. Barger, VP Pipeline Operations  
Dominion Transmission, Inc.

10-2-13  
Date

*Mark E. Barnes*  
\_\_\_\_\_  
Mark E. Barnes, Director Gas Operations  
Dominion Hope

10-8-2013  
Date





Known and Potential Distribution of Federally Listed Endangered and Threatened Species and Proposed Species in West Virginia

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIBUTION
<b>MAMMALS</b>			
Cougar, eastern	<i>Felis concolor cougar</i>	E	May occur throughout the entire state. However, this species may be extinct or extirpated and there have been no documented, verified occurrences in WV in over 100 years.
Bat, Indiana	<i>Myotis sodalis</i>	E	May occur throughout the state. Known hibernacula (winter habitat) in Fayette, Greenbrier, Mercer, Monroe, Pendleton, Pocahontas, Preston, Randolph, and Tucker Counties. The Indiana bat may use abandoned mine portals (confirmed in the New River Gorge National River, Fayette County) or occupy summer habitat throughout the entire state. Maternity activity confirmed in Boone, Fayette, Ohio, Tucker, and Wetzel Counties. Critical habitat: Hellhole Cave, Pendleton County. Two Conservation Areas are located in Boone County.
Bat, Virginia big-eared	<i>Corynorhinus (=Plecotus) townsendii virginianus</i>	E	Known summer or winter caves located in Grant, Pendleton, Randolph, Tucker and Counties. Also known to utilize abandoned mine portals in Fayette County. May also occur in mine portals and caves throughout the state, particularly in Hardy, Kanawha, Mercer, Monroe, Nicholas, Preston, Raleigh, Summers, and Wyoming Counties. Critical habitat: Hellhole Cave, Cave Mountain Cave, Hoffman School Cave, and Sinnitt/Thorn Mountain Cave, Pendleton County; Cave Hollow/Arbogast Cave, Tucker County.
<b>AMPHIBIANS</b>			
Cheat Mountain salamander	<i>Plethodon nettingi</i>	T	Grant, Pendleton, Pocahontas, Randolph, and Tucker Counties.
<b>FISHES</b>			
Diamond darter	<i>Crystallaria cincotta</i>	E	Clay and Kanawha Counties - Elk River.

E = Endangered; T = Threatened; P = Proposed

Updated March 2013

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIBUTION
<b>CRUSTACEANS</b>			
Madison Cave isopod	<i>Antrolana lira</i>	T	Known in Jefferson County and may potentially also occur in Berkeley County.
<b>MOLLUSKS</b>			
Mussel, clubshell	<i>Pleurobema clava</i>	E	Braxton, Clay and Kanawha Counties – Elk River and the lower ½ mile of these tributaries: Birch River, Blue Creek, and Laurel Creek; Harrison and Lewis Counties – Hackers Creek; Doddridge County – Meathouse Fork and the lower ½ mile of these tributaries: Toms Fork; Doddridge, Pleasants, and Tyler Counties – Middle Island Creek and the lower ½ mile of these tributaries: Arnold Creek, Bluestone Creek, Buckeye Creek, Indian Creek, McKim Creek, Point Pleasant Creek, Sancho Creek; Doddridge, Ritchie, and Wirt Counties - South Fork Hughes River and the lower ½ mile of these tributaries: Bone Creek, Indian Creek, Leatherbark Creek, Otterslide Creek, Slab Creek, and Spruce Creek.
Mussel, fanshell	<i>Cyprogenia stegaria</i> (= <i>irrorata</i> )	E	Fayette, Kanawha, Mason and Putnam Counties - Kanawha River; Cabell, Jackson, Mason, Pleasants, Tyler, Wayne, Wetzel, and Wood Counties - Ohio River.
Mussel, James spiny	<i>Pleurobema</i> (= <i>Canthya</i> ) <i>collina</i>	E	Monroe County – Cove Creek, South Fork of Potts Creek, and Potts Creek.
Mussel, pink mucket	<i>Lampsilis abrupta</i> (= <i>orbiculata</i> )	E	Braxton, Clay and Kanawha Counties - Elk River and the lower ½ mile of these tributaries: Birch River, Blue Creek, and Laurel Creek; Fayette, Kanawha, Mason, and Putnam Counties - Kanawha River; Cabell, Jackson, Mason, Pleasants, Tyler, Wayne, Wetzel, and Wood Counties - Ohio River.
Mussel, northern riffleshell	<i>Epioblasma torulosa</i> <i>rangiana</i>	E	Braxton, Clay and Kanawha Counties – Elk River and the lower ½ mile of these tributaries: Birch River, Blue Creek, and Laurel Creek.
Mussel, rayed bean	<i>Villosa fabalis</i>	E	<u>Braxton, Clay and Kanawha Counties</u> – Elk River and the lower ½ mile of these tributaries: Birch River, Blue Creek, and Laurel Creek; <u>Doddridge, Pleasants, and Tyler Counties</u> – Middle Island Creek and the lower ½ mile of these tributaries: Arnold Creek, Bluestone Creek, Buckeye Creek, Indian Creek, McKim Creek, Point Pleasant Creek, and Sancho Creek.

E = Endangered; T = Threatened; P = Proposed

Updated March 2013

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIBUTION
<b>MOLLUSKS</b>			
Mussel, sheepnose	<i>Plethobasus cyphus</i>	E	Fayette and Kanawha, Mason and Putnam Counties - Kanawha River; Cabell, Jackson, Mason, Pleasants, Tyler, Wayne, Wetzel, and Wood Counties - Ohio River.
Mussel, spectacle case	<i>Cumberlandia monodonta</i>	E	Fayette, Kanawha, Mason and Putnam Counties - Kanawha River.
Mussel, snuffbox	<i>Epioblasma triquetra</i>	E	Braxton County - Cedar Creek, Elk River, and Little Kanawha River; Cabell County - Ohio River; Calhoun County - Beech Fork, Henry's Fork, Steer Creek, and West Fork Little Kanawha River; Clay County - Elk River; Doddridge County - Arnold Creek, Bluestone Creek, Bone Creek, Buckeye Creek, Indian Creek, Leatherbark Creek, McElroy Creek, McKim Creek, Meathouse Fork, Middle Island Creek, Otterslide Creek, Point Pleasant Creek, Sancho Creek, Slab Creek, South Fork Hughes River, Spruce Creek, and Toms Fork; Gilmer County - Cedar Creek, Fink Creek, Leading Creek, Little Kanawha River, and Steer Creek; Harrison County - West Fork River and Hackers Creek; Jackson County - Ohio River; Kanawha County - Big Sandy Creek and Elk River; Lewis County - Fink Creek, Hackers Creek, Leading Creek and West Fork River; Marion County - West Fork River; Marshall County - Fish Creek; Mason County - Ohio River; Monongalia County - Dunkard Creek; Pleasants County - Arnold Creek, Bluestone Creek, Buckeye Creek, Indian Creek, McKim Creek, Middle Island Creek, Ohio River, Point Pleasant Creek, Sancho Creek, and Sugar Creek; Ritchie County - Addis Run, Bonds Creek, Devilhole Creek, Gillespie Run, Hughes River, North Fork Hughes River, South Fork Hughes River, and Spruce Creek; Roane County - Bone Creek, Henry's Fork, Indian Creek, Leatherbark Creek, Otterslide Creek, Reedy Creek, Slab Creek, Spring Creek, Spruce Creek, and South Fork Hughes River; Roane County - Reedy Creek, Spring Creek, and West Fork Little Kanawha River; Tyler County - Arnold Creek, Bluestone Creek, Buckeye Creek, Indian Creek, McElroy Creek, McKim Creek, Middle Island Creek, Ohio River, Point Pleasant Creek, and Sancho Creek; Wetzel County - Fishing Creek and Ohio River; Wirt County - Addis Run, Bonds Creek, Bone Creek, Devilhole Creek, Gillespie Run, Goose Creek, Hughes River, Indian Creek, Leatherbark Creek, Little Kanawha River, North Fork Hughes River, Otterslide Creek, Reedy Creek, Slab Creek, South Fork Hughes River, Spring Creek, Spruce Creek, and West Fork Little Kanawha River; Wood County - Little Kanawha River and Ohio River.
Mussel, tubercled-blossom pearly	<i>Epioblasma (=Dysnomia) torulosa torulosa</i>	E	Fayette, Kanawha, Mason, and Putnam Counties - Kanawha River. May be extinct.
Snail, flat-spined three-toothed land	<i>Triodopsis platysayoides</i>	T	Monongalia and Preston Counties, including both sides of Cheat River Gorge.

E = Endangered; T = Threatened; P = Proposed

Updated March 2013

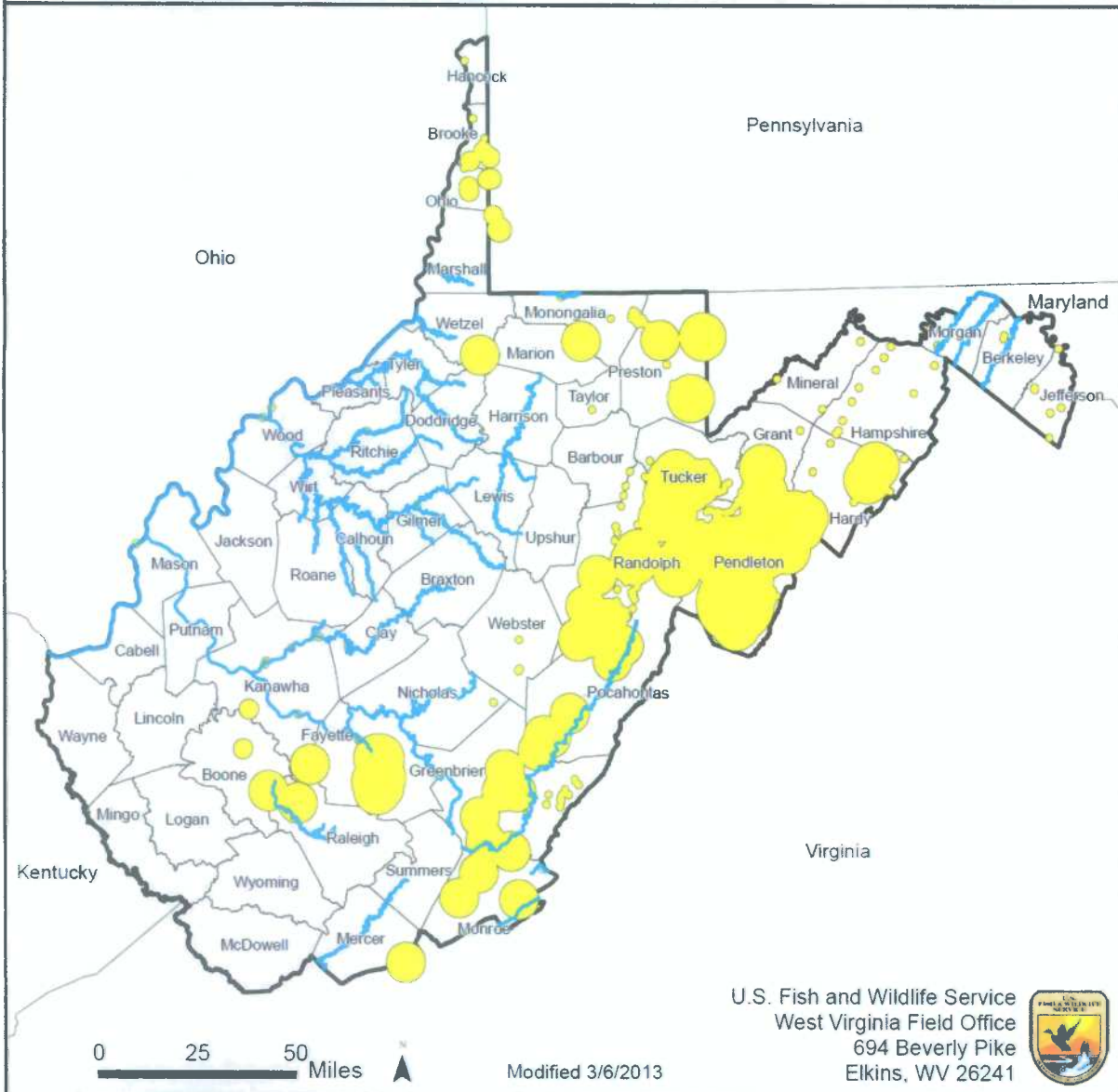
COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIBUTION
<b>PLANTS</b>			
Harperella	<i>Ptilimnium nodosum</i>	E	Berkeley County – Back Creek; Morgan County – Cacapon River, Potomac River, and Sleepy Creek.
Northeastern bulrush	<i>Scirpus ancistrochaetus</i>	E	Known in Berkeley and Hardy Counties and may potentially also occur in Hampshire, Mineral, Morgan, and Pendleton Counties.
Running buffalo clover	<i>Trifolium stoloniferum</i>	E	Known in Barbour, Brooke, Fayette, Pocahontas, Randolph, Webster, and Tucker Counties. May potentially also occur in Monongalia and Preston Counties.
Shale barren rock cress	<i>Boechera (=Arabis) serotina</i>	E	Greenbrier, Hardy, and Pendleton Counties.
Small whorled pogonia	<i>Isotria medeoloides</i>	T	Greenbrier County.
Virginia spiraea	<i>Spiraea virginiana</i>	T	Fayette County – Gauley River, Meadow River, and New River; Greenbrier County – Greenbrier River and Meadow River; Mercer County – Bluestone River; Nicholas County - Gauley River and Meadow River; Pocahontas County - Greenbrier River; Raleigh County – Marsh Fork River, Dingess Branch, and Millers Camp Branch; and Summers County - Bluestone River. May also potentially occur in Upshur County.

E = Endangered; T = Threatened; P = Proposed

Updated March 2013

Appendix B.

## Distribution of Federally Listed Threatened and Endangered Species in West Virginia<sup>1, 2</sup>



- Waterways supporting federally listed aquatic species
- Habitat buffers around known occurrences of other federally listed species<sup>2</sup>

1. All forested areas in West Virginia are considered potential summer habitat for the endangered Indiana bat. Please contact this office regarding any projects, anywhere in the state, that will require clearing of 17 acres or more of forest.

2. Includes nest sites of bald eagles, which are not listed under the Endangered Species Act. However they continue to receive Federal protection under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

## Appendix C.

### Aquatic Habitats Supporting Federally listed Endangered and Threatened Species, and Candidate Species in West Virginia (Updated August 2013)

There are fifteen federally listed endangered and threatened species that are associated with specific aquatic habitats in West Virginia. These include one endangered fish – the diamond darter (*Crystallaria cincotta*); ten endangered freshwater mussels - clubshell (*Pleurobema clava*), fanshell (*Cyprogenia stegaria*), James spiny mussel (*Pleurobema collina*), northern riffleshell (*Epioblasma torulosa rangiana*), pink mucket pearly mussel (*Lampsilis abrupta*), rayed bean (*Villosa fabilis*), sheepnose (*Plethobasus cyphus*), snuffbox (*Epioblasma triquetra*), spectaclecase (*Cumberlandia monodonta*), and tubercled-blossom pearly mussel (*Epioblasma torulosa torulosa*); two endangered plants - Harperella (*Ptilimnium nodosum*) and northeastern bulrush (*Scirpus ancistrochaetus*); one threatened plant - Virginia spiraea (*Spiraea virginiana*); and one threatened crustacean – Madison Cave isopod (*Antrolana lira*). Nine other listed species not associated with specific aquatic habitats also occur in West Virginia. Those species are not addressed here.

The aquatic habitats below, listed alphabetically within the two U.S. Army Corps of Engineers (Corps) regulatory districts that operate in West Virginia (Huntington and Pittsburgh districts), represent the most current information on the known and potential distribution of the federally listed species described above. Prior to conducting any activities that could result in adverse impacts to these aquatic habitats (e.g., projects that involve the placement of rock or other fill material into or adjacent to these habitats, the withdrawal or diversion of water, projects that could introduce sediment or toxic chemicals into waterways, or which could alter water temperature, streamside vegetation, etc.), please contact the U.S. Fish and Wildlife Service, West Virginia Field Office, at (304) 636-6586. To determine if a Corps permit is required for activities in or near these or other aquatic habitats in West Virginia, please contact the Huntington District at (304) 399-5710 or the Pittsburgh District at (412) 395-7152.

#### **U.S. Army Corps of Engineers Huntington District**

1. Big Sandy Creek: Kanawha County: Snuffbox.
2. Bluestone River: Mercer and Summers Counties (Bluestone Gorge to slackwater of Bluestone Reservoir): Virginia spiraea.
3. Cedar Creek: Braxton and Gilmer Counties: Snuffbox.
4. Cove Creek: Monroe County: James spiny mussel.
5. Elk River: Braxton, Clay, and Kanawha Counties (Sutton Dam to slackwater below Coonskin Park), including the lower one-half mile reaches of its tributaries Birch River, Blue Creek, and Laurel Creek: Clubshell, pink mucket pearly mussel, northern riffleshell, rayed bean, and snuffbox. The Elk River also contains the diamond darter.

6. Gauley River: Fayette and Nicholas Counties (Summersville Dam to Swiss): Virginia spiraea.
7. Greenbrier River: Greenbrier and Pocahontas Counties: Virginia spiraea.
8. Henry Fork: Calhoun and Roane Counties: Snuffbox.
9. Hughes River: Ritchie and Wirt Counties, including the lower one-half mile reach of its tributary Goose Creek: Snuffbox.
10. Kanawha River: Fayette, Kanawha, Mason, and Putnam Counties: Fanshell, pink mucket pearlymussel, sheepnose, spectaclecase, and tubercled-blossum pearlymussel.
11. Leading Creek: Gilmer and Lewis Counties, including the lower one-half mile reach of its tributary Fink Creek: Snuffbox.
12. Little Kanawha River: Braxton, Calhoun, Gilmer, Wirt, and Wood Counties, including the lower one-half mile reaches of its tributaries Leading Creek (Calhoun County., different stream than 5.d. above), Pine Creek, Sand Fork, Slate Creek, Straight Creek, Tanner Creek, Tucker Creek, and Walker Creek: Snuffbox.
13. Marsh Fork River including Dingess Branch and Millers Camp Branch and associated palustrine emergent and scrub-shrub wetlands: Raleigh County: Virginia spiraea.
14. McElroy Creek: Doddridge and Tyler Counties: Snuffbox.
15. Meadow River: Fayette, Greenbrier, and Nicholas Counties: Virginia spiraea.
16. Meathouse Fork of Middle Island Creek: Doddridge County, including the lower one-half mile reach of its tributary Toms Fork: Clubshell and snuffbox.
17. Middle Island Creek: Doddridge, Pleasants, and Tyler Counties, including the lower one-half mile reaches of its tributaries Arnold Creek, Bluestone Creek, Buckeye Creek, Indian Creek, McKim Creek, Point Pleasant Creek, and Sancho Creek: Clubshell, rayed bean, and snuffbox.
18. New River (Lower): Fayette County (Route 19 to Gauley Bridge): Virginia spiraea.
19. North Fork Hughes River: Ritchie and Wirt Counties, including the lower one-half mile reaches of its tributaries Addis Run, Bonds Creek, Devilhole Creek, and Gillespie Run: Snuffbox.
20. Ohio River: Cabell, Jackson, Mason Pleasants, Tyler, Wetzel, and Wood Counties: Fanshell, pink mucket pearlymussel, sheepnose, and snuffbox.
21. Potts Creek and South Fork of Potts Creek: Monroe County: James spinymussel.

22. Reedy Creek: Roane and Wirt Counties: Snuffbox.
23. South Fork Hughes River: Doddridge, Ritchie, and Wirt Counties, including the lower one-half mile reaches of its tributaries Bone Creek, Indian Creek, Leatherbark Creek, Otterslide Creek, Slab Creek, and Spruce Creek: Clubshell and snuffbox.
24. Spring Creek: Roane and Wirt Counties: Snuffbox.
25. Steer Creek: Calhoun and Gilmer Counties: Snuffbox.
26. Sugar Creek: Pleasants County: Snuffbox.
27. West Fork Little Kanawha River: Calhoun, Roane, and Wirt Counties: Snuffbox.

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28. Back Creek: Berkeley County: Harperella.
29. Cacapon River: Morgan County: Harperella.
30. Dunkard Creek: Monongalia County: Snuffbox.
31. Fish Creek: Marshall County: Snuffbox.
32. Fishing Creek: Wetzel County: Snuffbox. Note – the mouth of Fishing Creek at the Ohio River is regulated by the Huntington District.
33. Hackers Creek (of the West Fork River): Harrison and Lewis Counties: Clubshell and snuffbox.
34. Potomac River: Morgan County (from the mouth of the Cacapon River to the mouth of Sleepy Creek): Harperella.
35. Sleepy Creek: Morgan County: Harperella.
36. West Fork River: Harrison, Lewis, and Marion Counties: Snuffbox.
37. Streams, springs, and wetlands connected to the groundwater system including caves, areas near sinkholes, and other groundwater/surface interfaces, from the Potomac River west to Opequon Creek, especially in the Rippon and Leetown Areas, and the Evitts Run Watershed: Jefferson and Berkeley Counties: Madison Cave isopod.
38. Wetlands: Berkeley and Hardy Counties: Northeastern bulrush.



Please note that although the West Virginia Department of Environmental Protection has drafted guidance and a web-based tool for water withdrawal limits related to natural gas production and other development activities, the tool has not yet been validated as adequately protective of freshwater mussels or other aquatic species under all weather and precipitation conditions. The tool should be checked daily before withdrawing significant quantities of water from any watershed known to contain freshwater mussels. Users should exercise caution and use common sense, particularly during drought or extended dry conditions, or in cases where multiple users may be withdrawing water from the same source. If a stream is low and withdrawing additional water could expose portions of the stream bottom or banks that are normally submerged, including riffle areas downstream from pools from which water is typically withdrawn, users should find a different location or water source that does not contain federally listed species. Water users should not block, dam, or divert flows, or excavate pools or otherwise create unnatural deep spots in the aquatic habitats listed above or in their direct tributaries. Use of the tool does not absolve users of liability for the loss of aquatic life, including potential violation of the Endangered Species Act if take of federally listed species occurs.

Please also note that freshwater mussels which are not federally listed are protected and managed by the State of West Virginia, Division of Natural Resources (WVDNR). The guidelines above should also be followed when conducting activities that could impact any West Virginia waterways that may support any freshwater mussels. If in doubt as to whether conditions are suitable for withdrawing water, either select another more appropriate location or contact the WVDNR at (304) 637-0245.

**Appendix D.**

**Bald Eagle Management Guidelines**

In June 2007, the Service determined that the bald eagle was recovered and removed it from the List of Endangered and Threatened Wildlife. The species is still protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The information below is based on the U.S. Fish and Wildlife Service's *National Bald Eagle Management Guidelines* (USFWS 2007; <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BaldEagle/NationalBaldEagleManagementGuidelines.pdf>).

**Nesting Bald Eagle Sensitivity to Human Activities**

Phase	Activity	Sensitivity to Human Activity	Comments
I	Courtship and Nest Building	Most sensitive period; likely to respond negatively	Most critical time period. Disturbance is manifested in nest abandonment. Bald eagles in newly established territories are more prone to abandon nest sites.
II	Egg Laying	Very sensitive period	Human activity of even limited duration may cause nest desertion and abandonment of territory for the breeding season.
III	Incubation and Early Nestling Period (up to 4 weeks old)	Very sensitive period	Adults are less likely to abandon the nest near and after hatching. However, flushed adults leave eggs and young unattended; eggs are susceptible to cooling, loss of moisture, overheating, and predation; young are vulnerable to elements.
IV	Nestling Period (4 to 8 weeks old)	Moderately sensitive period	Likelihood of nest abandonment and vulnerability of the nestlings to elements somewhat decreases. However, nestlings may miss feedings, affecting their survival.
V	Late Nestling and Fledging Period (8 weeks old through fledging)	Very sensitive period	Gaining flight capability, nestlings 8 weeks and older may flush from the nest prematurely due to disruption and may die.

If agitated by human activities, eagles may inadequately construct or repair their nest, may expend energy defending the nest rather than tending to their young, or may abandon the nest altogether. Activities that cause prolonged absences of adults from their nests can jeopardize eggs or young. Depending on weather conditions, eggs may overheat or cool too much and fail to hatch. Unattended eggs and nestlings are subject to predation. Young nestlings are particularly vulnerable because they rely on their parents to provide warmth or shade, without which they may die as a result of hypothermia or heat stress. If food delivery schedules are interrupted, the young may not develop healthy plumage, which can affect their survival. In addition, adults startled while incubating or brooding young may damage eggs or injure their young as they

abruptly leave the nest. Older nestlings no longer require constant attention from the adults, but they may be startled by loud or intrusive human activities and prematurely jump from the nest before they are able to fly or care for themselves. Once fledged, juveniles range up to 0.25 mile from the nest site, often to a site with minimal human activity. During this period, until about six weeks after departure from the nest, the juveniles still depend on the adults to feed them.

Disturbance, destruction, or obstruction of roosting and foraging areas can also negatively affect bald eagles. Disruptive activities in or near eagle foraging areas can interfere with feeding, reducing chances of survival. Interference with feeding can also result in reduced productivity (number of young successfully fledged). Migrating and wintering bald eagles often congregate at specific sites for purposes of feeding and sheltering. Bald eagles rely on established roost sites because of their proximity to sufficient food sources. Roost sites are usually in mature trees where the eagles are somewhat sheltered from the wind and weather. Human activities near or within communal roost sites may prevent eagles from feeding or taking shelter, especially if there are not other undisturbed and productive feeding and roosting sites available. Activities that permanently alter communal roost sites and important foraging areas can altogether eliminate the elements that are essential for feeding and sheltering eagles.

**Recommended Distances from Active Bald Eagle Nests for Activities that Entail Permanent Landscape Alterations that May Result in Bald Eagle Disturbance**

	<i>If there is no similar activity within 1 mile of the nest</i>	<i>If there is similar activity closer than 1 mile from the nest</i>
<i>If the activity will be visible from the nest</i>	660 feet (201 m). Landscape buffers are recommended.	660 feet (201 m), or as close as existing tolerated activity of similar scope. Landscape buffers are recommended.
<i>If the activity will not be visible from the nest</i>	330 feet (101 m). Clearing, external construction, and landscaping between 330 feet (101 m) and 660 feet (201 m) should be done outside breeding season.	330 (101 m) feet, or as close as existing tolerated activity of similar scope. Clearing, external construction and landscaping within 660 feet (201 m) should be done outside breeding season.

The numerical distances shown in the table are the closest the activity should be conducted relative to the nest.

## Appendix E. INDIANA BAT MIST NETTING GUIDELINES

### **2013 REVISED** **RANGE-WIDE INDIANA BAT SUMMER SURVEY GUIDELINES** May 2013

#### INTRODUCTION

The Indiana bat (*Myotis sodalis*) was originally listed as being in danger of extinction under the Endangered Species Preservation Act of 1966 (32 FR 4001, March 11, 1967), and is currently listed as endangered under the Endangered Species Act (ESA) of 1973, as amended. This survey protocol provides the U.S. Fish and Wildlife Service's (USFWS) recommended guidance on survey methodology and outlines additional reporting requirements for surveyors.

The following guidance is designed to determine whether Indiana bats are present<sup>1</sup> or likely absent at a given site during the summer (May 15 to August 15). The phased-approach, which includes coordination with the USFWS, habitat assessments, and acoustic, mist-net, radio-tracking, and emergence surveys, supersedes or supplements the 2007 Indiana Bat Mist-Netting Guidelines. Future changes to this guidance are anticipated for 2014 and will be posted on the USFWS Indiana bat survey guidance website

(<http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html>).

Please check this website to ensure use of the most current version of the guidance.

#### OBJECTIVES

The objectives of Indiana bat summer survey guidelines are to (1) standardize range-wide survey procedures; (2) maximize the potential for detection/capture of Indiana bats at a minimum acceptable level of effort; (3) minimize false positives and false negatives in the surveys; (4) ensure sufficient information is provided to the USFWS<sup>2</sup> to analyze the likely effects of a project on the species; and (5) aid in conservation efforts for the species by identifying more areas where it occurs.

#### BACKGROUND

In 2011, the USFWS developed a multi-agency team to determine whether improvements could be made to the 2007 Indiana Bat Mist-Net Protocols. The team included members of the four USFWS regions (Midwest, Northeast, Southeast, and Southwest) where Indiana bats are known to occur, representatives of state natural resource agencies from three of those four regions (Midwest, Northeast, and Southeast), and representatives from three federal agencies (U.S. Geological Survey, Department of Defense, and U.S. Forest Service). We obtained informal peer review of the draft guidelines in February 2012, gathered additional information in 2012,

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<sup>1</sup> The guidance are not intended to be rigorous enough to provide sufficient data to fully determine population size or structure.

<sup>2</sup> Coordinate with the appropriate state natural resource agencies and any involved federal agency(ies) whenever "USFWS" coordination is listed. USFWS FO(s) may direct project sponsors to state agencies for existing

occurrence information. Coordinate with your local USFWS FO(s) to understand the process for their area of jurisdiction.

and made a revised version available for public comment in 2013 [78 FR 1879, January 9, 2013, and 78 FR 9409, February 8, 2013].

We considered the best available information for all aspects of the guidance. For the minimum level of survey effort, we reviewed information from the literature on detection and occupancy rates (e.g., Duchamp et al. 2006; Yates and Muzika 2006; Amelon 2007; Romeling et al. 2012) as well as additional information provided from prior netting and acoustic surveys in the vicinity of known Indiana bat maternity colonies (unpublished technical reports from various sources). The USFWS continues to work with local, State, and Federal biologists; scientific and academic institutions; commercial organizations; and other interested parties to collect additional data on the distribution, ecology, and biology of the Indiana bat and looks forward to receiving any additional pertinent information.

## GENERAL PROCESS

Indiana bat surveys for some proposed projects will require modification (or clarification) of this guidance through coordination with the USFWS FO(s) responsible for the state(s) in which the project occurs<sup>3</sup>. If not already required by federal permit, we encourage federal action agencies and surveyors to develop a proposed survey work plan in coordination with the USFWS FO(s) so that all parties fully understand which methods will be deployed, what assumptions will be made, and what the various outcomes would be based on the results of each step. Project proponents may stop survey work at any point once an assumption or documentation of Indiana bat presence occurs. Pre-survey coordination typically will preclude the need for subsequent reviews of intermediate steps by USFWS FO(s) during the busy field season. An online directory of USFWS FO(s) is available at <http://www.fws.gov/offices/directory/listofficemap.html>. Unless otherwise agreed to by the USFWS, negative presence/probable absence survey results obtained using this guidance are valid for a minimum of two years<sup>4</sup> from the completion of the survey. If not already required by federal permit, please submit all results (negative or positive) from any phase to the USFWS FO(s). We strongly encourage this coordination as it improves the USFWS' understanding of (1) the level of survey effort underway and (2) the distribution of the species. A single report can be submitted at the end of all phases conducted for a given project.

USFWS FO(s) level coordination is also important during the survey planning process. The USFWS recognizes that there may be project-specific habitat conditions that do not lend themselves to surveying with either acoustic detectors or mist-nets even though it met the definition of suitable Indiana bat summer habitat. The guidelines that are described in this document are designed to be implemented in habitats conducive to each technique described.

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<sup>3</sup> For example, project sponsors for large acreage and/or landscape-scale projects that do not result in permanent habitat loss and would not pose an ongoing threat of lethal take, especially those proposed by land management agencies, may work with local USFWS FOs to apply different scales of surveys (broad vs. project-level) or different types of surveys, such as long-term monitoring results (e.g., forest-wide acoustic transect data) and/or targeted survey efforts (e.g., sub-sampling of large project areas), to address P/A concerns.

<sup>4</sup> The timeframe may be reduced if significant habitat changes have occurred in the area or increased based on local information.

We strongly encourage coordination with the FO(s) prior to implementation of methodologies that may not be appropriate for site-specific habitat conditions.

Because Indiana bat surveys may result in take, such surveys should only be conducted by a qualified biologist<sup>5</sup>. Generally, a recovery permit for the Indiana bat authorizes the capture of bats for identification, and handling of bats for measurements, photography, and radio transmitter attachment. Following this guidance will meet standard USFWS requirements; however, surveyors also need to ensure they meet all applicable state permitting and reporting requirements. Failure to follow the survey guidance, as written, or failure to follow a study plan which has received concurrence from the local USFWS FO(s), may result in USFWS FO recommendations for additional survey effort.

The following provides a step-by-step outline of how Indiana bat summer surveys should be conducted in 2013. Some of these steps can occur concurrently.

### **PHASE 1 – INITIAL PROJECT SCREENING**

**Step 1. Coordinate with the U.S. Fish and Wildlife Service Field Office(s)<sup>6</sup> regarding existing Indiana bat summer occurrence information.**

***[Projects located within known Indiana bat summer habitat will not proceed to Phase 2 of this process.]***

a) If a project (located within or outside of a known maternity colony home range) is already covered under an existing Endangered Species Act (ESA) incidental take authorization (e.g., HCP, BO), then no further summer surveys are needed, follow the procedures previously authorized by the USFWS FO(s).

b) If there are known Indiana bat summer occurrences (e.g., known roost trees, capture locations, foraging locations) within the project action area<sup>7</sup>; **OR**

if there are no known Indiana bat summer occurrences within the proposed project area itself, but the project area is located within a known maternity colony home range<sup>8</sup>; **OR**

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<sup>5</sup> A qualified biologist is an individual who holds a USFWS Recovery Permit (Federal Fish and Wildlife Permit) for Indiana bats in the state/region in which they are surveying and/or has been authorized by the appropriate state agency to net and handle Indiana bats. Several USFWS offices maintain lists of qualified bat surveyors, and if working in one of those states with authorizations in lieu of a Recovery Permits, the individual will either need to be on that list or submit qualifications to receive USFWS approval prior to conducting any field work.

<sup>6</sup> Coordinate with the appropriate state natural resource agencies and any involved Federal Action agencies whenever "USFWS" coordination is listed. USFWS FO(s) may direct project sponsors to state agencies for existing occurrence information. Coordinate with your local USFWS FO(s) to understand the process for their area of jurisdiction.

<sup>7</sup> The "action area" is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. [50 CFR Section 402.02]

<sup>8</sup> See USFWS Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects (Questions 4 & 5) <http://www.fws.gov/midwest/endangered/mammals/inba/WindEnergyGuidance.html>

if the project is located outside a known maternity colony home range, but is within the range of the Indiana bat (note this can change over time), then proceed to Step 2.

**Step 2. Conduct Habitat Assessment (Desktop or Field-based; see Appendix A).**

- a) If suitable summer habitat is present within the action area, then proceed to Step 3.
- b) If suitable summer habitat is absent within the action area, then no further summer surveys are necessary; however, additional coordination with the USFWS FO(s) will be necessary if Indiana bats may be present during any other season and may be affected by the proposed project.

**Step 3. Assess potential for adverse effects to Indiana bats.**

- a) If the project is not anticipated to result in adverse effects to Indiana bats (as proposed), then no further summer surveys are necessary, coordinate with the USFWS FO(s).
- b) If the project may result in adverse effects to Indiana bats but the impacts can be adequately assessed and conservation measures can be designed to minimize those effects without additional presence/absence information (this includes **all** proposed projects within known maternity colony home ranges, but may include other areas as well), then no further summer surveys are necessary, coordinate with the USFWS FO(s) regarding an assessment of the project's potential effects, development of conservation measures, and determination of the need for any ESA incidental take authorization.
- c) If the project does not meet the conditions of 3a or 3b, then proceed to Phase 2.

**PHASE 2 - PRESENCE/ABSENCE SURVEYS (NETTING OR ACOUSTIC SURVEYS)<sup>2</sup>**

During the summer of 2013, presence/probable absence of Indiana bats may be determined by conducting either Step 4 (mist-netting; see Appendix B) or Step 5 (acoustics; see Appendix C) as outlined below. It is the project proponent's choice as to which option to use. The summer survey season is from 15 May through 15 August for either survey option. If netting is chosen as the preferred P/A method and an Indiana bat(s) is captured, then surveyors may immediately begin Phase 4/radio-tracking. Project proponents must decide whether they will proceed to Phase 4 in coordination with the USFWS FO before any mist netting occurs.

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<sup>2</sup> Note: acoustic and/or mist-net surveys should be conducted in the best suitable habitat possible for each survey type to increase the likelihood of detecting/capturing Indiana bats. In some cases, the most suitable habitat for effectively conducting surveys may occur outside a project site boundary and may be sampled if landowner permission is available.



**Step 4. Conduct Mist-Netting Surveys following Regionally-based protocols<sup>10</sup>  
(see Appendix B)**

**Northeast Region<sup>11</sup> of the USFWS (CT, DE, MA, MD, NJ, NY, PA, WV, VA, VT):**

Linear projects: a minimum of 6 net nights per km (0.6 miles) of suitable summer habitat.

Non-linear projects: a minimum of 24 net nights per 123 acres (0.5 km<sup>2</sup>) of suitable summer habitat.

For example:

- 6 sites, 2 nets/site for 2 calendar nights = 24 net nights
- 4 sites, 2 nets/site for 3 calendar nights = 24 net nights
- 3 sites, 2 nets/site for 4 calendar nights = 24 net nights

Maximum of 3 nights of consecutive netting at any given net location. After 3 consecutive nights of netting at the same location, you must change net locations or wait at least 2 calendar nights before resuming netting at the same location.

- a) If no capture of Indiana bats, then no further summer surveys are necessary<sup>12</sup>.
- b) If capture of Indiana bat(s), then stop or proceed to **Phase 4** as previously decided in coordination with the FO.

**Midwest (IL, IN, IA, MI, MO and OH,), Southeast (KY, TN, NC, GA, AL, MS, and AR), and Southwest (OK) USFWS Regions:**

During the summer of 2013, the Midwest, Southeast and Southwest Regions will continue to accept results from surveys following our current Indiana Bat Mist-Netting Guidelines<sup>13</sup> for this phase. However, we encourage project sponsors to work closely with our local field offices to determine whether the addition of acoustic methods is recommended (as has been the case for several years by some field offices).

Linear projects: a minimum of 4 net nights per km (0.6 miles) of suitable summer habitat.

<sup>10</sup> The Indiana bat populations in the Northeast Region have been most heavily impacted by white-nose syndrome to date; therefore, we recommend higher survey effort when compared to the Midwest, Southeast, and Southwest Regions.

<sup>11</sup> Map available here <http://www.fws.gov/where/>

<sup>12</sup> NOTE: For Phase 2 Presence/Absence Surveys, wherever the phrase "no further summer surveys are necessary" occurs within this document, the USFWS FO(s) is in affect assuming probable absence of Indiana bats.

<sup>13</sup> See Appendix 5 in USFWS. 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision, U.S. Fish and Wildlife Service, Fort Snelling, MN. 258 pp. Available online [http://www.fws.gov/midwest/ endangered/mammals/inba/inba\\_drftrecpln16ap07.html](http://www.fws.gov/midwest/ endangered/mammals/inba/inba_drftrecpln16ap07.html).

Non-linear projects: a minimum of 4 net nights per 123 acres (0.5 km<sup>2</sup>) of suitable summer habitat.

- 1 site, 2 nets/site for 2 calendar nights = 4 net nights
- a) If no capture of Indiana bats, then no further summer surveys are necessary.
- b) If capture of Indiana bat(s), then stop or proceed to **Phase 4** as previously decided in coordination with the FO.

**OR**

**Step 5. Conduct Acoustic Surveys<sup>14</sup> (see Appendix C)**

Linear projects: a minimum of 2 detector nights per km (0.6 miles) of suitable summer habitat.

Non-linear projects: a minimum of 6 detector nights per 123 acres (0.5 km<sup>2</sup>) of suitable summer habitat.

3 or more detector locations per 123 acre "site" shall be sampled until at least 6 detector nights has been completed over the course of at least 2 calendar nights (may be consecutive).

For example:

- 3 detectors for 2 nights each (can sample the same location or move within the site)
  - 2 detectors for 3 nights each (must sample at least 3 locations [i.e., must move at least 1 of the detectors for 1 night])
  - 1 detector for 6 nights (must sample at least 3 locations)
- a) Optional coarse screening - for high frequency (HF) or myotis calls (depending on available filters) or Proceed to Step 6
- ii) If no positive detection of HF calls ( $\geq 35$  kHz) or myotis calls, no further summer surveys necessary.
  - iii) If positive detection of HF or myotis calls, then
    - (a) proceed to Step 6 for further acoustic analysis; **OR**
    - (b) assume presence of Indiana bats and coordinate with the USFWS FO(s); **OR**

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<sup>14</sup> Acoustic surveys are available as a Presence/Absence option throughout the range (i.e., Northeast, Midwest, Southeast, and Southwest Regions).

- (c) assume presence and proceed to **Phase 3**.

**Step 6. Conduct Additional Acoustic Analyses for each site that had HF or Myotis calls from Step 5 or ALL sites if Step 5 was not conducted.**

Two or more of the currently available 'candidate' acoustic bat ID programs<sup>15</sup> must be used. Beginning with acoustic data from night one at each acoustic site, run each night's data for each site through a minimum of two candidate acoustic ID programs. Review results by night and site from each acoustic ID program used and flag each file indicating a positive probable detection of Indiana bats<sup>16</sup>.

- a) If no detections of probable Indiana bats by any candidate programs used in analysis, then no further summer surveys necessary.
- b) If detections of probable Indiana bats by any candidate programs used in analysis, then
  - i) proceed to **Step 7** for qualitative ID; **OR**
  - ii) assume presence of Indiana bats and coordinate with the USFWS FO(s); **OR**
  - iii) assume presence and proceed to **Phase 3**.

**Step 7. Conduct Qualitative Analysis of probable Indiana bat calls from Step 6.**

Qualitative analysis<sup>17</sup> must also include a comparison of the results of each acoustic ID program by site and night (including: number of call files flagged as probable Indiana bats by each tool used; an evaluation of other species identified by the acoustic ID program; individual file level agreements and disagreements on Indiana bats between programs; and a qualitative analysis of ALL probable Indiana bat call sequences to further evaluate that the correct ID has been recommended by the program used).

- a) If no visual confirmation of probable Indiana bats, then no further summer surveys necessary.
- b) If visual confirmation of probable Indiana bats, then
  - i) assume presence of Indiana bats and coordinate with the USFWS FO(s); **OR**
  - ii) assume presence and proceed to **Phase 3**.

<sup>15</sup> Candidate programs are listed at

<http://www.fws.gov/midwest/Endangered/mammals/inba/surveys/inbaAcousticSoftware.html>

<sup>16</sup> The candidate acoustic identification programs all have implemented a maximum likelihood estimator (MLE) at this time. If the analysis of collected calls at a given site on a given night results in the probable presence of Indiana bats with high levels of certainty ( $P < 0.05$ ), then select one of the options available in Step 6b.

<sup>17</sup> Qualitative analysis of each acoustic site and night with probable detections of Indiana bats during Step 6 must include the entire night's call data and not just those files making it through the acoustic analysis tools as probable Indiana bats in Step 6.

### **PHASE 3. CONDUCT MIST-NETTING SURVEYS TO CAPTURE INDIANA BATS.**

If netting was not conducted as the P/A method, then netting may be conducted in Phase 3 to capture and characterize (e.g., sex, age, reproductive condition) the Indiana bats that are present in an area and to facilitate Phase 4 efforts. We encourage working with the FOs to develop Phase 3 netting plans based on best available information (e.g., positive acoustic locations). There are no minimum requirements for this phase as this is not a P/A phase.

- a) If no Indiana bats are captured, then coordinate with the USFWS FO.
- b) If Indiana bats are captured, then proceed to **Phase 4**.

### **PHASE 4. CONDUCT RADIO-TRACKING AND EMERGENCE SURVEYS** **(See Appendices D and E).**

#### REFERENCES

- Amelon, S.K. 2007. Multi-scale factors influencing detection, site occupancy, and resource use by foraging bats in the Ozark Highlands of Missouri. PhD Dissertation. University of Missouri – Columbia.
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- Romeling, S., C.R. Allen, and L. Robbins. 2012. Acoustically detecting Indiana bats: how long does it take? *Bat Research News* 53(4):51-58.
- Yates, M.D. and R.M. Muzika. 2006. Effect of forest structure and fragmentation on site occupancy of bat species in Missouri Ozark forests. *Journal of Wildlife Management* 70(5):1238-1248

## APPENDIX A PHASE 1 SUMMER HABITAT ASSESSMENTS

Summer habitat assessments are Step 2 of Phase 1- Initial Project Screening. The information below is provided to assist applicants, consultants, and/or project proponents (hereinafter termed the "applicant") in establishing whether summer surveys for Indiana bats should be conducted. As a reminder, the first step for determining presence of Indiana bats at a given site is to determine whether there is any existing occurrence data available for the vicinity of the project from the local USFWS FO. This step can be conducted remotely via a desktop analysis (e.g., use of aerial photography). The applicant is responsible for developing and providing sufficient information as to whether potentially suitable summer Indiana bat habitat exists within a proposed project area. If suitable habitat is present, the applicant should calculate the amount and submit this to the USFWS FO(s) and determine the need for any presence/absence surveys (Phase 2). Note: if Indiana bats are present or assumed to be present during any phase, more detailed habitat information may be necessary to adequately assess the potential for impacts (see attached example Indiana Bat Habitat Assessment Datasheet). If no suitable habitat is present, no surveys are needed to assess risk during the summer. Habitat assessments for Indiana bats can be completed any time of year and applicants are encouraged to submit results and proposed Phase 2 study plans well in advance of the summer survey season.

### PERSONNEL

Habitat assessments should be completed by individuals with a natural resource degree or equivalent work experience.

### DEFINITION FOR POTENTIALLY SUITABLE SUMMER HABITAT

Suitable summer habitat for Indiana bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats<sup>18</sup> such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags greater than 5 inches dbh<sup>19</sup> (12.7 centimeter) that have exfoliating bark, cracks, crevices, and/or hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of other forested/wooded habitat. We recommend that project proponents or their

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<sup>18</sup> Non-forested habitats typically should be excluded from acreages used to establish a minimum level of survey effort for Phase 2 surveys.

<sup>19</sup> While trees <5 inches (<12.7 cm) dbh that have exfoliating bark, cracks, crevices, and/or hollows may have some potential to be male Indiana bat summer roosting habitat, the USFWS does not consider early-successional, even-aged stands of trees <5 inches dbh to be suitable roosting habitat for the purposes of this guidance. Suitable *roosting* habitat is defined as forest patches with trees of 5-inch (12.7 cm) dbh or larger. However, early successional habitat with small diameter trees may be used as foraging habitat by Indiana bats. Therefore, a project that would remove or otherwise adversely affect  $\geq 20$  acres of early successional habitat containing trees between 3 and 5 inches (7.6-12.7 cm) dbh would require coordination/consultation with the USFWS FO to ensure that associated impacts would not rise to the level of take. The USFWS may request P/A surveys if >20 acres of early successional habitat were proposed for removal.

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representatives coordinate with the appropriate USFWS Field Office to more clearly define suitable habitat for their particular region as some differences in state/regional suitability criteria may be warranted (e.g., high-elevation areas may be excluded as suitable habitat in some states).

**SUBMISSION OF HABITAT ASSESSMENT AND PHASE 2 STUDY PLAN (IF NEEDED)**

If a proposed project may affect (positively or negatively) Indiana bats and the conditions outlined in Step 3 a or b are not met, a habitat assessment report should be submitted to the appropriate USFWS FO(s) (and/or to the lead Federal Action Agency, such as the USACE, as appropriate) along with a draft study plan for the Phase 2 (acoustic or netting) survey (if suitable habitat is present). Complete reports will include the following:

1. Full names and relevant titles/qualifications of individuals (e.g., John E. Smith, Biologist II, State University, B.S. Wildlife Science 2007) completing the habitat assessment and when the assessment was conducted
2. A map and latitude/longitude or UTM clearly identifying the project location (or approximate center point) and boundaries
3. A detailed project description (if available)
4. Documentation of any known/occupied spring staging, summer, fall swarming, and/or winter habitat for Indiana bats within or near the project area
5. A description of methods used during the habitat assessment
6. A summary of the assessment findings and a completed Indiana Bat Habitat Assessment Datasheet (see attached below; use of this particular datasheet is optional)
7. Other information that may have a bearing on Indiana bat use of the project area (e.g., presence of fall or winter habitat [caves, crevices, fissures, or sinkholes, or abandoned mines of any kind], bridges and other non-tree potential summer roosts.)
8. Any other information requested by the local USFWS FO(s) related to the project

In addition, Phase 2 Study Plans should contain the following:

1. A statement as to which type of P/A surveys will be conducted (i.e., mist netting or acoustic surveys) and how the proposed survey level of effort (i.e., total # of net nights or detector nights) was calculated/determined;
2. A map depicting the proposed number of survey sites (mist netting or acoustic) and their tentative distribution throughout the project area;
3. A tentative list of surveyors names and copies of relevant federal permits (if required in the project State); and
4. A tentative survey schedule (e.g., start date, duration, end date).

**APPENDIX A  
PHASE I SUMMER HABITAT ASSESSMENTS**

**INDIANA BAT HABITAT ASSESSMENT DATASHEET**

Project Name: \_\_\_\_\_ Date: \_\_\_\_\_  
 Township/Range/Section: \_\_\_\_\_  
 Lat Long/UTM/ Zone: \_\_\_\_\_ Surveyor: \_\_\_\_\_

Brief Project Description

Project Area	Total Acres	Forest Acres		Open Acres
Project				
Proposed Tree Removal (ac)	Completely cleared	Partially cleared (will leave trees)	Preserve acres- no clearing	

Vegetation Cover Types	
Pre-Project	Post-Project

Landscape within 5 mile radius
Flight corridors to other forested areas?
Describe Adjacent Properties (e.g. forested, grassland, commercial or residential development, water sources)

Proximity to Public Land
What is the distance (mi.) from the project area to forested public lands (e.g., national or state forests, national or state parks, conservation areas, wildlife management areas)?

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Use additional sheets to assess discrete habitat types at multiple sites in a project area  
 Include a map depicting locations of sample sites if assessing discrete habitats at multiple sites in a project area  
 A single sheet can be used for multiple sample sites if habitat is the same

<b>Sample Site Description</b>
Sample Site No.(s): _____

Water Resources at Sample Site				
<b>Stream Type</b> (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources:
<b>Pools/Ponds</b> (# and size)	Open and accessible to bats?			
<b>Wetlands</b> (approx. ac.)	Permanent	Seasonal		

Forest Resources at Sample Site				
<b>Closure/Density</b>	Canopy (> 50%)	Midstory (20-50%)	Understory (<20%)	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60%, 5=61-80%, 6=81-100%
<b>Dominant Species of Mature Trees</b>				
<b>% Trees w/ Exfoliating Bark</b>				
<b>Size Composition of Live Trees (%)</b>	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
<b>No. of Suitable Snags</b>				

Standing dead trees with exfoliating bark, cracks, crevices, or hollows. Snags without these characteristics are not considered suitable.

**IS THE HABITAT SUITABLE FOR INDIANA BATS?** \_\_\_\_\_

<b>Additional Comments:</b>

Attach aerial photo of project site with all forested areas labeled and a general description of the habitat

**Photographic Documentation:** habitat shots at edge and interior from multiple locations; understory/midstory/canopy; examples of potential suitable snags and live trees; water sources



## APPENDIX B PHASE 2 or 3 MIST-NETTING

Mist-netting can be used as a presence/probable absence method (Phase 2 surveys) or it can be conducted for the purpose of attempting to capture Indiana bats after detection during acoustic presence/probable absence surveys (Phase 3 surveys). The same recommendations (e.g., season, personnel, equipment, apply for either use of mist-netting surveys).

SUMMER MIST-NETTING SEASON: May 15<sup>20</sup> – August 15

Capture of reproductive adult females (i.e., pregnant, lactating, or post-lactating) and/or young of the year during May 15 – August 15 confirms the presence of a maternity colony in the area. Since adult males and non-reproductive females have commonly been found summering with maternity colonies, radio-tracking results will be relied upon to help determine the presence or absence of a maternity colony or large concentrations of bats in the area when only males and/or non-reproductive females are captured.

### PERSONNEL

A qualified biologist(s)<sup>21</sup> must (1) select/approve mist-net set-ups in areas that are most suitable for capturing Indiana bats, (2) be physically present at each mist-net site throughout the survey period, and (3) confirm all bat species identifications. This biologist may oversee other biological technicians and manage mist-net set-ups in close proximity to one another as long as the net-check timing (i.e., every 10 minutes) can be maintained while **walking** between nets.

### COORDINATION WITH USFWS FO(s)

If not already required by federal permit, we recommend that applicants submit a draft study plan for all survey phases to the USFWS FO(s) for review and approval. Study plans should include a map/aerial photo identifying the proposed project area boundaries, suitable bat habitats and acreages within the project area, and the proposed number and tentative locations of net sites.

### EQUIPMENT

Use the finest, lowest visibility mesh mist-nets commercially available, as practicable. Currently, the finest net on the market is 75 denier, 2 ply, denoted 75/2 (Arndt and Schaez 2009); however, the 50 denier nets are still acceptable for use at this time. The finest mesh size available is approximately 1½ inches (38 millimeters).

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<sup>20</sup> Due to concerns with transmission of white-nose syndrome, some USFWS FO(s) and state natural resource agencies have delayed the start of the Indiana bat summer field survey season/mist-netting until June 1. Surveyors/applicants should always coordinate with local USFWS FO(s) and state natural resource agencies before beginning surveys.

<sup>21</sup> A qualified biologist is an individual who holds a USFWS Recovery Permit (Federal Fish and Wildlife Permit) for Indiana bats in the state/region in which they are surveying and/or has been authorized by the appropriate state agency to net and handle Indiana bats. Several USFWS offices maintain lists of qualified bat surveyors, and if working in one of those states with authorizations in lieu of a Recovery Permits, the individual will either need to be on that list or submit qualifications to receive USFWS approval prior to conducting any field work.

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No specific hardware is required. There are many suitable systems of ropes and/or poles to hold nets. The system of Gardner et al. (1989) has been widely used. See NET PLACEMENT for minimum net heights, habitats, and other netting requirements that affect the choice of hardware.

To minimize potential for disease transmission, any equipment that comes in contact with bats should be kept clean and disinfected, following approved protocols; this is particularly a concern relative to white-nose syndrome (WNS). Disinfection of equipment to avoid disease transmission (e.g., WNS) is required; protocols are posted at <http://www.whitenosesyndrome.org/>. Federal and state permits may also have specific equipment restrictions and disinfection requirements.

MINIMUM PRESENCE/ABSENCE MIST-NETTING LEVEL OF EFFORT (PHASE 2)

**Step 4. Conduct Mist-Netting Surveys following Regionally-based protocols<sup>22</sup>**

**Northeast Region<sup>23</sup> of the USFWS (CT, DE, MA, MD, NJ, NY, PA, WV, VA, VT):**

Linear projects: a minimum of 6 net nights per km (0.6 miles) of suitable summer habitat.

Non-linear projects: a minimum of 24 net nights per 123 acres (0.5 km<sup>2</sup>) of suitable summer habitat.

For example:

- 6 sites, 2 nets/site for 2 calendar nights = 24 net nights
- 4 sites, 2 nets/site for 3 calendar nights = 24 net nights
- 3 sites, 2 nets/site for 4 calendar nights = 24 net nights

Maximum of 3 nights of consecutive netting at any given net location. After 3 consecutive nights of netting at the same location, you must change net locations or wait at least 2 calendar nights before resuming netting at the same location.

- a) If no capture of Indiana bats, then no further summer surveys are necessary<sup>24</sup>.
- b) If capture of Indiana bat(s), then stop or proceed to **Phase 4** as previously decided in coordination with the FO(s).

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<sup>22</sup> The Indiana bat populations in the Northeast Region have been most heavily impacted by white-nose syndrome; therefore, we recommend higher survey effort when compared to the Midwest, Southeast, and Southwest Regions.

<sup>23</sup> Map available here <http://www.fws.gov/where/>

<sup>24</sup> NOTE: For Phase 2 Presence/Absence Surveys, wherever the phrase "no further summer surveys are necessary" occurs within this document, the USFWS FO(s) is in affect assuming probable absence of Indiana bats.

During the summer of 2013, the Midwest, Southeast and Southwest Regions will continue to accept results from surveys following our current Indiana Bat Mist-Netting Guidelines<sup>25</sup> for this phase. However, we encourage project sponsors to work closely with our local field offices to determine whether the addition of acoustic methods is recommended (as has been the case for several years by some field offices).

Linear projects: a minimum of 4 net nights per km (0.6 miles) of suitable summer habitat.

Non-linear projects: a minimum of 4 net nights per 123 acres (0.5 km<sup>2</sup>) of suitable summer habitat.

- 1 site, 2 nets/site for 2 calendar nights = 4 net nights
- a) If no capture of Indiana bats, then no further summer surveys are necessary.
- b) If capture of Indiana bat(s), then stop or proceed to **Phase 4** as previously decided in coordination with the FO(s).

#### MIST-NETTING SURVEYS TO CAPTURE INDIANA BATS AFTER ACOUSTICS WERE USED AS P/A METHOD (PHASE 3)

If netting was not conducted as the P/A method, then netting may be conducted to capture and characterize (e.g., sex, age, reproductive condition) the Indiana bats (documented through the Phase 2 acoustic P/A survey) present in an area and to facilitate Radio-tracking (Phase 4) efforts. We encourage working with the FO(s) to develop Phase 3 netting plans based on best available information (e.g., positive acoustic locations). There are no minimum requirements for this phase as this is not a P/A phase.

- a) If no Indiana bats are captured, then coordinate with the USFWS FO.
- b) If Indiana bats are captured, then proceed to **Phase 4** as previously decided in coordination with the FO(s).

#### NET PLACEMENT

Potential travel corridors (e.g., streams, logging trails) typically are the most effective places to net (although other places may also be productive; see Carroll et al. 2002). Place nets approximately perpendicular across the corridor. Nets should fill the corridor from side to side, extending beyond the corridor boundaries when possible, and from stream (or ground) level up

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<sup>25</sup> See Appendix 5 in USFWS. 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision, U.S. Fish and Wildlife Service, Fort Snelling, MN. 258 pp. Available online [http://www.fws.gov/midwest/indangered/mammals/inba/inba\\_drftrecpln16ap07.html](http://www.fws.gov/midwest/indangered/mammals/inba/inba_drftrecpln16ap07.html).

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PHASE 2 or 3 MIST-NETTING

**Midwest (IL, IN, IA, MI, MO and OH), Southeast (KY, TN, NC, GA, AL, MS, and AR), and Southwest (OK) USFWS Regions:**

## APPENDIX B PHASE 2 or 3 MIST-NETTING

to the overhanging canopy. Nets of varying widths and heights may be used as the situation dictates. A typical set is at least 5 m to 9 m high consisting of two or more nets stacked on top one another and from 6 m to 18 m wide. If netting over water, ensure there is enough space between the net and the water so that captured bats will not get wet.

Occasionally it may be necessary or desirable to net where a suitable corridor is lacking. The typical equipment described in the section above may be inadequate for these situations, requiring innovation on the part of the surveyor (see Humphrey et al. 1968). See Kiser and MacGregor (2005) for additional discussion about net placement.

Although no minimum spacing between mist-nets is being specified, surveyors should distribute net set-ups throughout suitable habitat. Net set-ups can be repeatedly sampled throughout the project, but generally no more than two nights at a single location is recommended. In addition, changing locations within a project area may improve capture success (see Robbins et al. 2008; Winhold and Kurta 2008). Photo-document placement of nets.

### SURVEY PERIOD

The survey period shall begin at sunset<sup>26</sup> and continue for at least 5 hours (longer survey periods may also improve success).

### CHECKING NETS

Each net set-up should be checked approximately every 10 minutes, never exceeding 15 minutes (Gannon et al. 2007). If surveyors monitor nets continuously, take care to minimize noise, lights and movement near the nets. Monitoring the net set-up continuously with a bat detector (ideally using ear phones to avoid alerting bats) can be beneficial: (a) bats can be detected immediately when they are captured, (b) prompt removal from the net decreases stress on the bat and potential for the bat to escape (MacCarthy et al. 2006), and (c) monitoring with a bat detector also allows the biologist to assess the effectiveness of each net placement (i.e., if bats are active near the net set-up but avoiding capture), which may allow for adjustments that will increase netting success on subsequent nights. There should be no other disturbance near the nets, other than to check nets and remove bats. Biologists should be prepared to cut the net if a bat is severely entangled and cannot be safely extracted within 3 or 4 minutes (CCAC 2003; Kunz et al. 2009).

Capture and handling are stressful for bats. Emphasis should be on minimizing handling and holding bats to as short a time as possible to achieve field study objectives. Indiana bats should not be held for more than 30 minutes after capture, unless the individual is targeted for radio-tracking. Bats targeted for radio-tracking should be released as quickly as possible, but no longer than 45 minutes after capture, or as allowed in federal and state permits. See Kunz and Kurta (1988) for general recommendations for holding bats.

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<sup>26</sup> Surveys may need to start a little earlier or later than official sunset times (i.e., at "dusk") in some settings such as a deep/dark forested valleys or ridge tops to avoid missing early-flying bats or capturing late-flying birds, respectively. Sunset tables for the location of survey can be found at:

[http://aa.usno.navy.mil/data/docs/RS\\_OneYear.php](http://aa.usno.navy.mil/data/docs/RS_OneYear.php).

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WEATHER AND LIGHT CONDITIONS

Severe weather adversely affects capture of bats. Some Indiana bats may remain active despite inclement weather and may still be captured while others in the same area become inactive. Therefore, negative surveys combined with any of the following weather conditions throughout all or most of a sampling period are likely to require an additional night of mist-netting: (a) temperatures that fall below 50°F (10°C); (b) precipitation, including rain and/or heavy fog, that exceeds 30 minutes or continues intermittently during the survey period; and (c) sustained wind speeds greater than 9 miles/hour (4 meters/seconds; 3 on Beaufort scale).

It is typically best to place net set-ups under the canopy where they are out of moonlight, particularly when the moon is half-full or greater. Net set-ups illuminated by artificial light sources should also be avoided.

DOCUMENTATION OF *MYOTIS SODALIS* CAPTURES

If an Indiana bat(s) is captured during mist-netting, protocols for radio-tracking and emergence survey requirements, as provided in Appendix D and E, respectively, should be followed. In addition, the appropriate USFWS FO(s) must be notified of the capture within 48 hours (or in accordance with permit conditions), and the sex and reproductive condition of the bat and GPS coordinates of the capture site should be provided.

Several species of bats from the genus *Myotis* share common features which can make identification difficult; Indiana bats and little brown bats (*Myotis lucifugus*) can be particularly difficult to distinguish. Photo-documentation of all bats captured and identified as Indiana bats and the first 10 little brown bats per project are requested to verify the identifications made in the field.

Photo-documentation should include diagnostic characteristics:

- a ¾-view of face showing ear, tragus, and muzzle
- view of calcar showing presence/absence of keel
- a transverse view of toes showing extent of toe hairs

If a bat from the genus *Myotis* is captured during mist netting that cannot be readily identified to the species level, then species verification may be attempted through fecal DNA analysis. Collect one or more fecal pellets (i.e., guano) from the bat in question by placing it temporarily in a holding bag (15 minutes is usually sufficient, no more than 30 minutes is recommended). The pellet (or pellets) collected should be placed in a small vial (e.g., 1.5 ml) with silica gel desiccant; pellets from each individual bat should be stored in separate vials and out of direct light. Fees charged by independent laboratories for sequencing fecal DNA samples is generally inexpensive (approx. \$50 per guano sample), however, it has been challenging to identify labs willing to consistently conduct these analyses. Any additional information and a list of available laboratories will be made available on the Indiana bat webpage on the USFWS's Region 3 website (<http://www.fws.gov/midwest/Endangered/mammals/inba/index.html>).

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PHASE 2 or 3 MIST-NETTING

SUBMISSION OF MIST-NETTING RESULTS

Provide results of netting surveys to the appropriate USFWS FO(s) in accordance with previously agreed upon<sup>27</sup> timeframes. If Indiana bats are captured, this report should also include the results of subsequent radio-tracking and emergence counts. Reports should include the following:

1. Copy of prior phase reports (if not previously provided).
2. Explanation of any modifications from original survey plan (e.g., altered net locations).<sup>28</sup>
3. Description of net locations (including site diagrams), net set-ups (include net heights), survey dates, duration of surveys, weather conditions, and a summary of findings.
4. Map identifying netting locations and information regarding net set-ups, including lat/long or UTM, individual net placement, and net spacing (i.e., include mist-netting equipment in photographs of net locations).
5. Full names of mist-netting personnel attending each mist-net site during an operation, including the federally-permitted/qualified biologist present at each mist-net site. Indicate on the field data sheet the full name of person who identified bats each night at each site.
6. Legible copies of all original mist-netting datasheets (see example datasheet below) and a summary table with information on all bats captured during the survey including, but not limited to: capture site, date of capture, time of capture, sex, reproductive condition, age, weight, right forearm measurement, band number and type (if applicable), and Reichard's wing damage index score (Reichard and Kunz. 2009).
7. Photographs of all net set-ups, as well as all Indiana bats and the first 10 little brown bats captured from each project, so that the placement of netting equipment and identification of species can be verified. Photographs of bats should include all diagnostic characteristics that resulted in the identification of the bat to the species level.
8. Any other information requested by the local USFWS FO(s) related to the project.

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<sup>27</sup> As discussed in the Introduction, we encourage coordination with USFWS FO(s) prior to implementation of any surveys to ensure that all parties agree upon the need for surveys, the methods proposed, and the decisions from various survey results.

<sup>28</sup> If the USFWS previously agreed upon the study plan we need to understand whether the revised work still accomplished the agreed upon methods

APPENDIX B  
PHASE 2 or 3 MIST-NETTING

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Sample Data Sheets for Indiana Bat Surveys

Site No.		Project/Firm:					Date:									
Location:																
County:			State:		Quad:			Quadrant:								
Lat/Long (DMS):		N		W		Zone:			Surveyors:							
#	Time	Species	Age	Sex	Repro. Cond.*	RFA (mm)	Mass (g)	Net/ Ht	Guano/ Hair	Wing Score	Band # Type	Moon Phase:	%			
1												Rise                      Set				
2												Moon:				
3												Sun:				
4												Time	Temp	Sky	Wind	# Bats
5																
6																
7																
8																
9																
10																
11																
12																
13																
14												Avg				
15												Sky Code				
16												0	Clear			
17												1	Few Clouds			
18												2	Partly Cloudy			
19												3	Cloudy or overcast			
20												4	Smoke or fog			
21												5	Drizzle or light rain			
22												6	Thunderstorm			
23												Beauford Wind Code				
24												0	Calm (0 mph)			
25												1	Light wind (1-3 mph)			
26												2	Light breeze (4-7 mph)			
27												3	Gentle breeze (8-12 mph)			
28												4	Moderate breeze (13-18 mph)			
29																
30																

\*Repro. Cond (Reproductive Condition): (P) pregnant; (L) lactating; (PL) post-lactating; (NR) non-reproductive, (TD) testes descended



APPENDIX C  
PHASE 2 ACOUSTIC SURVEYS

SUMMER ACOUSTIC SURVEY SEASON: May 15 – August 15

PERSONNEL

**Overall:** Acoustic surveyors should have either completed one or more of the available acoustic courses/workshops (e.g., BCI, BCM, AnaBat) or be able to show similar on-the-job or academic experience.

**Detector Deployment:** Acoustic surveyors should have a working knowledge of the acoustic equipment and Indiana bat ecology. Surveyors should be able to identify appropriate detector placement sites and establish those sites in the areas that are most suitable for recording high-quality Indiana bat calls. Thus, it is highly recommended that all potential acoustic surveyors attend appropriate training and have experience in the proper placement of their field equipment.

**Acoustic Analysis:** Acoustic surveyors should have a working knowledge of the candidate acoustic analysis programs. Thus, it is highly recommended that all potential acoustic surveyors attend appropriate training and have experience in the analysis of acoustic recordings.

**Qualitative Analysis:** Individuals qualified to conduct qualitative analysis of acoustic bat calls typically have experience: (1) gathering known calls. This provides a valuable resource in understanding how bat calls change and the variation present in them; (2) identifying bat calls recorded in numerous habitat types; (3) familiarity with the species likely to be encountered within the project area; and (4) individuals must have multiple years of experience and must have stayed current with qualitative ID skills. A resume (or similar documentation) will be required to be submitted along with final survey reports for anyone making final qualitative identifications.

COORDINATION WITH USFWS FO(s)

If not already required by federal permit, we recommend that applicants submit a draft study plan for all survey phases to the USFWS FO(s) for review and approval. Study plans should include a map/aerial photo identifying the proposed project area boundaries, suitable bat habitats and acreages within the project area, and the proposed number and tentative locations of acoustic monitoring sites.

DETECTOR AND MICROPHONE REQUIRED CHARACTERISTICS

Full-spectrum and/or zero-crossing detectors are suitable for use in this survey protocol.

Directional microphones are the only microphone type accepted for acoustic surveys at this time, although omni-directional microphones that have been converted to directional microphones are also acceptable. Microphones attached to detectors via a cable are also acceptable.

APPENDIX C  
PHASE 2 ACOUSTIC SURVEYS

ACOUSTIC SAMPLING PROTOCOL

Detector/Microphone Placement

Detector/Microphone placement is critical to the successful isolation of high-quality bat call sequences for later analysis. The following locations are likely to be suitable sites for detectors/microphones, including, but not limited to: (a) forest-canopy openings; (b) near water sources; (c) wooded fence lines that are adjacent to large openings or connect two larger blocks of suitable habitat; (d) blocks of recently logged forest where some potential roost trees remain; (e) road and/or stream corridors with open tree canopies or canopy height of more than 33 feet (10 meters); and (f) woodland edges (Britzke et al. 2010). It is also important to assess the volume and area of highest sensitivity within the zone of detection around the microphone to ensure the best detector/microphone placement and orientation. If detectors/microphones are placed in unsuitable locations, effective data analysis may be impossible, and the results of the sampling effort will likely be invalid.

Many features (e.g., vegetation, water, wind turbines, high-tensile power-lines, micro-wave towers) can reduce the quality of call sequences recorded in the field and impact the surveyor's ability to record high-quality bat call sequences by causing calls to reflect off of these surfaces. The following recommendations are provided to aid surveyors in their selection of acoustic sites. If surveyors choose acoustic sites outside of these recommendations, then adequate justification for doing so should be provided with the acoustic survey report provided to the USFWS FO(s); otherwise, results from these sites will not be accepted. Surveyors should deploy detectors/microphones: (a) at least 5 feet (1.5 meters) in any direction from vegetation or other obstructions (Hayes 2000; Weller and Zabel 2002); (b) in areas without, or with minimal<sup>29</sup>, vegetation within 33 feet (10 meters) in front of the microphone; (c) parallel to woodland edges; and (d) at least 49 feet (15 meters) from known or suitable roosts<sup>30</sup> (e.g., trees/snags, buildings, bridges, bat houses, cave or mine portal entrances).

Elevating a detector greater than 1.5 meters above ground level vegetation can dramatically improve recording quality. For example, microphones can be attached horizontally to a pole to listen out into flight space, rather than just listening up from the ground. This will serve to increase the volume of airspace sampled and avoid the distortion effect of recording near the ground.

Surveyors should distribute acoustic sites throughout the project area or adjacent habitats. In most cases, acoustic sites should be at least 656 feet (200 meters) apart. If closer spacing is determined to be necessary or beneficial (e.g., multiple suitable habitats and acoustic sites immediately adjacent to each other), sufficient justification must be provided in the acoustic survey report submitted to USFWS FO(s).

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<sup>29</sup> If necessary, surveyors can remove small amounts of vegetation (e.g., small limbs, saplings) from the estimated detection cone at a site, much like what is done while setting up mist-nets. Deployment of detectors/microphones in closed-canopy locations that typically are good for mist-netting are acceptable as long as the area sampled below the canopy does not restrict the ability of the equipment's detection cone to record high-quality calls (i.e., the vegetation is outside of the detection cone).

<sup>30</sup> If the surveyor discovers a potential roost and wishes to document bat use, please refer to Appendix E for guidance on conducting emergence surveys and contact the USFWS FO(s).

## APPENDIX C PHASE 2 ACOUSTIC SURVEYS

### Verification of Deployment Location

It is recommended to temporarily attach GPS units to each detector (according to manufacturer's instructions) to directly record accurate location coordinates for each acoustic site that is paired with the acoustic data files. Regardless of technique used, accurate GPS coordinates must be generated and reported for each acoustic survey site.

### Verification of Proper Functioning

It is highly recommended that surveyors ensure acoustic detectors are functioning properly through a periodic verification of performance to factory specifications (a service currently offered or in development by several manufacturers). It may be possible that independent service bureaus would be willing to perform this service, providing that a standard test/adjustment procedure can be developed.

It is also recommended to ensure equipment is working during set-up in the field. This can be done simply by producing ultrasound (e.g., finger rubs, calibrator, or follow the equipment manufacturer's testing recommendations) in front of the microphone at survey start and survey finish. This documents that the equipment was working when deployed and when picked up (and by assumption throughout the entire period). Detector field settings (e.g., sensitivity, frequency, etc.) should follow the recommendations provided by the manufacturer. Surveyors should also save files produced by detectors (e.g., log files, status files, sensor files) as an excellent way to provide documentation when equipment was functioning within the survey period. Many types of detectors allow for setting timers that initiate and end recording sessions. This saves battery life as well as reducing the number of extraneous noise files recorded. However, if the units are visited when the timer is off, the surveyor cannot verify that the unit is functioning properly. This is particularly important in areas where no bat activity is recorded for the entire night or during the last portion of the night. In these cases, if the surveyor cannot demonstrate that the detector was indeed functioning properly throughout the survey period then the site will need to be re-sampled, unless adequate justification can be provided to the USFWS FO(s).

Selection of acoustic sites is similarly important. Suitable set-up of the equipment should result in high-quality call sequences that are adequate for species identification. Nights of sampling at individual sites that produce no bat calls may need to be re-sampled unless adequate justification (e.g., areas with significant bat population declines due to WNS) can be provided to the USFWS FO(s). Modifications of the equipment (e.g., changing the orientation) at the same location on subsequent nights may improve quantity and quality of call sequences recorded, which can be determined through daily data downloads. If modifications of the equipment do not improve call identification, then the detectors will need to be moved to a new location.

Orientation

Detectors deployed near the ground (e.g., on a tripod) should be aimed 45 degrees or more above horizontal. Microphones deployed higher within the flight path/zone (e.g., on a pole) should be oriented horizontally. In some circumstances (e.g., forest openings), it might be desirable to aim a detector's microphone vertically. This has shown to record high-quality calls but precludes the use of weatherproofing for protection of the microphone, since no currently-approved weatherproofing system will adequately protect the microphone of a detector aimed vertically.

Deploy detectors at or below the lowest expected flight height of the bats but high enough above ground vegetation to avoid interference within the detection cone. Once acoustic sites are identified, photographs documenting the orientation, detection cone (i.e., "what the detector is sampling"), and relative position of the microphone should be taken for later submittal to the USFWS FO(s) as part of the acoustic survey report.

Weather Conditions

If any of the following weather conditions exist at a survey site during acoustic sampling, note the time and duration of such conditions, and repeat the acoustic sampling effort for that night: (a) temperatures fall below 50°F (10°C) during the first 5 hours of survey period; (b) precipitation, including rain and/or fog, that exceeds 30 minutes or continues intermittently during the first 5 hours of the survey period; and (c) sustained wind speeds greater than 9 miles/hour (4 meters/second; 3 on Beaufort scale) during the first 5 hours of the survey period. At a minimum, nightly weather conditions for survey sites should be checked using the nearest NOAA National Weather Service station and summarized in the survey reports.

Weatherproofing

Most bat detectors are not weatherproof when delivered from the factory. Recording without after-market weatherproofing is preferred as the addition of these systems may result in some signal degradation. **The decision to weatherproof detectors or not should be determined nightly based on the likelihood of precipitation in the survey area.**

For directional microphones, the use of a polyvinyl chloride (PVC) tube<sup>31</sup>, generally in the form of a 45-degree elbow the same diameter as the microphone (Britzke et al. 2010) is acceptable, if the situation requires the use of after-market weatherproofing. Attach the elbow to a weatherproof box that houses the main portion of the detector. Point the microphone into one end of the elbow and point the open end of the elbow in the direction to be monitored (generally 45 degrees to horizontal). Another option for weatherproofing detectors is to detach the microphone from the detector so that the detector can be placed in a weatherproof container but the microphone (tethered by a cable) remains unobstructed.

Other after-market weatherproofing systems may become available and approved by the USFWS provided they show that call quality and the number of calls recorded are comparable to those without weatherproofing.

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<sup>31</sup> The PVC option has only been tested with AnaBat detectors and directional microphones. It may not perform as well with other detector microphone combinations.



APPENDIX C

APPENDIX C  
PHASE 2 ACOUSTIC SURVEYS

MINIMUM LEVEL OF EFFORT

The number of acoustic survey sites required for a project will be dependent upon the overall acreage of suitable habitat proposed to be impacted by the action. To determine the acoustic survey effort, quantify the amount of suitable summer habitat within the project area.

Linear projects: a minimum of 2 detector nights per km (0.6 miles) of suitable summer habitat.

Non-linear projects: a minimum of 6 detector nights per 123 acres (0.5 km<sup>2</sup>) of suitable summer habitat.

3 or more detector locations per 123 acre "site" shall be sampled until at least 6 detector nights has been completed over the course of at least 2 calendar nights (may be consecutive).

For example:

- 3 detectors for 2 nights each (can sample the same location or move within the site)
- 2 detectors for 3 nights each (must sample at least 3 locations [i.e., must move at least 1 of the detectors for 1 night])
- 1 detector for 6 nights (must sample at least 3 locations)

The acoustic sampling period for each site must begin at sunset<sup>32</sup> and ends at sunrise each night of sampling.

ANALYSIS OF RECORDED ECHOLOCATION CALLS

**Step 5. Optional coarse screening - for high frequency (HF) or myotid calls (depending on available filters) or Proceed to Step 6.**

- a) If no positive detection of HF calls ( $\geq 35$  kHz) or myotid calls, no further summer surveys necessary.
- b) If positive detection of HF or myotid calls, then
  - i) proceed to Step 6 for further acoustic analysis; **OR**
  - ii) assume presence of Indiana bats and coordinate with the USFWS FO(s); **OR**
  - iii) assume presence and proceed to **Phase 3**.

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<sup>32</sup> Surveys may need to start a little earlier or later than official sunset times (i.e., at "dusk") in some settings such as a deep/dark forested valleys or ridge tops to avoid missing early-flying bats or capturing late-flying birds, respectively. Sunset tables for the location of survey can be found at:  
[http://aa.usno.navy.mil/data/docs/RS\\_OneYear.php](http://aa.usno.navy.mil/data/docs/RS_OneYear.php)

APPENDIX C  
PHASE 2 ACOUSTIC SURVEYS

**Step 6. Conduct Additional Acoustic Analyses for each site that had HF or Myotis calls from Step 5 or ALL sites if Step 5 was not conducted.**

Two or more of the currently available 'candidate' acoustic bat ID programs<sup>33</sup> must be used. Beginning with acoustic data from night one at each acoustic site, run each night's data for each site through a minimum of two candidate acoustic ID programs. Review results by night and site from each acoustic ID program used and flag each file indicating a positive probable detection of Indiana bats<sup>34</sup>.

- a) If no detections of probable Indiana bats by any candidate programs used in analysis, then no further summer surveys necessary.
- b) If detections of probable Indiana bats by any candidate programs used in analysis, then
  - i) proceed to Step 7 for qualitative ID; **OR**
  - ii) assume presence of Indiana bats and coordinate with the USFWS FO(s); **OR**
  - iii) assume presence and proceed to Phase 3.

**Step 7. Conduct Qualitative Analysis of probable Indiana bat calls from Step 6.**

Qualitative analysis<sup>35</sup> must also include a comparison of the results of each acoustic ID program by site and night (including: number of call files flagged as probable Indiana bats by each tool used; an evaluation of other species identified by the acoustic ID program; individual file level agreements and disagreements on Indiana bats between programs; and a qualitative analysis of ALL probable Indiana bat call sequences to further evaluate that the correct ID has been recommended by the program used).

- a) If no visual confirmation of probable Indiana bats, then no further summer surveys necessary.
- b) If visual confirmation of probable Indiana bats, then
  - i) assume presence of Indiana bats and coordinate with the USFWS FO(s); **OR**
  - ii) assume presence and proceed to Phase 3.

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<sup>33</sup> Candidate programs are listed at

<http://www.fws.gov/midwest/Endangered/mammals/inba/surveys/inbaAcousticSoftware.html>

<sup>34</sup> The candidate acoustic identification programs all have implemented a maximum-likelihood estimator (MLE) at this time. If the analysis of collected calls at a given site on a given night results in the probable presence of Indiana bats with high levels of certainty ( $P < 0.05$ ), then select one of the options available in Step 6b.

<sup>35</sup> Qualitative analysis of each acoustic site and night with probable detections of Indiana bats during Step 6 should include the entire night's call data and not just those files making it through the acoustic analysis tools as probable Indiana bats in Step 6.

APPENDIX C  
PHASE 2 ACOUSTIC SURVEYS

SUBMISSION OF ACOUSTIC SURVEY RESULTS

Provide results of acoustic surveys to the appropriate USFWS FO(s) in accordance with previously agreed upon<sup>36</sup> timeframes. Each acoustic survey report should include the following:

1. Copy of habitat assessment (if not previously provided)
2. Explanation of any modifications from original survey plan (e.g., altered site locations)<sup>37</sup>
3. Description of acoustic monitoring sites, survey dates, duration of survey, weather conditions, and a summary of findings
4. Map identifying acoustic monitoring locations and a corresponding table including the GPS coordinates
5. Full names of all personnel conducting acoustic surveys, including those that selected acoustic sites and deployed detectors, and include copies of state and federal permits (if applicable)
6. Table with information on acoustic monitoring and resulting data, including but not limited to: detector GPS coordinates, survey dates, survey hours
7. Description of acoustic detector brand(s) and model(s) used, microphone type, use of weatherproofing, acoustic monitoring equipment settings (e.g., sensitivity, audio and data division ratios), deployment data (i.e., deployment site, habitat, date, time started, time stopped, orientation), and call analysis methods used
8. Acoustic analysis software program output/summary results by site (i.e., number of calls detected, species composition, MLE results)
9. Photographs of each acoustic site documenting the location of the detector, the orientation of the detector, and the detection cone (i.e., what the detector sampled.
10. A description of how proper functioning of bat detectors was verified
11. Any other information requested by the local USFWS FO(s) related to the project

REFERENCES

Britzke, E.R., B.A. Slack, M.P. Armstrong, and S.C. Loeb. 2010. Effects of orientation and weatherproofing on the detection of bat echolocation calls. *Journal of Fish and Wildlife Management* 1(2):136-141.

<sup>36</sup> As discussed in the Introduction, we encourage coordination with USFWS FO(s) prior to implementation of any surveys to ensure that all parties agree upon the need for surveys, the methods proposed, and the decisions from various survey results.

<sup>37</sup> If the USFWS previously agreed upon the study plan we need to understand whether the revised work still accomplished the agreed upon methods.

APPENDIX C  
PHASE 2 ACOUSTIC SURVEYS

- Hayes, J. P. 2000. Assumption and practical considerations in the design and interpretation of echolocation-monitoring studies. *Acta Chiropterologica* 2:225-236.
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APPENDIX D  
PHASE 4 RADIO-TRACKING

PERSONNEL

**Transmitter Attachment:** A qualified biologist<sup>38</sup> who is experienced in handling Indiana bats and attaching radio transmitters must perform transmitter attachments, as further explained in the protocol below.

**Tracking:** Biological technicians and/or a qualified biologist who is experienced in tracking transmittered bats must be present and actively involved in all tracking activities for Indiana bats as further explained in the protocol below.

METHODS

If one or more Indiana bats are captured, the following radio-tracking protocols will be applicable:

1. Biologists should coordinate in advance with USFWS FO(s) regarding recommendations for the number and distribution of transmitters (e.g., prioritization of sex/age, maximum number per site) and whether foraging data would be beneficial to collect. Also, professional judgment should be used to determine whether attachment of transmitters could compromise the health of a bat. Since the maximum holding times for Indiana bats targeted for radio-tracking is 45 minutes, or as allowed in federal and state permits, surveyors should be prepared to place transmitters on bats immediately following their capture to minimize holding times.
2. The radio transmitter, adhesive, and any other markings (e.g., wing bands) should weigh less than 5% of pre-attachment body weight (American Society of Mammalogists 1998), but must not weigh more than 10% of a bat's total body weight (Kurta and Murray 2002) and must comply with any USFWS and state permits. In all cases, the lightest transmitters capable of the required task should be used, particularly with pregnant females and volant juveniles. With pregnant bats, biologists should always use the lightest transmitter possible but no more than 5% of their expected non-pregnant weight.
3. Proposed radio telemetry equipment (e.g., receivers, antennas, and transmitters) and frequencies should be coordinated with the appropriate state natural resource agency and USFWS FO(s).
4. The qualified biologist or biological technician(s) should track all radio-tagged bats captured to diurnal roosts in accordance with permit requirements. We generally recommend tracking until the transmitter fails, fall off, or cannot be located for at least 7 days and should conduct a minimum of 2 evening emergence counts at each identified

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<sup>38</sup> A qualified biologist is an individual who holds a USFWS Recovery Permit (Federal Fish and Wildlife Permit) for federally-listed bats in the state/region in which they are surveying and/or has been authorized by the appropriate state agency to mist-net for Indiana bats. Several USFWS offices maintain lists of qualified bat surveyors, and if working in one of those states with authorizations in lieu of a Recovery Permits, the individual will either need to be on that list or submit qualifications to receive USFWS approval prior to conducting any field work.

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PHASE 4 RADIO-TRACKING

roost (See Appendix F for Emergence Survey Protocols). However, biologists are encouraged to continue radio-tracking efforts for the life of the transmitter. Biologists should contact the USFWS FO(s) immediately if they plan to cease tracking efforts before the 7-day tracking period ends. If landowner access is denied, approximate roost locations (i.e., coordinates) should be determined using triangulation.

5. Daily radio telemetry searches for roosts must be conducted during daylight hours and should be conducted until the bat(s) is located or for a minimum of 4 hours of ground or 1 hour of aerial-searching effort per tagged bat per day for 7 days. However, multiple bats captured at the same net location or nearby may be tracked simultaneously. Once a signal is detected, tracking should continue until the roost is located. At a minimum, biologists should document all ground and aerial-searching effort for all bats not recovered during radio-tracking for submittal with the survey report. For each roost identified during tracking, the biologist should complete a "USFWS Indiana Bat Roost Datasheet" (Appendix D).
6. To minimize potential for disease transmission, any equipment that comes in contact with bats should be kept clean and disinfected, following approved protocols; this is particularly a concern relative to WNS. Protocols are posted at <http://www.whitenosesyndrome.org/>. Federal and state permits may also have specific equipment restrictions and disinfection requirements.

#### SUBMISSION OF RADIO-TRACKING RESULTS

Phase 4 radio-tracking results should be included with the Phase 2 or 3 mist-netting report and submitted to the appropriate USFWS FO(s). Each report should include the following information related to radio-tracking efforts:

1. Copy of prior phase reports (if not previously provided)
2. Explanation of any modifications from original survey plan (e.g., number of transmitters used, frequency of transmitters changed)<sup>39</sup>
3. Map and narrative detailing all ground and aerial searching effort for all bats not recovered during radio-tracking and relative to the negotiated or agreed effort as determined by the appropriate USFWS FO(s)
4. Map summarizing Indiana bat data collected from summer surveys for the proposed project (e.g., project area boundary and results from the site habitat assessment, acoustic survey, mist-net survey, radio-tracking, and emergence surveys)
5. Full names and permit numbers of personnel who attached transmitters to Indiana bats and full names of all personnel conducting radio-tracking efforts
6. Photographs of all roosts identified during radio-tracking
7. Legible copies of all original USFWS Indiana Bat Roost Datasheets
8. Any other information requested by the local USFWS FO(s) where work was conducted

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<sup>39</sup> If the USFWS previously agreed upon the study plan we need to understand whether the revised work still accomplished the agreed upon methods

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PHASE 4 RADIO-TRACKING

REFERENCES

- American Society of Mammalogists. 1998. Guidelines for the capture, handling and care of mammals. *Journal of Mammalogy* 79:1416-1431.
- Kurta, A., and S. Murray. 2002. Philopatry and migration of banded Indiana Bats (*Myotis sodalis*) and effects of radio transmitters. *Journal of Mammalogy* 83:585-589.



APPENDIX D  
PHASE 4 RADIO-TRACKING

USFWS INDIANA BAT ROOST DATASHEET

Biologists (Full Name): \_\_\_\_\_ Date: \_\_\_\_\_

UTM: Zone \_\_\_\_\_ Easting \_\_\_\_\_ Northing \_\_\_\_\_ OR

LAT \_\_\_\_\_ LONG \_\_\_\_\_

Property Owner: \_\_\_\_\_ Phone# \_\_\_\_\_

State \_\_\_\_\_ County \_\_\_\_\_ Site # \_\_\_\_\_

Roost # \_\_\_\_\_ Roost Name: \_\_\_\_\_

*Roost Tree Data*

Species: \_\_\_\_\_ Live \_ Snag \_ Other \_

(if other, explain) \_\_\_\_\_

DBH (in or cm) \_\_\_\_\_ Total Height (ft or m) \_\_\_\_\_

Height of roost area (if known) \_\_\_\_\_ Dist. from capture site \_\_\_\_\_

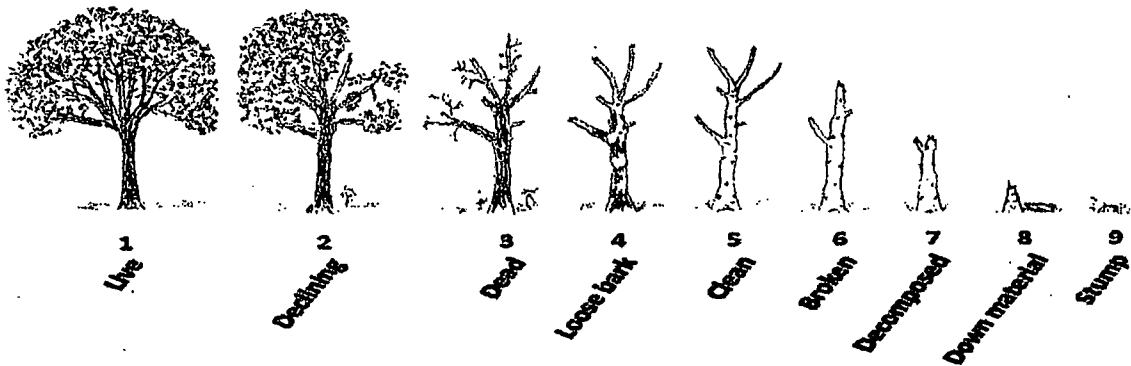
Roost position aspect (deg) \_\_\_\_\_

Exfoliating bark on bole (%) \_\_\_\_\_ Describe: sloughing \_ platy \_ tight \_

Cavities present? \_\_\_ If so, describe: \_\_\_\_\_

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Roost Decay State: 1 2 3 4 5 6 7 8 9 Other





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Roost tree or snag canopy position:                      Co-Dominant \_ Suppressed \_  
Dominant \_\_\_\_\_

*Secondary Habitat Condition*

APPENDIX E  
PHASE 4 EMERGENCE SURVEYS

PERSONNEL

Qualified biologists<sup>40</sup>, biological technicians, and any other individuals deemed qualified by a local USFWS FO may conduct emergence surveys for Indiana bats by following the protocols below.

EMERGENCE SURVEYS FOR KNOWN INDIANA BAT ROOSTS

The following protocols should begin as soon as feasible after identification of a diurnal roost (ideally that night):

1. Bat emergence surveys should begin one half hour before sunset<sup>41</sup> and continue until at least one hour after sunset or until it is otherwise too dark to see emerging bats. The surveyor(s) should be positioned so that emerging bats will be silhouetted against the sky as they exit the roost. Tallies of emerging bats should be recorded every few minutes or as natural breaks in bat activity allow. There should be at least one surveyor per roost. Surveyors must be close enough to the roost to observe all exiting bats but not close enough to influence emergence. That is, do not stand directly beneath the roost, do not make noise or carry on a conversation, and minimize use of lights (use a small flashlight or similar to record data, if necessary). Do not shine a light on the roost as this may prevent or delay bats from emerging. Use of an infra-red, night vision, or thermal-imaging video camera or spotting scope is encouraged but not required. Likewise, use of an ultrasonic bat detector may aid in identifying the exact timing of bats emerging and may be used to help differentiate between low- and high-frequency bats species, and therefore, is strongly recommended. If multiple roosts are known within a colony, then simultaneous emergence surveys are encouraged to estimate population size. [Note: If a roost cannot be adequately silhouetted, then the local USFWS FO(s) should be contacted to discuss alternative survey methods].
2. Bat activity is affected by weather; therefore emergence surveys should not be conducted when the following conditions exist: (a) temperatures that fall below 50°F (10°C); (b) precipitation, including rain and/or fog, that exceeds 30 minutes or continues intermittently during the survey period; and (c) sustained wind speeds greater than 9 miles/hour (4 meters/second; 3 on Beaufort scale).
3. Surveyors should use the attached (or similar) "Bat Emergence Survey Datasheet".

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<sup>40</sup> A qualified biologist is an individual who holds a USFWS Recovery Permit (Federal Fish and Wildlife Permit) for federally-listed bats in the state/region in which they are surveying and/or has been authorized by the appropriate state agency to mist-net for Indiana bats. Several USFWS offices maintain lists of qualified bat surveyors, and if working in one of those states with authorizations in lieu of a Recovery Permits, the individual will either need to be on that list or submit qualifications to receive USFWS approval prior to conducting any field work.

<sup>41</sup> Surveys may need to start a little earlier or later than one half hour before official sunset times (i.e., before "dusk") in some settings such as deep/dark forested valleys or ridge tops, respectively. Sunset tables for the location of survey can be found at: [http://aa.usno.navy.mil/data/docs/RS\\_OneYear.php](http://aa.usno.navy.mil/data/docs/RS_OneYear.php)

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4. Surveyors should also complete an "Indiana Bat Roost Datasheet" for each roost known to be used by one or more Indiana bats (see Appendix D for an example).
5. Completed datasheets should be included in reports prepared for the USFWS.

EMERGENCY SURVEYS FOR POTENTIAL INDIANA BAT ROOSTS

In some limited cases (e.g., individual hazard tree removal during the active season), surveyors may have the option of conducting emergency surveys for individual potential Indiana bat roosts to determine use prior to removal. The following protocol applies to these surveys:

1. Consult with the local USFWS FO(s) to determine whether a tree(s) that needs to be felled/ cleared may be potential roosting habitat for Indiana bats and whether conducting an emergency survey is an appropriate means of avoiding take of Indiana bats<sup>42</sup>. In general, the USFWS only approves of conducting emergency surveys as a means of avoiding direct take of bats for projects that only affect a very small number of potential roosts (e.g., less than or equal to 10)<sup>43</sup>. An online directory of USFWS offices is available at: <http://www.fws.gov/offices/directory/listofficemap.html>.
2. If the USFWS FO(s) approves/concurs with Step 1, then follow the emergency guidelines for Emergency Surveys for Known Indiana Bat Roosts (above) to determine if any bats are roosting in the tree(s).
3. At the conclusion of the emergency survey:
  - a. If **no** bats were observed emerging from the potential roost(s), then it may be felled immediately. If safety concerns dictate that a tree cannot be felled immediately (i.e., in the dark), then the tree(s) should be felled as soon as possible after sunrise on the following day. If a tree is not felled during the daytime immediately following an emergency survey, then the survey has to be repeated, because bats may switch roosts on a nightly basis. Immediately after the tree is felled, a visual inspection of the downed tree must be completed to ensure that no bats were present, injured, or killed. The USFWS FO(s) should be contacted immediately, if bats are discovered during this inspection.

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<sup>42</sup> If a potential bat roost tree poses an imminent threat to human safety or property, then emergency consultation procedures should be followed as appropriate. (50 CFR §402.05). If a hazard tree does not pose an imminent threat, then the USFWS requests that it be felled during the bat's inactive season (i.e., generally from October – March, but contact the FO for specific dates for your area.) When possible, felling of potential roost/hazard trees should be avoided during the primary maternity period (June – July) to avoid potential adverse effects to non-volant pups.

<sup>43</sup> Areas containing >10 hazard trees will be assessed by the USFWS on a case-by-case basis with the project proponent.

APPENDIX E  
PHASE 4 EMERGENCE SURVEYS

- b. If **1 or more** bats (regardless of species, because species identification cannot reliably be made during visual emergence counts alone) are observed emerging from the roost, then it should **not** be felled, and the USFWS FO(s) should be contacted the next working day for further guidance.

SUBMISSION OF EMERGENCE SURVEY RESULTS

Emergence survey results should be included with the mist-netting survey report, unless the survey was completed as an evaluation of potential roosts, and should be submitted to the appropriate USFWS FO(s) for review. Each survey report should include the following information related to emergence survey efforts:

1. Copy of prior phase reports (if not previously provided)
2. Explanation of any modifications from the Phase 4 emergence count study plan (e.g., number of potential roosts surveyed), if applicable
3. Summary of roost emergence data
4. Map identifying location of roost(s) identified during radio-tracking and/or emergence surveys for Indiana bat(s) including GPS coordinates
5. Full names of personnel present during emergence survey efforts and who conducted emergence surveys of roosts
6. Photographs of each identified roost
7. Copies of all "Emergence Survey" and "Indiana Bat Roost" datasheets
8. Any other information requested by the local USFWS FO(s) where work was conducted
9. Copy of the pre-approved site-specific written authorization from USFWS and/or state natural resource agency (if required)



APPENDIX E  
PHASE 4 EMERGENCE SURVEYS

Site Name/ #: \_\_\_\_\_ Roost Name/ #: \_\_\_\_\_



APPENDIX E

Time	Number of Bats Leaving Roost*	Comments / Notes
<b>Total Number of Bats Observed Emerging from the Roost/Feature During the Survey:</b>		

\* If any bats return to the roost during the survey, then they should be subtracted from the tally.

**Describe Emergence:** Did bats emerge simultaneously, fly off in the same direction, loiter, circle, disperse, etc. If a radio-tagged bat was roosting in the tree, at what time did it emerge?

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**Appendix F. ALPHABETICAL LIST OF SURVEYORS QUALIFIED\* TO CONDUCT  
INDIANA BAT SURVEYS IN WEST VIRGINIA - Updated December, 2012**

<p>BHE Environmental, Inc. 11733 Chesterdale Road Cincinnati, OH 45246 phone: 513-326-1500 fax: 513-326-1178</p>	<p>URS Corporation Contact: Ryan Leiberher 4507 North Front Street, Suite 200 Harrisburg, PA 17110 phone: 717-635-7901 email: <a href="mailto:ryan_leiberher@urscorp.com">ryan_leiberher@urscorp.com</a></p>
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**APPENDIX E**

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<p>Skybax Ecological Services, LLC          Contact: Gary Libby          107 Vanwinkle Grove          Berea, KY 40403          phone: 859-302-2897          email: <a href="mailto:garylubby@windstream.net">garylubby@windstream.net</a></p>	<p>Mountain State Biosurveys, LLC          Contact: Keith Johnson          6703 Ohio River Road          Lesage, WV 25537          phone: 304-762-2453          email: <a href="mailto:kjohnson@mntstatebio.com">kjohnson@mntstatebio.com</a></p>
<p>Pittsburgh Wildlife &amp; Environmental, Inc.          Contact: Neil Bossart          853 Beagle Club Road          McDonald, PA 15057          phone: 724-796-5137          cell: 717-860-7679          email: <a href="mailto:nbossart@windstream.net">nbossart@windstream.net</a></p>	<p>Compliance Monitoring Labs, Inc.          Contact: J.D. Wilhide          50 Caney Branch Road, Suite 1          Chapmanville, WV 25508          phone: 304-855-0140          email: <a href="mailto:jd_wilhide@cml.net">jd_wilhide@cml.net</a></p>
<p>Appalachian Technical Services          Contact: Chris Isaac          PO Box 3537          Wise, VA 24293          phone: 276-328-4200          email: <a href="mailto:cisaac@atsone.com">cisaac@atsone.com</a></p>	<p>Normandeau Associates          Contact: Mick O'Mahony          400 Reading Pike          Building A, Suite 101          Stowe, PA 19464          phone: 484-945-2631          email: <a href="mailto:momahony@normandeau.com">momahony@normandeau.com</a></p>
<p>Jackson Environmental Consulting Services, LLC          Contact: Jeremy Jackson, Shane Prescott          114 North 3<sup>rd</sup> Street, Suite 1          Richmond, KY 40475          phone: 859-623-0499          email: <a href="mailto:jjj@jacksonenvironmental.com">jjj@jacksonenvironmental.com</a></p>	<p>Redwing Ecological Services, Inc.          Contact: Benjamin Deetsch          129 S. Sixth Street          Louisville, KY 40202          phone: 502-625-3009          email: <a href="mailto:bdeetsch@redwingeco.com">bdeetsch@redwingeco.com</a></p>
<p>Davey Resource Group          Contact : Jennifer Hickey          3728 Fishcreek Road          Stow, OH 44224          email: <a href="mailto:jessica.hickey@davey.com">jessica.hickey@davey.com</a></p>	<p>Stantec Consulting Services, Inc.          Contact: James Kiser          1901 Nelson Miller Parkway          Louisville, KY 40223-2177          phone: 502-396-3199          email: <a href="mailto:james.kiser@stantec.com">james.kiser@stantec.com</a></p>
<p>Wildlife Specialists, LCL          Contact: James Hart          2785 Hills Creek Road          Wellsboro, PA 17257          phone: 570-376-2255          email: <a href="mailto:jahart@pa.net">jahart@pa.net</a></p>	<p>AllStar Ecology, LLC          Contact: Sheila Captain          1582 Meadowdale Road          Fairmont, WV 26554          phone: 304-816-3490; 866-213-2666 (toll free)          cell: 734-678-8901          email: <a href="mailto:sheila@allstarecology.com">sheila@allstarecology.com</a></p>
<p>Skelly &amp; Loy, Inc.          Contact: Julie Zeyzus          449 Eisenhower Boulevard, Suite 300          Harrisburg, PA 17111          phone: 800-892-6532          cell: 412-443-6745          email: <a href="mailto:jzeyzus@skellyloy.com">jzeyzus@skellyloy.com</a></p>	<p>Alliance Consulting, Inc.          Contact: Braden Hoffman          124 Philpott Lane          Beaver, WV 25813          phone: 304-255-0491          email: <a href="mailto:bhoffman@aci-wv.com">bhoffman@aci-wv.com</a></p>

## APPENDIX E

\* This list includes individuals who are qualified to conduct surveys for Indiana bats, or those who are company contacts, and may not include all individuals qualified to conduct such surveys. Inclusion of names on this list does not constitute endorsement by the WV Division of Natural Resources (WVDNR), the US Fish and Wildlife Service, nor any other government agency. A WV Scientific Collecting Permit will be required from the WVDNR to sample bats in WV. Note that various techniques are used to sample for and study bats, including mist-netting, Anabat detectors, and radio-telemetry. Some individuals on this list may not be qualified to conduct all three techniques.

rhododendron, it may be coincidental. Rock structure is likely a better indicator of habitat than vegetative composition or the age of the trees. Little is known of the life history of this animal, but some information has been obtained from a captive colony. Small clusters of eggs are laid in the spring and summer. The eggs are usually buried in the soil or leaf litter. Flat-spined three-toothed land snails appear to be most active during the spring and early summer. Threats to the species are related to human disturbance within its small range, including logging, road-building, hiking, rock climbing and the potential for human-started fires.

**Madison Cave isopod (*Antrolana lira*)** - This species, which inhabits underground lakes and deep karst aquifers where it lives in the groundwater, was listed as threatened in 1982. Karst habitat includes areas of irregular limestone in which erosion has produced fissures, sinkholes, underground streams, and caverns. The Madison Cave isopod has been observed in a few caves that descend to the groundwater table. In West Virginia, this species is currently known to occur within caves and wells in Jefferson County. This animal probably occurs in pockets of ground water that extend beyond the sites where it has been observed. Contamination of groundwater is the major threat to the Madison Cave isopod. Sources of contaminants include runoff from agriculture and industrial and urban developments.

**Freshwater mussels** - Ten species of freshwater mussels that inhabit medium to large streams and rivers in West Virginia were listed as endangered between 1976 and 2012. These include the Clubshell (*Pleurobema clava*), Fanshell (*Cyprogenia stegaria*), James spiny mussel (*Pleurobema collina*), Northern riffleshell (*Epioblasma torulosa rangiana*), Pink mucket pearly mussel (*Lampsilis abrupta*), Rayed bean (*Villosa fabilis*), Sheepnose (*Plethobasus cyphyus*), Snuffbox (*Epioblasma triquetra*), Spectaclecase (*Cumberlandia monodonta*), and Tubercled-blossom pearly mussel (*Epioblasma torulosa torulosa*). Many are found in gravelly substrates with moderate current. Freshwater mussels feed by filtering food particles from the water column. Juvenile and adult freshwater mussels have been documented to feed on detritus, diatoms, phytoplankton, and zooplankton. Freshwater mussels rely on fish to complete their life histories. When mussel larvae (glochidia) are released into the water by adult females, they must attach themselves within a few days to the gills of an appropriate fish host, which they then parasitize for a short time while developing into juvenile mussels. The loss of many historic populations was likely due to the impacts of impoundments, navigation projects, water quality degradation from agricultural and industrial wastes, deforestation and other forms of habitat alteration, including gravel and sand dredging. Impacts that directly affected the species also include reduction or elimination of fish hosts.

**Running buffalo clover (*Trifolium stoloniferum*)** - This species, which was listed as endangered in 1987, occurs in mesic habitats of partial to filtered sunlight, where there is a prolonged pattern of moderate periodic disturbance, such as mowing, trampling, or grazing. It is most often found in regions underlain with limestone or other calcareous bedrock. In West Virginia, running buffalo clover seems to prefer old logging roads, off-road vehicle (ORV) trails, hawthorne thickets, grazed woodlands, jeep trails, railroad grades, game trails, and old fields succeeding to mesic woodlands. The larger occurrences exist within a matrix of mesophytic deciduous forest. All populations are associated with light to moderate disturbance such as occasional ORV or foot traffic, stream scour, or grazing. The primary threat to running buffalo clover is habitat alteration including natural forest succession and subsequent canopy closure,

competition by invasive plant species, and catastrophic disturbance such as development or road construction. The elimination of bison and other large herbivores from its range also may have contributed to the decline of this species. These animals were sources of the periodic habitat disturbances required by the species and also played a role in seed germination and dispersal.

**Harperella (*Ptilimnium nodosum*)** - This water-associated annual herb was listed as endangered in 1988. Flowering of in-pond populations begins in May, while riverine populations flower much later, beginning in late June or July and continuing until frost. In West Virginia, harperella typically occurs in riverine habitat types such as rocky or gravel shoals and margins of clear, swift-flowing stream sections. This plant tolerates and may actually require a very specific and unusual water regime, which includes moderately intensive spring floods, which may reduce or eliminate competing vegetation. Harperella is readily eliminated from its habitat by alterations of the water regime resulting from impoundments, water withdrawal, and drainage or deepening of ponds. Siltation, pollution, and shoreline development also threaten harperella populations. Over half the historically-known populations have been eliminated by such factors.

**Northeastern bulrush (*Scirpus ancistrochaetus*)** - This tall perennial sedge with narrow leaves was listed as endangered in 1991. It is characterized by a drooping flower head with chocolate-brown florets and yellow-brown fruits. This species has been found in open, tall herb-dominant wetlands or sinkhole ponds underlain with sandstone. Beaver-influenced wetlands also provide suitable habitat for the plant. Activities such as filling, ditching, or draining wetlands or altering the local hydrology can impact Northeastern bulrush. Residential development, use of ORVs through ponds and other wetlands, agricultural runoff, and water chemistry changes can also impact this plant.

**Shale barren rock cress (*Arabis serotina*)** - This biennial herb of the mustard family was listed as endangered in 1989. It is one of several endemic species restricted to the mid-Appalachian shale barrens of the Ridge and Valley province of the Appalachian Highlands. Shale barren vegetation occurs on eroding shale formations. Mid-Appalachian shale barren is a designation for a shale formation of the region with an open, scrubby growth of pine, oak, red cedar, and other woody species adapted to xeric conditions. Shale barren rock cress is threatened by drought, nonnative invasive plants, and anthropogenic habitat degradation. Grazing by herbivores, such as deer, also threatens the species.

**Virginia spiraea (*Spiraea virginiana*)** - This clonal shrub of the rose family, found in early-successional habitats that do not have a closed canopy, was listed as threatened in 1990. It has been found along streams and rivers, as well as roadside wet areas and wet marshy meadows. In West Virginia, it can be found among large boulders, flatrock, and flood debris along scoured streambanks. Virginia spiraea requires periodic flood scouring to eliminate taller woody competitors and to create river-wash deposits and early successional habitats. Threats to the species include roadside maintenance, deer browse, ORV use in suitable habitats, long-term flooding, water stabilization efforts, and nonnative invasive plants.

**Small whorled pogonia (*Isotria medeoloides*)** - This perennial member of the orchid family, generally known from open, dry, deciduous woods with acid soil, was listed as threatened in 1993. It flowers from about mid-May to mid-June, typically with only one flower per plant,

which lasts only a few days to a week. Individual plants may not flower every year and extended dormancy, although not scientifically documented, is purported to occur under certain conditions. This plant is believed to be self-pollinating by mechanical processes; no evidence of insect pollination has been observed. The current status of small whorled pogonia is attributed to loss of habitat and overutilization for scientific and private collections. However, some populations observed for a number of years have also declined for unknown reasons.

**Bald Eagle (*Haliaeetus leucocephalus*)**

The bald eagle, a North American species that historically occurred throughout the contiguous United States and Alaska, was listed in 1967 as endangered south of the 40<sup>th</sup> parallel. In 1978, it was listed under the ESA as endangered throughout most of the lower 48 states. This segment of the population was down-listed to threatened in 1995, and in 2007 it was deemed recovered and removed from the list of threatened and endangered species. Bald eagles continue to receive Federal protection under the Eagle Act and the MBTA.

Bald eagle distribution varies seasonally; eagles that nest in southern latitudes frequently move northward in late spring and early summer, often summering as far north as Canada. Most eagles that breed at northern latitudes migrate southward during winter or to coastal areas where waters remain unfrozen. Migrants frequently concentrate in large numbers at sites where food is abundant and they often roost together communally. In some cases, concentration areas are used year-round: in summer by southern eagles and in winter by northern eagles.

Bald eagles may occur throughout West Virginia during the winter. Active nest sites, while most numerous in the Eastern Panhandle, have been documented in Grant, Greenbrier, Hampshire, Hancock, Hardy, Jefferson, Mineral, Morgan, Pendleton, Pocahontas, Summers, and Taylor counties. During the breeding season, bald eagles are sensitive to a variety of human activities. However, not all bald eagle pairs react to human activities in the same way. Some pairs nest successfully just dozens of yards from human activity, while others abandon nest sites in response to activities much farther away. This variability may be related to a number of factors, including visibility, duration, noise levels, extent of the area affected by the activity, prior experiences with humans, and tolerance of the individual nesting pair.

In most of West Virginia, nest building typically occurs between early December and early March, followed by egg laying/incubation between late January and early May, hatching/rearing of young between late February and early July, and fledging of young between late May and late August. These breeding stages may occur up to two weeks earlier in the Eastern Panhandle of West Virginia. The species' relative sensitivity during various stages of the breeding season, and recommendations for avoiding or minimizing impacts to nesting bald eagles are outlined in Appendix D. If bald eagle nests are found in the vicinity of any activities carried out under this agreement, the WVFO should be notified of the location and status of the nest, and Dominion should coordinate with the WVFO in implementing the Service's *Bald Eagle Management Guidelines* (see Appendix D).

While the Service's goal is to avoid take of eagles, we recognize that take may occur despite efforts to avoid it. Toward that end, the Service published new regulations for eagle permits on September 11, 2009 (74 *Federal Register* 46836-46879), which became effective on November

10, 2009. The new regulations allow for applications for permits for the types of take anticipated by particular projects or activities. The WVFO is available to work with Dominion to develop appropriate avoidance, minimization and mitigation options or to respond to permit requests, if needed.

#### **IX. Effects of the Action**

Effects of the action must be considered to determine the impact of the proposed activities on the conservation and recovery of federally listed species. Effects of the action include the direct, indirect, and cumulative effects of an action on the species or critical habitat. Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur. Cumulative effects are those effects of future State or private activities, not involving Federal activities that are reasonably certain to occur within the action area.

This program is designed to address gas pipeline activities permitted by the Corps' NWP program, which may only authorize projects that result in minimal adverse environmental effects, individually and cumulatively. Activities that result in "may affect" determinations are not authorized under the NWP program unless a Section 7(a)(2) consultation addressing the effects of the proposed activity has been completed. The activities listed in Section V, in combination with the exceptions and conditions listed in Section VI, will result in only minimal adverse environmental effects. Any activities that may result in greater than minimal adverse environmental effects may require another permit from the Corps. If this is the case, then Section 7(a)(2) consultation can occur as part of that permit process. In addition, if any activity may affect a federally listed species, then a separate consultation must be conducted.

#### **X. Annual Reporting**

Dominion shall provide the Service with an annual report for all projects conducted under this Agreement so that the Service may evaluate the effects of these activities, if any, on federally listed species in West Virginia. All projects conducted under this Agreement should be reported to the Service's WVFO by September 15 of each year the Agreement is in place.

The annual report should be submitted in a spreadsheet format and shall include the following information:

1. Dominion's Project Number and Name;
2. Type of project;
3. County in which the project occurred and the name of the nearest town;
4. Date the project was completed;
5. Names of aquatic resources (wetlands or streams) impacted by or immediately adjacent to the project, if any;
6. Acreage of forested habitat removed by the project, if any; and,
7. Total number of projects completed under this program during the reporting period.

#### **XI. Expiration Date**



This Programmatic Agreement will be valid for the period of 5 years from its full execution. Either the Service or Dominion may revisit this Agreement at any time and update it if new information becomes available.

**XII. Signatures of Authorizing Officials**

*Laura Hill*  
\_\_\_\_\_  
for John E. Schmidt, Field Supervisor  
West Virginia Field Office  
U.S. Fish and Wildlife Service

9-17-2013  
Date

*Jeffrey L. Barger*  
\_\_\_\_\_  
Jeffrey L. Barger, VP Pipeline Operations  
Dominion Transmission, Inc.

10-2-13  
Date

*Mark E. Barnes*  
\_\_\_\_\_  
Mark E. Barnes, Director Gas Operations  
Dominion Hope

10-8-2013  
Date



Known and Potential Distribution of Federally Listed Endangered and Threatened Species and Proposed Species in West Virginia

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIBUTION
<b>MAMMALS</b>			
Cougar, eastern	<i>Felis concolor cougar</i>	E	May occur throughout the entire state. However, this species may be extinct or extirpated and there have been no documented, verified occurrences in WV in over 100 years.
Bat, Indiana	<i>Myotis sodalis</i>	E	May occur throughout the state. Known hibernacula (winter habitat) in Fayette, Greenbrier, Mercer, Monroe, Pendleton, Pocahontas, Preston, Randolph, and Tucker Counties. The Indiana bat may use abandoned mine portals (confirmed in the New River Gorge National River, Fayette County) or occupy summer habitat throughout the entire state. Maternity activity confirmed in Boone, Fayette, Ohio, Tucker, and Wetzel Counties. Critical habitat: Hellhole Cave, Pendleton County. Two Conservation Areas are located in Boone County.
Bat, Virginia big-eared	<i>Corynorhinus (=Plecotus) townsendii virginianus</i>	E	Known summer or winter caves located in Grant, Pendleton, Randolph, Tucker and Counties. Also known to utilize abandoned mine portals in Fayette County. May also occur in mine portals and caves throughout the state, particularly in Hardy, Kanawha, Mercer, Monroe, Nicholas, Preston, Raleigh, Summers, and Wyoming Counties. Critical habitat: Hellhole Cave, Cave Mountain Cave, Hoffman School Cave, and Sinnitt/Thorn Mountain Cave, Pendleton County; Cave Hollow/Arbogast Cave, Tucker County.
<b>AMPHIBIANS</b>			
Cheat Mountain salamander	<i>Plethodon nettingi</i>	T	Grant, Pendleton, Pocahontas, Randolph, and Tucker Counties.
<b>FISHES</b>			
Diamond darter	<i>Crystallaria cincotta</i>	E	Clay and Kanawha Counties - Elk River.

E = Endangered; T = Threatened; P = Proposed

Updated March 2013

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIBUTION
<b>CRUSTACEANS</b>			
Madison Cave isopod	<i>Antrolana lira</i>	T	Known in Jefferson County and may potentially also occur in Berkeley County.
<b>MOLLUSKS</b>			
Mussel, clubshell	<i>Pleurobema clava</i>	E	Braxton, Clay and Kanawha Counties – Elk River and the lower ½ mile of these tributaries: Birch River, Blue Creek, and Laurel Creek; Harrison and Lewis Counties – Hackers Creek; Doddridge County – Meathouse Fork and the lower ½ mile of these tributaries: Toms Fork; Doddridge, Pleasants, and Tyler Counties – Middle Island Creek and the lower ½ mile of these tributaries: Arnold Creek, Bluestone Creek, Buckeye Creek, Indian Creek, McKim Creek, Point Pleasant Creek, Sancho Creek; Doddridge, Ritchie, and Wirt Counties - South Fork Hughes River and the lower ½ mile of these tributaries: Bone Creek, Indian Creek, Leatherbark Creek, Otterslide Creek, Slab Creek, and Spruce Creek.
Mussel, fanshell	<i>Cyprogenia stegaria</i> (= <i>irrorata</i> )	E	Fayette, Kanawha, Mason and Putnam Counties - Kanawha River; Cabell, Jackson, Mason, Pleasants, Tyler, Wayne, Wetzel, and Wood Counties - Ohio River.
Mussel, James spiny	<i>Pleurobema</i> (= <i>Canthyria</i> ) <i>collina</i>	E	Monroe County – Cove Creek, South Fork of Potts Creek, and Potts Creek.
Mussel, pink mucket	<i>Lampsilis abrupta</i> (= <i>orbiculata</i> )	E	Braxton, Clay and Kanawha Counties - Elk River and the lower ½ mile of these tributaries: Birch River, Blue Creek, and Laurel Creek; Fayette, Kanawha, Mason, and Putnam Counties - Kanawha River; Cabell, Jackson, Mason, Pleasants, Tyler, Wayne, Wetzel, and Wood Counties - Ohio River.
Mussel, northern riffleshell	<i>Epioblasma torulosa</i> <i>rangiana</i>	E	Braxton, Clay and Kanawha Counties – Elk River and the lower ½ mile of these tributaries: Birch River, Blue Creek, and Laurel Creek.
Mussel, rayed bean	<i>Villosa fabalis</i>	E	<u>Braxton, Clay and Kanawha Counties</u> – Elk River and the lower ½ mile of these tributaries: Birch River, Blue Creek, and Laurel Creek; <u>Doddridge, Pleasants, and Tyler Counties</u> – Middle Island Creek and the lower ½ mile of these tributaries: Arnold Creek, Bluestone Creek, Buckeye Creek, Indian Creek, McKim Creek, Point Pleasant Creek, and Sancho Creek.

E = Endangered; T = Threatened; P = Proposed

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COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIBUTION
<b>MOLLUSKS</b>			
Mussel, sheepnose	<i>Plethobasus cyphus</i>	E	<u>Fayette and Kanawha, Mason and Putnam Counties</u> - Kanawha River; <u>Cabell, Jackson, Mason, Pleasants, Tyler, Wayne, Wetzel, and Wood Counties</u> – Ohio River.
Mussel, spectacle case	<i>Cumberlandia monodonta</i>	E	Fayette, Kanawha, Mason and Putnam Counties - Kanawha River.
Mussel, snuffbox	<i>Epioblasma triquetra</i>	E	<u>Braxton County</u> – Cedar Creek, Elk River, and Little Kanawha River; <u>Cabell County</u> – Ohio River; <u>Calhoun County</u> – Beech Fork, Henry’s Fork, Steer Creek, and West Fork Little Kanawha River; <u>Clay County</u> - Elk River; <u>Doddridge County</u> – Arnold Creek, Bluestone Creek, Bone Creek, Buckeye Creek, Indian Creek, Leatherbark Creek, McElroy Creek, McKim Creek, Meathouse Fork, Middle Island Creek, Otterslide Creek, Point Pleasant Creek, Sancho Creek, Slab Creek, South Fork Hughes River, Spruce Creek, and Toms Fork; <u>Gilmer County</u> – Cedar Creek, Fink Creek, Leading Creek, Little Kanawha River, and Steer Creek; <u>Harrison County</u> – West Fork River and Hackers Creek; <u>Jackson County</u> – Ohio River; <u>Kanawha County</u> – Big Sandy Creek and Elk River; <u>Lewis County</u> – Fink Creek, Hackers Creek, Leading Creek and West Fork River; <u>Marion County</u> - West Fork River; <u>Marshall County</u> – Fish Creek; <u>Mason County</u> – Ohio River; <u>Monongalia County</u> – Dunkard Creek; <u>Pleasants County</u> – Arnold Creek, Bluestone Creek, Buckeye Creek, Indian Creek, McKim Creek, Middle Island Creek, Ohio River, Point Pleasant Creek, Sancho Creek, and Sugar Creek; <u>Ritchie County</u> – Addis Run, Bonds Creek, Devilhole Creek, Gillespie Run, Hughes River, North Fork Hughes River, South Fork Hughes River, and Spruce Creek; <u>Roane County</u> – Bone Creek, Henry’s Fork, Indian Creek, Leatherbark Creek, Otterslide Creek, Reedy Creek, Slab Creek, Spring Creek, Spruce Creek, and South Fork Hughes River; <u>Roane County</u> – Reedy Creek, Spring Creek, and West Fork Little Kanawha River; <u>Tyler County</u> – Arnold Creek, Bluestone Creek, Buckeye Creek, Indian Creek, McElroy Creek, McKim Creek, Middle Island Creek, Ohio River, Point Pleasant Creek, and Sancho Creek; <u>Wetzel County</u> – Fishing Creek and Ohio River; <u>Wirt County</u> – Addis Run, Bonds Creek, Bone Creek, Devilhole Creek, Gillespie Run, Goose Creek, Hughes River, Indian Creek, Leatherbark Creek, Little Kanawha River, North Fork Hughes River, Otterslide Creek, Reedy Creek, Slab Creek, South Fork Hughes River, Spring Creek, Spruce Creek, and West Fork Little Kanawha River; <u>Wood County</u> - Little Kanawha River and Ohio River.
Mussel, tubercled-blossom pearly	<i>Epioblasma (=Dysnomia) torulosa torulosa</i>	E	Fayette, Kanawha, Mason, and Putnam Counties - Kanawha River. May be extinct.
Snail, flat-spined three-toothed land	<i>Triodopsis platysayoides</i>	T	Monongalia and Preston Counties, including both sides of Cheat River Gorge.

E = Endangered; T = Threatened; P = Proposed

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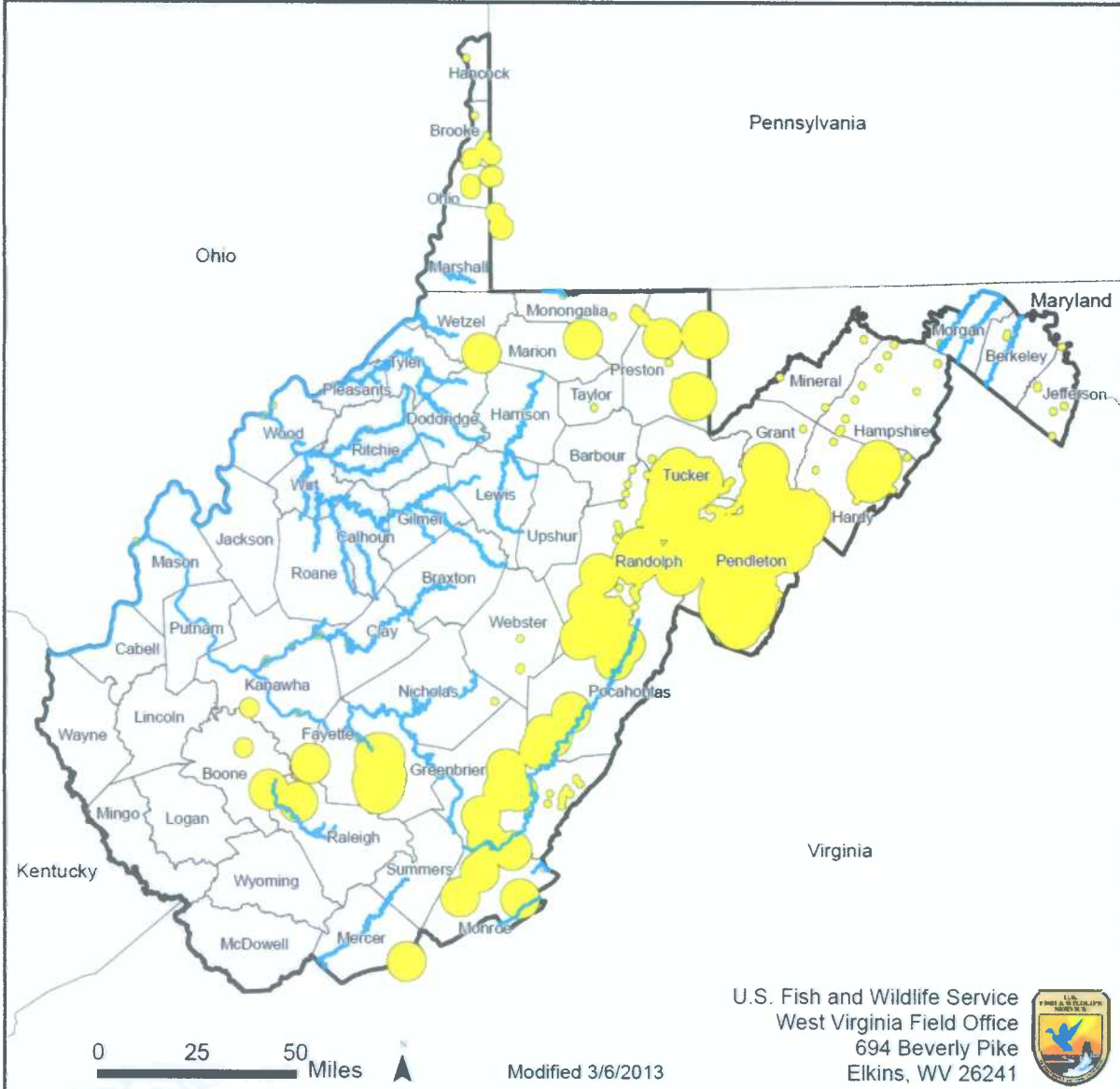
COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIBUTION
<b>PLANTS</b>			
Harperella	<i>Ptilimnium nodosum</i>	E	Berkeley County – Back Creek; Morgan County – Cacapon River, Potomac River, and Sleepy Creek.
Northeastern bulrush	<i>Scirpus ancistrochaetus</i>	E	Known in Berkeley and Hardy Counties and may potentially also occur in Hampshire, Mineral, Morgan, and Pendleton Counties.
Running buffalo clover	<i>Trifolium stoloniferum</i>	E	Known in Barbour, Brooke, Fayette, Pocahontas, Randolph, Webster, and Tucker Counties. May potentially also occur in Monongalia and Preston Counties.
Shale barren rock cress	<i>Boechera (=Arabis) serotina</i>	E	Greenbrier, Hardy, and Pendleton Counties.
Small whorled pogonia	<i>Isotria medeoloides</i>	T	Greenbrier County.
Virginia spiraea	<i>Spiraea virginiana</i>	T	Fayette County – Gauley River, Meadow River, and New River; Greenbrier County – Greenbrier River and Meadow River; Mercer County – Bluestone River; Nicholas County – Gauley River and Meadow River; Pocahontas County – Greenbrier River; Raleigh County – Marsh Fork River, Dingess Branch, and Millers Camp Branch; and Summers County – Bluestone River. May also potentially occur in Upshur County.

E = Endangered; T = Threatened; P = Proposed

Updated March 2013

Appendix B.

## Distribution of Federally Listed Threatened and Endangered Species in West Virginia<sup>1, 2</sup>



- Waterways supporting federally listed aquatic species
- Habitat buffers around known occurrences of other federally listed species<sup>2</sup>

1. All forested areas in West Virginia are considered potential summer habitat for the endangered Indiana bat. Please contact this office regarding any projects, anywhere in the state, that will require clearing of 17 acres or more of forest.

2. Includes nest sites of bald eagles, which are not listed under the Endangered Species Act. However they continue to receive Federal protection under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

## Appendix C.

### Aquatic Habitats Supporting Federally listed Endangered and Threatened Species, and Candidate Species in West Virginia (Updated August 2013)

There are fifteen federally listed endangered and threatened species that are associated with specific aquatic habitats in West Virginia. These include one endangered fish – the diamond darter (*Crystallaria cincotta*); ten endangered freshwater mussels - clubshell (*Pleurobema clava*), fanshell (*Cyprogenia stegaria*), James spiny mussel (*Pleurobema collina*), northern riffleshell (*Epioblasma torulosa rangiana*), pink mucket pearl mussel (*Lampsilis abrupta*), rayed bean (*Villosa fabilis*), sheepnose (*Plethobasus cyphus*), snuffbox (*Epioblasma triquetra*), spectaclecase (*Cumberlandia monodonta*), and tubercled-blossom pearl mussel (*Epioblasma torulosa torulosa*); two endangered plants - Harperella (*Ptilimnium nodosum*) and northeastern bulrush (*Scirpus ancistrochaetus*); one threatened plant - Virginia spiraea (*Spiraea virginiana*); and one threatened crustacean – Madison Cave isopod (*Antrolana lira*). Nine other listed species not associated with specific aquatic habitats also occur in West Virginia. Those species are not addressed here.

The aquatic habitats below, listed alphabetically within the two U.S. Army Corps of Engineers (Corps) regulatory districts that operate in West Virginia (Huntington and Pittsburgh districts), represent the most current information on the known and potential distribution of the federally listed species described above. Prior to conducting any activities that could result in adverse impacts to these aquatic habitats (e.g., projects that involve the placement of rock or other fill material into or adjacent to these habitats, the withdrawal or diversion of water, projects that could introduce sediment or toxic chemicals into waterways, or which could alter water temperature, streamside vegetation, etc.), please contact the U.S. Fish and Wildlife Service, West Virginia Field Office, at (304) 636-6586. To determine if a Corps permit is required for activities in or near these or other aquatic habitats in West Virginia, please contact the Huntington District at (304) 399-5710 or the Pittsburgh District at (412) 395-7152.

#### **U.S. Army Corps of Engineers Huntington District**

1. Big Sandy Creek: Kanawha County: Snuffbox.
2. Bluestone River: Mercer and Summers Counties (Bluestone Gorge to slackwater of Bluestone Reservoir): Virginia spiraea.
3. Cedar Creek: Braxton and Gilmer Counties: Snuffbox.
4. Cove Creek: Monroe County: James spiny mussel.
5. Elk River: Braxton, Clay, and Kanawha Counties (Sutton Dam to slackwater below Coonskin Park), including the lower one-half mile reaches of its tributaries Birch River, Blue Creek, and Laurel Creek: Clubshell, pink mucket pearl mussel, northern riffleshell, rayed bean, and snuffbox. The Elk River also contains the diamond darter.



6. Gauley River: Fayette and Nicholas Counties (Summersville Dam to Swiss): Virginia spiraea.
7. Greenbrier River: Greenbrier and Pocahontas Counties: Virginia spiraea.
8. Henry Fork: Calhoun and Roane Counties: Snuffbox.
9. Hughes River: Ritchie and Wirt Counties, including the lower one-half mile reach of its tributary Goose Creek: Snuffbox.
10. Kanawha River: Fayette, Kanawha, Mason, and Putnam Counties: Fanshell, pink mucket pearlymussel, sheepnose, spectaclecase, and tubercled-blossum pearlymussel.
11. Leading Creek: Gilmer and Lewis Counties, including the lower one-half mile reach of its tributary Fink Creek: Snuffbox.
12. Little Kanawha River: Braxton, Calhoun, Gilmer, Wirt, and Wood Counties, including the lower one-half mile reaches of its tributaries Leading Creek (Calhoun County., different stream than 5.d. above), Pine Creek, Sand Fork, Slate Creek, Straight Creek, Tanner Creek, Tucker Creek, and Walker Creek: Snuffbox.
13. Marsh Fork River including Dingess Branch and Millers Camp Branch and associated palustrine emergent and scrub-shrub wetlands: Raleigh County: Virginia spiraea.
14. McElroy Creek: Doddridge and Tyler Counties: Snuffbox.
15. Meadow River: Fayette, Greenbrier, and Nicholas Counties: Virginia spiraea.
16. Meathouse Fork of Middle Island Creek: Doddridge County, including the lower one-half mile reach of its tributary Toms Fork: Clubshell and snuffbox.
17. Middle Island Creek: Doddridge, Pleasants, and Tyler Counties, including the lower one-half mile reaches of its tributaries Arnold Creek, Bluestone Creek, Buckeye Creek, Indian Creek, McKim Creek, Point Pleasant Creek, and Sancho Creek: Clubshell, rayed bean, and snuffbox.
18. New River (Lower): Fayette County (Route 19 to Gauley Bridge): Virginia spiraea.
19. North Fork Hughes River: Ritchie and Wirt Counties, including the lower one-half mile reaches of its tributaries Addis Run, Bonds Creek, Devilhole Creek, and Gillespie Run: Snuffbox.
20. Ohio River: Cabell, Jackson, Mason Pleasants, Tyler, Wetzel, and Wood Counties: Fanshell, pink mucket pearlymussel, sheepnose, and snuffbox.
21. Potts Creek and South Fork of Potts Creek: Monroe County: James spinymussel.

22. Reedy Creek: Roane and Wirt Counties: Snuffbox.
23. South Fork Hughes River: Doddridge, Ritchie, and Wirt Counties, including the lower one-half mile reaches of its tributaries Bone Creek, Indian Creek, Leatherbark Creek, Otterslide Creek, Slab Creek, and Spruce Creek: Clubshell and snuffbox.
24. Spring Creek: Roane and Wirt Counties: Snuffbox.
25. Steer Creek: Calhoun and Gilmer Counties: Snuffbox.
26. Sugar Creek: Pleasants County: Snuffbox.
27. West Fork Little Kanawha River: Calhoun, Roane, and Wirt Counties: Snuffbox.

**U.S. Army Corps of Engineers Pittsburgh District**

28. Back Creek: Berkeley County: Harperella.
29. Cacapon River: Morgan County: Harperella.
30. Dunkard Creek: Monongalia County: Snuffbox.
31. Fish Creek: Marshall County: Snuffbox.
32. Fishing Creek: Wetzel County: Snuffbox. Note – the mouth of Fishing Creek at the Ohio River is regulated by the Huntington District.
33. Hackers Creek (of the West Fork River): Harrison and Lewis Counties: Clubshell and snuffbox.
34. Potomac River: Morgan County (from the mouth of the Cacapon River to the mouth of Sleepy Creek): Harperella.
35. Sleepy Creek: Morgan County: Harperella.
36. West Fork River: Harrison, Lewis, and Marion Counties: Snuffbox.
37. Streams, springs, and wetlands connected to the groundwater system including caves, areas near sinkholes, and other groundwater/surface interfaces, from the Potomac River west to Opequon Creek, especially in the Rippon and Leetown Areas, and the Evitts Run Watershed: Jefferson and Berkeley Counties: Madison Cave isopod.
38. Wetlands: Berkeley and Hardy Counties: Northeastern bulrush.

Please note that although the West Virginia Department of Environmental Protection has drafted guidance and a web-based tool for water withdrawal limits related to natural gas production and other development activities, the tool has not yet been validated as adequately protective of freshwater mussels or other aquatic species under all weather and precipitation conditions. The tool should be checked daily before withdrawing significant quantities of water from any watershed known to contain freshwater mussels. Users should exercise caution and use common sense, particularly during drought or extended dry conditions, or in cases where multiple users may be withdrawing water from the same source. If a stream is low and withdrawing additional water could expose portions of the stream bottom or banks that are normally submerged, including riffle areas downstream from pools from which water is typically withdrawn, users should find a different location or water source that does not contain federally listed species. Water users should not block, dam, or divert flows, or excavate pools or otherwise create unnatural deep spots in the aquatic habitats listed above or in their direct tributaries. Use of the tool does not absolve users of liability for the loss of aquatic life, including potential violation of the Endangered Species Act if take of federally listed species occurs.

Please also note that freshwater mussels which are not federally listed are protected and managed by the State of West Virginia, Division of Natural Resources (WVDNR). The guidelines above should also be followed when conducting activities that could impact any West Virginia waterways that may support any freshwater mussels. If in doubt as to whether conditions are suitable for withdrawing water, either select another more appropriate location or contact the WVDNR at (304) 637-0245.

## Bald Eagle Management Guidelines

In June 2007, the Service determined that the bald eagle was recovered and removed it from the List of Endangered and Threatened Wildlife. The species is still protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The information below is based on the U.S. Fish and Wildlife Service's *National Bald Eagle Management Guidelines* (USFWS 2007; <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BaldEagle/NationalBaldEagleManagementGuidelines.pdf>).

### Nesting Bald Eagle Sensitivity to Human Activities

Phase	Activity	Sensitivity to Human Activity	Comments
I	Courtship and Nest Building	Most sensitive period; likely to respond negatively	Most critical time period. Disturbance is manifested in nest abandonment. Bald eagles in newly established territories are more prone to abandon nest sites.
II	Egg Laying	Very sensitive period	Human activity of even limited duration may cause nest desertion and abandonment of territory for the breeding season.
III	Incubation and Early Nestling Period (up to 4 weeks old)	Very sensitive period	Adults are less likely to abandon the nest near and after hatching. However, flushed adults leave eggs and young unattended; eggs are susceptible to cooling, loss of moisture, overheating, and predation; young are vulnerable to elements.
IV	Nestling Period (4 to 8 weeks old)	Moderately sensitive period	Likelihood of nest abandonment and vulnerability of the nestlings to elements somewhat decreases. However, nestlings may miss feedings, affecting their survival.
V	Late Nestling and Fledging Period (8 weeks old through fledging)	Very sensitive period	Gaining flight capability, nestlings 8 weeks and older may flush from the nest prematurely due to disruption and may die.

If agitated by human activities, eagles may inadequately construct or repair their nest, may expend energy defending the nest rather than tending to their young, or may abandon the nest altogether. Activities that cause prolonged absences of adults from their nests can jeopardize eggs or young. Depending on weather conditions, eggs may overheat or cool too much and fail to hatch. Unattended eggs and nestlings are subject to predation. Young nestlings are particularly vulnerable because they rely on their parents to provide warmth or shade, without which they may die as a result of hypothermia or heat stress. If food delivery schedules are interrupted, the young may not develop healthy plumage, which can affect their survival. In addition, adults startled while incubating or brooding young may damage eggs or injure their young as they

**Appendix D.**

abruptly leave the nest. Older nestlings no longer require constant attention from the adults, but they may be startled by loud or intrusive human activities and prematurely jump from the nest before they are able to fly or care for themselves. Once fledged, juveniles range up to 0.25 mile from the nest site, often to a site with minimal human activity. During this period, until about six weeks after departure from the nest, the juveniles still depend on the adults to feed them.

Disturbance, destruction, or obstruction of roosting and foraging areas can also negatively affect bald eagles. Disruptive activities in or near eagle foraging areas can interfere with feeding, reducing chances of survival. Interference with feeding can also result in reduced productivity (number of young successfully fledged). Migrating and wintering bald eagles often congregate at specific sites for purposes of feeding and sheltering. Bald eagles rely on established roost sites because of their proximity to sufficient food sources. Roost sites are usually in mature trees where the eagles are somewhat sheltered from the wind and weather. Human activities near or within communal roost sites may prevent eagles from feeding or taking shelter, especially if there are not other undisturbed and productive feeding and roosting sites available. Activities that permanently alter communal roost sites and important foraging areas can altogether eliminate the elements that are essential for feeding and sheltering eagles.

**Recommended Distances from Active Bald Eagle Nests for Activities that Entail Permanent Landscape Alterations that May Result in Bald Eagle Disturbance**

	<i>If there is no similar activity within 1 mile of the nest</i>	<i>If there is similar activity closer than 1 mile from the nest</i>
<i>If the activity will be visible from the nest</i>	660 feet (201 m). Landscape buffers are recommended.	660 feet (201 m), or as close as existing tolerated activity of similar scope. Landscape buffers are recommended.
<i>If the activity will not be visible from the nest</i>	330 feet (101 m). Clearing, external construction, and landscaping between 330 feet (101 m) and 660 feet (201 m) should be done outside breeding season.	330 (101 m) feet, or as close as existing tolerated activity of similar scope. Clearing, external construction and landscaping within 660 feet (201 m) should be done outside breeding season.

The numerical distances shown in the table are the closest the activity should be conducted relative to the nest.

## Appendix E. INDIANA BAT MIST NETTING GUIDELINES

### **2013 REVISED** **RANGE-WIDE INDIANA BAT SUMMER SURVEY GUIDELINES** May 2013

#### INTRODUCTION

The Indiana bat (*Myotis sodalis*) was originally listed as being in danger of extinction under the Endangered Species Preservation Act of 1966 (32 FR 4001, March 11, 1967), and is currently listed as endangered under the Endangered Species Act (ESA) of 1973, as amended. This survey protocol provides the U.S. Fish and Wildlife Service's (USFWS) recommended guidance on survey methodology and outlines additional reporting requirements for surveyors.

The following guidance is designed to determine whether Indiana bats are present<sup>1</sup> or likely absent at a given site during the summer (May 15 to August 15). The phased-approach, which includes coordination with the USFWS, habitat assessments, and acoustic, mist-net, radio-tracking, and emergence surveys, supersedes or supplements the 2007 Indiana Bat Mist-Netting Guidelines. Future changes to this guidance are anticipated for 2014 and will be posted on the USFWS Indiana bat survey guidance website

(<http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html>).

Please check this website to ensure use of the most current version of the guidance.

#### OBJECTIVES

The objectives of Indiana bat summer survey guidelines are to (1) standardize range-wide survey procedures; (2) maximize the potential for detection/capture of Indiana bats at a minimum acceptable level of effort; (3) minimize false positives and false negatives in the surveys; (4) ensure sufficient information is provided to the USFWS<sup>2</sup> to analyze the likely effects of a project on the species; and (5) aid in conservation efforts for the species by identifying more areas where it occurs.

#### BACKGROUND

In 2011, the USFWS developed a multi-agency team to determine whether improvements could be made to the 2007 Indiana Bat Mist-Net Protocols. The team included members of the four USFWS regions (Midwest, Northeast, Southeast, and Southwest) where Indiana bats are known to occur, representatives of state natural resource agencies from three of those four regions (Midwest, Northeast, and Southeast), and representatives from three federal agencies (U.S. Geological Survey, Department of Defense, and U.S. Forest Service). We obtained informal peer review of the draft guidelines in February 2012, gathered additional information in 2012,

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<sup>1</sup> The guidance are not intended to be rigorous enough to provide sufficient data to fully determine population size or structure.

<sup>2</sup> Coordinate with the appropriate state natural resource agencies and any involved federal agency(ies) whenever "USFWS" coordination is listed. USFWS FO(s) may direct project sponsors to state agencies for existing

occurrence information. Coordinate with your local USFWS FO(s) to understand the process for their area of jurisdiction.



and made a revised version available for public comment in 2013 [78 FR 1879, January 9, 2013, and 78 FR 9409, February 8, 2013].

We considered the best available information for all aspects of the guidance. For the minimum level of survey effort, we reviewed information from the literature on detection and occupancy rates (e.g., Duchamp et al. 2006; Yates and Muzika 2006; Amelon 2007; Romeling et al. 2012) as well as additional information provided from prior netting and acoustic surveys in the vicinity of known Indiana bat maternity colonies (unpublished technical reports from various sources). The USFWS continues to work with local, State, and Federal biologists; scientific and academic institutions; commercial organizations; and other interested parties to collect additional data on the distribution, ecology, and biology of the Indiana bat and looks forward to receiving any additional pertinent information.

## GENERAL PROCESS

Indiana bat surveys for some proposed projects will require modification (or clarification) of this guidance through coordination with the USFWS FO(s) responsible for the state(s) in which the project occurs<sup>3</sup>. If not already required by federal permit, we encourage federal action agencies and surveyors to develop a proposed survey work plan in coordination with the USFWS FO(s) so that all parties fully understand which methods will be deployed, what assumptions will be made, and what the various outcomes would be based on the results of each step. Project proponents may stop survey work at any point once an assumption or documentation of Indiana bat presence occurs. Pre-survey coordination typically will preclude the need for subsequent reviews of intermediate steps by USFWS FO(s) during the busy field season. An online directory of USFWS FO(s) is available at <http://www.fws.gov/offices/directory/listofficemap.html>. Unless otherwise agreed to by the USFWS, negative presence/probable absence survey results obtained using this guidance are valid for a minimum of two years<sup>4</sup> from the completion of the survey. If not already required by federal permit, please submit all results (negative or positive) from any phase to the USFWS FO(s). We strongly encourage this coordination as it improves the USFWS' understanding of (1) the level of survey effort underway and (2) the distribution of the species. A single report can be submitted at the end of all phases conducted for a given project.

USFWS FO(s) level coordination is also important during the survey planning process. The USFWS recognizes that there may be project-specific habitat conditions that do not lend themselves to surveying with either acoustic detectors or mist-nets even though it met the definition of suitable Indiana bat summer habitat. The guidelines that are described in this document are designed to be implemented in habitats conducive to each technique described.

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<sup>3</sup> For example, project sponsors for large acreage and/or landscape-scale projects that do not result in permanent habitat loss and would not pose an ongoing threat of lethal take, especially those proposed by land management agencies, may work with local USFWS FOs to apply different scales of surveys (broad vs. project-level) or different types of surveys, such as long-term monitoring results (e.g., forest-wide acoustic transect data) and/or targeted survey efforts (e.g., sub-sampling of large project areas), to address P/A concerns.

<sup>4</sup> The timeframe may be reduced if significant habitat changes have occurred in the area or increased based on local information.

We strongly encourage coordination with the FO(s) prior to implementation of methodologies that may not be appropriate for site-specific habitat conditions.

Because Indiana bat surveys may result in take, such surveys should only be conducted by a qualified biologist<sup>5</sup>. Generally, a recovery permit for the Indiana bat authorizes the capture of bats for identification, and handling of bats for measurements, photography, and radio transmitter attachment. Following this guidance will meet standard USFWS requirements; however, surveyors also need to ensure they meet all applicable state permitting and reporting requirements. Failure to follow the survey guidance, as written, or failure to follow a study plan which has received concurrence from the local USFWS FO(s), may result in USFWS FO recommendations for additional survey effort.

The following provides a step-by-step outline of how Indiana bat summer surveys should be conducted in 2013. Some of these steps can occur concurrently.

### **PHASE 1 – INITIAL PROJECT SCREENING**

**Step 1. Coordinate with the U.S. Fish and Wildlife Service Field Office(s)<sup>6</sup> regarding existing Indiana bat summer occurrence information.**

***[Projects located within known Indiana bat summer habitat will not proceed to Phase 2 of this process.]***

a) If a project (located within or outside of a known maternity colony home range) is already covered under an existing Endangered Species Act (ESA) incidental take authorization (e.g., HCP, BO), then no further summer surveys are needed, follow the procedures previously authorized by the USFWS FO(s).

b) If there are known Indiana bat summer occurrences (e.g., known roost trees, capture locations, foraging locations) within the project action area<sup>7</sup>; **OR**

if there are no known Indiana bat summer occurrences within the proposed project area itself, but the project area is located within a known maternity colony home range<sup>8</sup>; **OR**

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<sup>5</sup> A qualified biologist is an individual who holds a USFWS Recovery Permit (Federal Fish and Wildlife Permit) for Indiana bats in the state/region in which they are surveying and/or has been authorized by the appropriate state agency to net and handle Indiana bats. Several USFWS offices maintain lists of qualified bat surveyors, and if working in one of those states with authorizations in lieu of a Recovery Permits, the individual will either need to be on that list or submit qualifications to receive USFWS approval prior to conducting any field work.

<sup>6</sup> Coordinate with the appropriate state natural resource agencies and any involved Federal Action agencies whenever "USFWS" coordination is listed. USFWS FO(s) may direct project sponsors to state agencies for existing occurrence information. Coordinate with your local USFWS FO(s) to understand the process for their area of jurisdiction.

<sup>7</sup> The "action area" is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. [50 CFR Section 402.02]

<sup>8</sup> See USFWS Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects (Questions 4 & 5) <http://www.fws.gov/midwest/endangered/mammals/inba/WindEnergyGuidance.html>

if the project is located outside a known maternity colony home range, but is within the range of the Indiana bat (note this can change over time), then proceed to Step 2.

**Step 2. Conduct Habitat Assessment (Desktop or Field-based; see Appendix A).**

- a) If suitable summer habitat is present within the action area, then proceed to Step 3.
- b) If suitable summer habitat is absent within the action area, then no further summer surveys are necessary; however, additional coordination with the USFWS FO(s) will be necessary if Indiana bats may be present during any other season and may be affected by the proposed project.

**Step 3. Assess potential for adverse effects to Indiana bats.**

- a) If the project is not anticipated to result in adverse effects to Indiana bats (as proposed), then no further summer surveys are necessary, coordinate with the USFWS FO(s).
- b) If the project may result in adverse effects to Indiana bats but the impacts can be adequately assessed and conservation measures can be designed to minimize those effects without additional presence/absence information (this includes **all** proposed projects within known maternity colony home ranges, but may include other areas as well), then no further summer surveys are necessary, coordinate with the USFWS FO(s) regarding an assessment of the project's potential effects, development of conservation measures, and determination of the need for any ESA incidental take authorization.
- c) If the project does not meet the conditions of 3a or 3b, then proceed to Phase 2.

**PHASE 2 - PRESENCE/ABSENCE SURVEYS (NETTING OR ACOUSTIC SURVEYS)<sup>2</sup>**

During the summer of 2013, presence/probable absence of Indiana bats may be determined by conducting either Step 4 (mist-netting; see Appendix B) or Step 5 (acoustics; see Appendix C) as outlined below. It is the project proponent's choice as to which option to use. The summer survey season is from 15 May through 15 August for either survey option. If netting is chosen as the preferred P/A method and an Indiana bat(s) is captured, then surveyors may immediately begin Phase 4/radio-tracking. Project proponents must decide whether they will proceed to Phase 4 in coordination with the USFWS FO before any mist netting occurs.

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<sup>2</sup> Note: acoustic and/or mist-net surveys should be conducted in the best suitable habitat possible for each survey type to increase the likelihood of detecting/capturing Indiana bats. In some cases, the most suitable habitat for effectively conducting surveys may occur outside a project site boundary and may be sampled if landowner permission is available.

**Step 4. Conduct Mist-Netting Surveys following Regionally-based protocols<sup>10</sup>  
(see Appendix B)**

**Northeast Region<sup>11</sup> of the USFWS (CT, DE, MA, MD, NJ, NY, PA, WV, VA, VT):**

Linear projects: a minimum of 6 net nights per km (0.6 miles) of suitable summer habitat.

Non-linear projects: a minimum of 24 net nights per 123 acres (0.5 km<sup>2</sup>) of suitable summer habitat.

For example:

- 6 sites, 2 nets/site for 2 calendar nights = 24 net nights
- 4 sites, 2 nets/site for 3 calendar nights = 24 net nights
- 3 sites, 2 nets/site for 4 calendar nights = 24 net nights

Maximum of 3 nights of consecutive netting at any given net location. After 3 consecutive nights of netting at the same location, you must change net locations or wait at least 2 calendar nights before resuming netting at the same location.

- a) If no capture of Indiana bats, then no further summer surveys are necessary<sup>12</sup>.
- b) If capture of Indiana bat(s), then stop or proceed to **Phase 4** as previously decided in coordination with the FO.

**Midwest (IL, IN, IA, MI, MO and OH,), Southeast (KY, TN, NC, GA, AL, MS, and AR), and Southwest (OK) USFWS Regions:**

During the summer of 2013, the Midwest, Southeast and Southwest Regions will continue to accept results from surveys following our current Indiana Bat Mist-Netting Guidelines<sup>13</sup> for this phase. However, we encourage project sponsors to work closely with our local field offices to determine whether the addition of acoustic methods is recommended (as has been the case for several years by some field offices).

Linear projects: a minimum of 4 net nights per km (0.6 miles) of suitable summer habitat.

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<sup>10</sup> The Indiana bat populations in the Northeast Region have been most heavily impacted by white-nose syndrome to date; therefore, we recommend higher survey effort when compared to the Midwest, Southeast, and Southwest Regions.

<sup>11</sup> Map available here <http://www.fws.gov/where/>

<sup>12</sup> NOTE: For Phase 2 Presence/Absence Surveys, wherever the phrase "no further summer surveys are necessary" occurs within this document, the USFWS FO(s) is in affect assuming probable absence of Indiana bats.

<sup>13</sup> See Appendix 5 in USFWS. 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision, U.S. Fish and Wildlife Service, Fort Snelling, MN. 258 pp. Available online [http://www.fws.gov/midwest/angered/mammals/inba/inba\\_drfrecpln16ap07.html](http://www.fws.gov/midwest/angered/mammals/inba/inba_drfrecpln16ap07.html).

Non-linear projects: a minimum of 4 net nights per 123 acres (0.5 km<sup>2</sup>) of suitable summer habitat.

- 1 site, 2 nets/site for 2 calendar nights = 4 net nights

- a) If no capture of Indiana bats, then no further summer surveys are necessary.
- b) If capture of Indiana bat(s), then stop or proceed to **Phase 4** as previously decided in coordination with the FO.

**OR**

**Step 5. Conduct Acoustic Surveys<sup>14</sup> (see Appendix C)**

Linear projects: a minimum of 2 detector nights per km (0.6 miles) of suitable summer habitat.

Non-linear projects: a minimum of 6 detector nights per 123 acres (0.5 km<sup>2</sup>) of suitable summer habitat.

3 or more detector locations per 123 acre "site" shall be sampled until at least 6 detector nights has been completed over the course of at least 2 calendar nights (may be consecutive).

For example:

- 3 detectors for 2 nights each (can sample the same location or move within the site)
- 2 detectors for 3 nights each (must sample at least 3 locations [i.e., must move at least 1 of the detectors for 1 night])
- 1 detector for 6 nights (must sample at least 3 locations)

- a) Optional coarse screening - for high frequency (HF) or myotid calls (depending on available filters) or Proceed to Step 6
  - ii) If no positive detection of HF calls ( $\geq 35$  kHz) or myotid calls, no further summer surveys necessary.
  - iii) If positive detection of HF or myotid calls, then
    - (a) proceed to Step 6 for further acoustic analysis; **OR**
    - (b) assume presence of Indiana bats and coordinate with the USFWS FO(s); **OR**

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<sup>14</sup> Acoustic surveys are available as a Presence/Absence option throughout the range (i.e., Northeast, Midwest, Southeast, and Southwest Regions).

(c) assume presence and proceed to **Phase 3**.

**Step 6. Conduct Additional Acoustic Analyses for each site that had HF or Myotis calls from Step 5 or ALL sites if Step 5 was not conducted.**

Two or more of the currently available 'candidate' acoustic bat ID programs<sup>15</sup> must be used. Beginning with acoustic data from night one at each acoustic site, run each night's data for each site through a minimum of two candidate acoustic ID programs. Review results by night and site from each acoustic ID program used and flag each file indicating a positive probable detection of Indiana bats<sup>16</sup>.

- a) If no detections of probable Indiana bats by any candidate programs used in analysis, then no further summer surveys necessary.
- b) If detections of probable Indiana bats by any candidate programs used in analysis, then
  - i) proceed to **Step 7** for qualitative ID; OR
  - ii) assume presence of Indiana bats and coordinate with the USFWS FO(s); OR
  - iii) assume presence and proceed to **Phase 3**.

**Step 7. Conduct Qualitative Analysis of probable Indiana bat calls from Step 6.**

Qualitative analysis<sup>17</sup> must also include a comparison of the results of each acoustic ID program by site and night (including: number of call files flagged as probable Indiana bats by each tool used; an evaluation of other species identified by the acoustic ID program; individual file level agreements and disagreements on Indiana bats between programs; and a qualitative analysis of ALL probable Indiana bat call sequences to further evaluate that the correct ID has been recommended by the program used).

- a) If no visual confirmation of probable Indiana bats, then no further summer surveys necessary.
- b) If visual confirmation of probable Indiana bats, then
  - i) assume presence of Indiana bats and coordinate with the USFWS FO(s); OR
  - ii) assume presence and proceed to **Phase 3**.

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<sup>15</sup> Candidate programs are listed at

<http://www.fws.gov/midwest/Endangered/mammals/inba/surveys/inbaAcousticSoftware.html>

<sup>16</sup> The candidate acoustic identification programs all have implemented a maximum likelihood estimator (MLE) at this time. If the analysis of collected calls at a given site on a given night results in the probable presence of Indiana bats with high levels of certainty ( $P < 0.05$ ), then select one of the options available in Step 6b.

<sup>17</sup> Qualitative analysis of each acoustic site and night with probable detections of Indiana bats during Step 6 must include the entire night's call data and not just those files making it through the acoustic analysis tools as probable Indiana bats in Step 6.

### **PHASE 3. CONDUCT MIST-NETTING SURVEYS TO CAPTURE INDIANA BATS.**

If netting was not conducted as the P/A method, then netting may be conducted in Phase 3 to capture and characterize (e.g., sex, age, reproductive condition) the Indiana bats that are present in an area and to facilitate Phase 4 efforts. We encourage working with the FOs to develop Phase 3 netting plans based on best available information (e.g., positive acoustic locations). There are no minimum requirements for this phase as this is not a P/A phase.

- a) If no Indiana bats are captured, then coordinate with the USFWS FO.
- b) If Indiana bats are captured, then proceed to **Phase 4**.

### **PHASE 4. CONDUCT RADIO-TRACKING AND EMERGENCE SURVEYS** **(See Appendices D and E).**

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## APPENDIX A PHASE 1 SUMMER HABITAT ASSESSMENTS

Summer habitat assessments are Step 2 of Phase 1- Initial Project Screening. The information below is provided to assist applicants, consultants, and/or project proponents (hereinafter termed the "applicant") in establishing whether summer surveys for Indiana bats should be conducted. As a reminder, the first step for determining presence of Indiana bats at a given site is to determine whether there is any existing occurrence data available for the vicinity of the project from the local USFWS FO. This step can be conducted remotely via a desktop analysis (e.g., use of aerial photography). The applicant is responsible for developing and providing sufficient information as to whether potentially suitable summer Indiana bat habitat exists within a proposed project area. If suitable habitat is present, the applicant should calculate the amount and submit this to the USFWS FO(s) and determine the need for any presence/absence surveys (Phase 2). Note: if Indiana bats are present or assumed to be present during any phase, more detailed habitat information may be necessary to adequately assess the potential for impacts (see attached example Indiana Bat Habitat Assessment Datasheet). If no suitable habitat is present, no surveys are needed to assess risk during the summer. Habitat assessments for Indiana bats can be completed any time of year and applicants are encouraged to submit results and proposed Phase 2 study plans well in advance of the summer survey season.

### PERSONNEL

Habitat assessments should be completed by individuals with a natural resource degree or equivalent work experience.

### DEFINITION FOR POTENTIALLY SUITABLE SUMMER HABITAT

Suitable summer habitat for Indiana bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats<sup>18</sup> such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags greater than 5 inches dbh<sup>19</sup> (12.7 centimeter) that have exfoliating bark, cracks, crevices, and/or hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of other forested/wooded habitat. We recommend that project proponents or their

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<sup>18</sup> Non-forested habitats typically should be excluded from acreages used to establish a minimum level of survey effort for Phase 2 surveys.

<sup>19</sup> While trees <5 inches (<12.7 cm) dbh that have exfoliating bark, cracks, crevices, and/or hollows may have some potential to be male Indiana bat summer roosting habitat, the USFWS does not consider early-successional, even-aged stands of trees <5 inches dbh to be suitable roosting habitat for the purposes of this guidance. Suitable *roosting* habitat is defined as forest patches with trees of 5-inch (12.7 cm) dbh or larger. However, early successional habitat with small diameter trees may be used as foraging habitat by Indiana bats. Therefore, a project that would remove or otherwise adversely affect ≥20 acres of early successional habitat containing trees between 3 and 5 inches (7.6-12.7 cm) dbh would require coordination/consultation with the USFWS FO to ensure that associated impacts would not rise to the level of take. The USFWS may request P/A surveys if >20 acres of early successional habitat were proposed for removal.



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representatives coordinate with the appropriate USFWS Field Office to more clearly define suitable habitat for their particular region as some differences in state/regional suitability criteria may be warranted (e.g., high-elevation areas may be excluded as suitable habitat in some states).

**SUBMISSION OF HABITAT ASSESSMENT AND PHASE 2 STUDY PLAN (IF NEEDED)**

If a proposed project may affect (positively or negatively) Indiana bats and the conditions outlined in Step 3 a or b are not met, a habitat assessment report should be submitted to the appropriate USFWS FO(s) (and/or to the lead Federal Action Agency, such as the USACE, as appropriate) along with a draft study plan for the Phase 2 (acoustic or netting) survey (if suitable habitat is present). Complete reports will include the following:

1. Full names and relevant titles/qualifications of individuals (e.g., John E. Smith, Biologist II, State University, B.S. Wildlife Science 2007) completing the habitat assessment and when the assessment was conducted
2. A map and latitude/longitude or UTM clearly identifying the project location (or approximate center point) and boundaries
3. A detailed project description (if available)
4. Documentation of any known/occupied spring staging, summer, fall swarming, and/or winter habitat for Indiana bats within or near the project area
5. A description of methods used during the habitat assessment
6. A summary of the assessment findings and a completed Indiana Bat Habitat Assessment Datasheet (see attached below; use of this particular datasheet is optional)
7. Other information that may have a bearing on Indiana bat use of the project area (e.g., presence of fall or winter habitat [caves, crevices, fissures, or sinkholes, or abandoned mines of any kind], bridges and other non-tree potential summer roosts.)
8. Any other information requested by the local USFWS FO(s) related to the project

In addition, Phase 2 Study Plans should contain the following:

1. A statement as to which type of P/A surveys will be conducted (i.e., mist netting or acoustic surveys) and how the proposed survey level of effort (i.e., total # of net nights or detector nights) was calculated/determined;
2. A map depicting the proposed number of survey sites (mist netting or acoustic) and their tentative distribution throughout the project area;
3. A tentative list of surveyors names and copies of relevant federal permits (if required in the project State); and
4. A tentative survey schedule (e.g., start date, duration, end date).

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**INDIANA BAT HABITAT ASSESSMENT DATASHEET**

Project Name: \_\_\_\_\_ Date: \_\_\_\_\_  
 Township/Range/Section: \_\_\_\_\_  
 Lat Long/UTM/ Zone: \_\_\_\_\_ Surveyor: \_\_\_\_\_

Brief Project Description

Project Area				
	Total Acres	Forest Acres		Open Acres
Project				
Proposed Tree Removal (ac)	Completely cleared	Partially cleared (will leave trees)	Preserve acres- no clearing	

Vegetation Cover Types	
Pre-Project	Post-Project

Landscape within 5 mile radius
Flight corridors to other forested areas?
Describe Adjacent Properties (e.g. forested, grassland, commercial or residential development, water sources)

Proximity to Public Land
What is the distance (mi.) from the project area to forested public lands (e.g., national or state forests, national or state parks, conservation areas, wildlife management areas)?

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Use additional sheets to assess discrete habitat types at multiple sites in a project area  
Include a map depicting locations of sample sites if assessing discrete habitats at multiple sites in a project area  
A single sheet can be used for multiple sample sites if habitat is the same

<b>Sample Site Description</b>
Sample Site No.(s): _____

Water Resources at Sample Site			
<b>Stream Type (# and length)</b>	Ephemeral	Intermittent	Perennial
<b>Pools/Ponds (# and size)</b>	Open and accessible to bats?		
<b>Wetlands (approx. ac.)</b>	Permanent	Seasonal	
Describe existing condition of water sources:			

Forest Resources at Sample Site			
<b>Closures/Density</b>	Canopy (> 50%)	Midstory (20-50%)	Understory (<20%)
<b>Dominant Species of Mature Trees</b>			
<b>% Trees w/ Exfoliating Bark</b>			
<b>Size Composition of Live Trees (%)</b>	Small (3-8 in)	Med (9-15 in)	Large (>15 in)
<b>No. of Suitable Snags</b>			

1=1-10%, 2=11-20%, 3=21-40%, 4=41-60%,  
5=61-80%, 6=81-100%

Standing dead trees with exfoliating bark, cracks, crevices, or hollows. Snags without these characteristics are not considered suitable.

**IS THE HABITAT SUITABLE FOR INDIANA BATS?** \_\_\_\_\_

**Additional Comments:**

Attach aerial photo of project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations; understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

## APPENDIX B PHASE 2 or 3 MIST-NETTING

Mist-netting can be used as a presence/probable absence method (Phase 2 surveys) or it can be conducted for the purpose of attempting to capture Indiana bats after detection during acoustic presence/probable absence surveys (Phase 3 surveys). The same recommendations (e.g., season, personnel, equipment, apply for either use of mist-netting surveys).

SUMMER MIST-NETTING SEASON: May 15<sup>20</sup> – August 15

Capture of reproductive adult females (i.e., pregnant, lactating, or post-lactating) and/or young of the year during May 15 – August 15 confirms the presence of a maternity colony in the area. Since adult males and non-reproductive females have commonly been found summering with maternity colonies, radio-tracking results will be relied upon to help determine the presence or absence of a maternity colony or large concentrations of bats in the area when only males and/or non-reproductive females are captured.

### PERSONNEL

A qualified biologist(s)<sup>21</sup> must (1) select/approve mist-net set-ups in areas that are most suitable for capturing Indiana bats, (2) be physically present at each mist-net site throughout the survey period, and (3) confirm all bat species identifications. This biologist may oversee other biological technicians and manage mist-net set-ups in close proximity to one another as long as the net-check timing (i.e., every 10 minutes) can be maintained while **walking** between nets.

### COORDINATION WITH USFWS FO(s)

If not already required by federal permit, we recommend that applicants submit a draft study plan for all survey phases to the USFWS FO(s) for review and approval. Study plans should include a map/aerial photo identifying the proposed project area boundaries, suitable bat habitats and acreages within the project area, and the proposed number and tentative locations of net sites.

### EQUIPMENT

Use the finest, lowest visibility mesh mist-nets commercially available, as practicable. Currently, the finest net on the market is 75 denier, 2 ply, denoted 75/2 (Arndt and Schaez 2009); however, the 50 denier nets are still acceptable for use at this time. The finest mesh size available is approximately 1½ inches (38 millimeters).

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<sup>20</sup> Due to concerns with transmission of white-nose syndrome, some USFWS FO(s) and state natural resource agencies have delayed the start of the Indiana bat summer field survey season/mist-netting until June 1. Surveyors/applicants should always coordinate with local USFWS FO(s) and state natural resource agencies before beginning surveys.

<sup>21</sup> A qualified biologist is an individual who holds a USFWS Recovery Permit (Federal Fish and Wildlife Permit) for Indiana bats in the state/region in which they are surveying and/or has been authorized by the appropriate state agency to net and handle Indiana bats. Several USFWS offices maintain lists of qualified bat surveyors, and if working in one of those states with authorizations in lieu of a Recovery Permits, the individual will either need to be on that list or submit qualifications to receive USFWS approval prior to conducting any field work.

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No specific hardware is required. There are many suitable systems of ropes and/or poles to hold nets. The system of Gardner et al. (1989) has been widely used. See NET PLACEMENT for minimum net heights, habitats, and other netting requirements that affect the choice of hardware.

To minimize potential for disease transmission, any equipment that comes in contact with bats should be kept clean and disinfected, following approved protocols; this is particularly a concern relative to white-nose syndrome (WNS). Disinfection of equipment to avoid disease transmission (e.g., WNS) is required; protocols are posted at <http://www.whitenosesyndrome.org/>. Federal and state permits may also have specific equipment restrictions and disinfection requirements.

MINIMUM PRESENCE/ABSENCE MIST-NETTING LEVEL OF EFFORT (PHASE 2)

**Step 4. Conduct Mist-Netting Surveys following Regionally-based protocols<sup>22</sup>**

**Northeast Region<sup>23</sup> of the USFWS (CT, DE, MA, MD, NJ, NY, PA, WV, VA, VT):**

Linear projects: a minimum of 6 net nights per km (0.6 miles) of suitable summer habitat.

Non-linear projects: a minimum of 24 net nights per 123 acres (0.5 km<sup>2</sup>) of suitable summer habitat.

For example:

- 6 sites, 2 nets/site for 2 calendar nights = 24 net nights
- 4 sites, 2 nets/site for 3 calendar nights = 24 net nights
- 3 sites, 2 nets/site for 4 calendar nights = 24 net nights

Maximum of 3 nights of consecutive netting at any given net location. After 3 consecutive nights of netting at the same location, you must change net locations or wait at least 2 calendar nights before resuming netting at the same location.

- a) If no capture of Indiana bats, then no further summer surveys are necessary<sup>24</sup>.
- b) If capture of Indiana bat(s), then stop or proceed to **Phase 4** as previously decided in coordination with the FO(s).

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<sup>22</sup> The Indiana bat populations in the Northeast Region have been most heavily impacted by white-nose syndrome; therefore, we recommend higher survey effort when compared to the Midwest, Southeast, and Southwest Regions.

<sup>23</sup> Map available here <http://www.fws.gov/where/>

<sup>24</sup> NOTE: For Phase 2 Presence/Absence Surveys, wherever the phrase "no further summer surveys are necessary" occurs within this document, the USFWS FO(s) is in affect assuming probable absence of Indiana bats.

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**Midwest (IL, IN, IA, MI, MO and OH,), Southeast (KY, TN, NC, GA, AL, MS, and AR), and Southwest (OK) USFWS Regions:**

During the summer of 2013, the Midwest, Southeast and Southwest Regions will continue to accept results from surveys following our current Indiana Bat Mist-Netting Guidelines<sup>25</sup> for this phase. However, we encourage project sponsors to work closely with our local field offices to determine whether the addition of acoustic methods is recommended (as has been the case for several years by some field offices).

Linear projects: a minimum of 4 net nights per km (0.6 miles) of suitable summer habitat.

Non-linear projects: a minimum of 4 net nights per 123 acres (0.5 km<sup>2</sup>) of suitable summer habitat.

- 1 site, 2 nets/site for 2 calendar nights = 4 net nights
- a) If no capture of Indiana bats, then no further summer surveys are necessary.
- b) If capture of Indiana bat(s), then stop or proceed to **Phase 4** as previously decided in coordination with the FO(s).

**MIST-NETTING SURVEYS TO CAPTURE INDIANA BATS AFTER ACOUSTICS WERE USED AS P/A METHOD (PHASE 3)**

If netting was not conducted as the P/A method, then netting may be conducted to capture and characterize (e.g., sex, age, reproductive condition) the Indiana bats (documented through the Phase 2 acoustic P/A survey) present in an area and to facilitate Radio-tracking (Phase 4) efforts. We encourage working with the FO(s) to develop Phase 3 netting plans based on best available information (e.g., positive acoustic locations). There are no minimum requirements for this phase as this is not a P/A phase.

- a) If no Indiana bats are captured, then coordinate with the USFWS FO.
- b) If Indiana bats are captured, then proceed to **Phase 4** as previously decided in coordination with the FO(s).

**NET PLACEMENT**

Potential travel corridors (e.g., streams, logging trails) typically are the most effective places to net (although other places may also be productive; see Carroll et al. 2002). Place nets approximately perpendicular across the corridor. Nets should fill the corridor from side to side, extending beyond the corridor boundaries when possible, and from stream (or ground) level up

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<sup>25</sup> See Appendix 5 in USFWS. 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision, U.S. Fish and Wildlife Service, Fort Snelling, MN. 258 pp. Available online [http://www.fws.gov/midwest/endangered/mammals/inba/inba\\_drftrecpln16ap07.html](http://www.fws.gov/midwest/endangered/mammals/inba/inba_drftrecpln16ap07.html).

## APPENDIX B PHASE 2 or 3 MIST-NETTING

to the overhanging canopy. Nets of varying widths and heights may be used as the situation dictates. A typical set is at least 5 m to 9 m high consisting of two or more nets stacked on top one another and from 6 m to 18 m wide. If netting over water, ensure there is enough space between the net and the water so that captured bats will not get wet.

Occasionally it may be necessary or desirable to net where a suitable corridor is lacking. The typical equipment described in the section above may be inadequate for these situations, requiring innovation on the part of the surveyor (see Humphrey et al. 1968). See Kiser and MacGregor (2005) for additional discussion about net placement.

Although no minimum spacing between mist-nets is being specified, surveyors should distribute net set-ups throughout suitable habitat. Net set-ups can be repeatedly sampled throughout the project, but generally no more than two nights at a single location is recommended. In addition, changing locations within a project area may improve capture success (see Robbins et al. 2008; Winhold and Kurta 2008). Photo-document placement of nets.

### SURVEY PERIOD

The survey period shall begin at sunset<sup>26</sup> and continue for at least 5 hours (longer survey periods may also improve success).

### CHECKING NETS

Each net set-up should be checked approximately every 10 minutes, never exceeding 15 minutes (Gannon et al. 2007). If surveyors monitor nets continuously, take care to minimize noise, lights and movement near the nets. Monitoring the net set-up continuously with a bat detector (ideally using ear phones to avoid alerting bats) can be beneficial: (a) bats can be detected immediately when they are captured, (b) prompt removal from the net decreases stress on the bat and potential for the bat to escape (MacCarthy et al. 2006), and (c) monitoring with a bat detector also allows the biologist to assess the effectiveness of each net placement (i.e., if bats are active near the net set-up but avoiding capture), which may allow for adjustments that will increase netting success on subsequent nights. There should be no other disturbance near the nets, other than to check nets and remove bats. Biologists should be prepared to cut the net if a bat is severely entangled and cannot be safely extracted within 3 or 4 minutes (CCAC 2003; Kunz et al. 2009).

Capture and handling are stressful for bats. Emphasis should be on minimizing handling and holding bats to as short a time as possible to achieve field study objectives. Indiana bats should not be held for more than 30 minutes after capture, unless the individual is targeted for radio-tracking. Bats targeted for radio-tracking should be released as quickly as possible, but no longer than 45 minutes after capture, or as allowed in federal and state permits. See Kunz and Kurta (1988) for general recommendations for holding bats.

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<sup>26</sup> Surveys may need to start a little earlier or later than official sunset times (i.e., at "dusk") in some settings such as a deep/dark forested valleys or ridge tops to avoid missing early-flying bats or capturing late-flying birds, respectively. Sunset tables for the location of survey can be found at:

[http://aa.usno.navy.mil/data/docs/RS\\_OneYear.php](http://aa.usno.navy.mil/data/docs/RS_OneYear.php).

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WEATHER AND LIGHT CONDITIONS

Severe weather adversely affects capture of bats. Some Indiana bats may remain active despite inclement weather and may still be captured while others in the same area become inactive. Therefore, negative surveys combined with any of the following weather conditions throughout all or most of a sampling period are likely to require an additional night of mist-netting: (a) temperatures that fall below 50°F (10°C); (b) precipitation, including rain and/or heavy fog, that exceeds 30 minutes or continues intermittently during the survey period; and (c) sustained wind speeds greater than 9 miles/hour (4 meters/seconds; 3 on Beaufort scale).

It is typically best to place net set-ups under the canopy where they are out of moonlight, particularly when the moon is half-full or greater. Net set-ups illuminated by artificial light sources should also be avoided.

DOCUMENTATION OF *MYOTIS SODALIS* CAPTURES

If an Indiana bat(s) is captured during mist-netting, protocols for radio-tracking and emergence survey requirements, as provided in Appendix D and E, respectively, should be followed. In addition, the appropriate USFWS FO(s) must be notified of the capture within 48 hours (or in accordance with permit conditions), and the sex and reproductive condition of the bat and GPS coordinates of the capture site should be provided.

Several species of bats from the genus *Myotis* share common features which can make identification difficult; Indiana bats and little brown bats (*Myotis lucifugus*) can be particularly difficult to distinguish. Photo-documentation of all bats captured and identified as Indiana bats and the first 10 little brown bats per project are requested to verify the identifications made in the field.

Photo-documentation should include diagnostic characteristics:

- a ¾-view of face showing ear, tragus, and muzzle
- view of calcar showing presence/absence of keel
- a transverse view of toes showing extent of toe hairs

If a bat from the genus *Myotis* is captured during mist netting that cannot be readily identified to the species level, then species verification may be attempted through fecal DNA analysis. Collect one or more fecal pellets (i.e., guano) from the bat in question by placing it temporarily in a holding bag (15 minutes is usually sufficient, no more than 30 minutes is recommended). The pellet (or pellets) collected should be placed in a small vial (e.g., 1.5 ml) with silica gel desiccant; pellets from each individual bat should be stored in separate vials and out of direct light. Fees charged by independent laboratories for sequencing fecal DNA samples is generally inexpensive (approx. \$50 per guano sample), however, it has been challenging to identify labs willing to consistently conduct these analyses. Any additional information and a list of available laboratories will be made available on the Indiana bat webpage on the USFWS's Region 3 website (<http://www.fws.gov/midwest/Endangered/mammals/inba/index.html>).



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SUBMISSION OF MIST-NETTING RESULTS

Provide results of netting surveys to the appropriate USFWS FO(s) in accordance with previously agreed upon<sup>27</sup> timeframes. If Indiana bats are captured, this report should also include the results of subsequent radio-tracking and emergence counts. Reports should include the following:

1. Copy of prior phase reports (if not previously provided).
2. Explanation of any modifications from original survey plan (e.g., altered net locations).<sup>28</sup>
3. Description of net locations (including site diagrams), net set-ups (include net heights), survey dates, duration of surveys, weather conditions, and a summary of findings.
4. Map identifying netting locations and information regarding net set-ups, including lat/long or UTM, individual net placement, and net spacing (i.e., include mist-netting equipment in photographs of net locations).
5. Full names of mist-netting personnel attending each mist-net site during an operation, including the federally-permitted/qualified biologist present at each mist-net site. Indicate on the field data sheet the full name of person who identified bats each night at each site.
6. Legible copies of all original mist-netting datasheets (see example datasheet below) and a summary table with information on all bats captured during the survey including, but not limited to: capture site, date of capture, time of capture, sex, reproductive condition, age, weight, right forearm measurement, band number and type (if applicable), and Reichard's wing damage index score (Reichard and Kunz. 2009).
7. Photographs of all net set-ups, as well as all Indiana bats and the first 10 little brown bats captured from each project, so that the placement of netting equipment and identification of species can be verified. Photographs of bats should include all diagnostic characteristics that resulted in the identification of the bat to the species level.
8. Any other information requested by the local USFWS FO(s) related to the project.

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<sup>27</sup> As discussed in the Introduction, we encourage coordination with USFWS FO(s) prior to implementation of any surveys to ensure that all parties agree upon the need for surveys, the methods proposed, and the decisions from various survey results.

<sup>28</sup> If the USFWS previously agreed upon the study plan we need to understand whether the revised work still accomplished the agreed upon methods

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Sample Data Sheets for Indiana Bat Surveys

Site No.		Project/Firm:					Date:									
Location:																
County:			State:		Quad:		Quadrant:									
Lat/Long (DMS):		N		W		Zone:		Surveyors:								
#	Time	Species	Age	Sex	Repro. Cond.*	RFA (mm)	Mass (g)	Net/Ht	Guano/Hair	Wing Score	Band # Type	Moon Phase:	%			
1												Rise	Set			
2												Moon:				
3												Sun:				
4																
5												Time	Temp	Sky	Wind	# Bats
6																
7																
8																
9																
10																
11																
12																
13												Avg				
14																
15																
16																
17																
18																
19																
20																
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																

\*Repro. Cond (Reproductive Condition): (P) pregnant; (L) lactating; (PL) post-lactating; (NR) non-reproductive, (TD) testes descended

### Sample Data Sheets for Indiana Bat Surveys

<b>Net Site Diagram</b>	<b>Dominant Vegetation</b>				
	1				
	2				
	3				
	4				
	5				
	<b>Net Site(s) by Habitat</b>				
	<b>Habitat</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
	River				
	Stream				
	Pond				
	Road Rut				
	Corridor				
	Cave/mine				
	<b>Total</b>				
<b>No. of Poles X Net length</b>					
<b>A</b>	=		X		
<b>B</b>	=		X		
<b>C</b>	=		X		
<b>D</b>	=		X		
<b>Other Species:</b>					
<b>Comments:</b>					

APPENDIX C  
PHASE 2 ACOUSTIC SURVEYS

SUMMER ACOUSTIC SURVEY SEASON: May 15 – August 15

PERSONNEL

**Overall:** Acoustic surveyors should have either completed one or more of the available acoustic courses/workshops (e.g., BCI, BCM, AnaBat) or be able to show similar on-the-job or academic experience.

**Detector Deployment:** Acoustic surveyors should have a working knowledge of the acoustic equipment and Indiana bat ecology. Surveyors should be able to identify appropriate detector placement sites and establish those sites in the areas that are most suitable for recording high-quality Indiana bat calls. Thus, it is highly recommended that all potential acoustic surveyors attend appropriate training and have experience in the proper placement of their field equipment.

**Acoustic Analysis:** Acoustic surveyors should have a working knowledge of the candidate acoustic analysis programs. Thus, it is highly recommended that all potential acoustic surveyors attend appropriate training and have experience in the analysis of acoustic recordings.

**Qualitative Analysis:** Individuals qualified to conduct qualitative analysis of acoustic bat calls typically have experience: (1) gathering known calls. This provides a valuable resource in understanding how bat calls change and the variation present in them; (2) identifying bat calls recorded in numerous habitat types; (3) familiarity with the species likely to be encountered within the project area; and (4) individuals must have multiple years of experience and must have stayed current with qualitative ID skills. A resume (or similar documentation) will be required to be submitted along with final survey reports for anyone making final qualitative identifications.

COORDINATION WITH USFWS FO(s)

If not already required by federal permit, we recommend that applicants submit a draft study plan for all survey phases to the USFWS FO(s) for review and approval. Study plans should include a map/aerial photo identifying the proposed project area boundaries, suitable bat habitats and acreages within the project area, and the proposed number and tentative locations of acoustic monitoring sites.

DETECTOR AND MICROPHONE REQUIRED CHARACTERISTICS

Full-spectrum and/or zero-crossing detectors are suitable for use in this survey protocol.

Directional microphones are the only microphone type accepted for acoustic surveys at this time, although omni-directional microphones that have been converted to directional microphones are also acceptable. Microphones attached to detectors via a cable are also acceptable.

APPENDIX C  
PHASE 2 ACOUSTIC SURVEYS

ACOUSTIC SAMPLING PROTOCOL

Detector/Microphone Placement

Detector/Microphone placement is critical to the successful isolation of high-quality bat call sequences for later analysis. The following locations are likely to be suitable sites for detectors/microphones, including, but not limited to: (a) forest-canopy openings; (b) near water sources; (c) wooded fence lines that are adjacent to large openings or connect two larger blocks of suitable habitat; (d) blocks of recently logged forest where some potential roost trees remain; (e) road and/or stream corridors with open tree canopies or canopy height of more than 33 feet (10 meters); and (f) woodland edges (Britzke et al. 2010). It is also important to assess the volume and area of highest sensitivity within the zone of detection around the microphone to ensure the best detector/microphone placement and orientation. If detectors/microphones are placed in unsuitable locations, effective data analysis may be impossible, and the results of the sampling effort will likely be invalid.

Many features (e.g., vegetation, water, wind turbines, high-tensile power-lines, micro-wave towers) can reduce the quality of call sequences recorded in the field and impact the surveyor's ability to record high-quality bat call sequences by causing calls to reflect off of these surfaces. The following recommendations are provided to aid surveyors in their selection of acoustic sites. If surveyors choose acoustic sites outside of these recommendations, then adequate justification for doing so should be provided with the acoustic survey report provided to the USFWS FO(s); otherwise, results from these sites will not be accepted. Surveyors should deploy detectors/microphones: (a) at least 5 feet (1.5 meters) in any direction from vegetation or other obstructions (Hayes 2000; Weller and Zabel 2002); (b) in areas without, or with minimal<sup>29</sup>, vegetation within 33 feet (10 meters) in front of the microphone; (c) parallel to woodland edges; and (d) at least 49 feet (15 meters) from known or suitable roosts<sup>30</sup> (e.g., trees/snags, buildings, bridges, bat houses, cave or mine portal entrances).

Elevating a detector greater than 1.5 meters above ground level vegetation can dramatically improve recording quality. For example, microphones can be attached horizontally to a pole to listen out into flight space, rather than just listening up from the ground. This will serve to increase the volume of airspace sampled and avoid the distortion effect of recording near the ground.

Surveyors should distribute acoustic sites throughout the project area or adjacent habitats. In most cases, acoustic sites should be at least 656 feet (200 meters) apart. If closer spacing is determined to be necessary or beneficial (e.g., multiple suitable habitats and acoustic sites immediately adjacent to each other), sufficient justification must be provided in the acoustic survey report submitted to USFWS FO(s).

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<sup>29</sup> If necessary, surveyors can remove small amounts of vegetation (e.g., small limbs, saplings) from the estimated detection cone at a site, much like what is done while setting up mist-nets. Deployment of detectors/microphones in closed-canopy locations that typically are good for mist-netting are acceptable as long as the area sampled below the canopy does not restrict the ability of the equipment's detection cone to record high-quality calls (i.e., the vegetation is outside of the detection cone).

<sup>30</sup> If the surveyor discovers a potential roost and wishes to document bat use, please refer to Appendix E for guidance on conducting emergence surveys and contact the USFWS FO(s).

## APPENDIX C PHASE 2 ACOUSTIC SURVEYS

### Verification of Deployment Location

It is recommended to temporarily attach GPS units to each detector (according to manufacturer's instructions) to directly record accurate location coordinates for each acoustic site that is paired with the acoustic data files. Regardless of technique used, accurate GPS coordinates must be generated and reported for each acoustic survey site.

### Verification of Proper Functioning

It is highly recommended that surveyors ensure acoustic detectors are functioning properly through a periodic verification of performance to factory specifications (a service currently offered or in development by several manufacturers). It may be possible that independent service bureaus would be willing to perform this service, providing that a standard test/adjustment procedure can be developed.

It is also recommended to ensure equipment is working during set-up in the field. This can be done simply by producing ultrasound (e.g., finger rubs, calibrator, or follow the equipment manufacturer's testing recommendations) in front of the microphone at survey start and survey finish. This documents that the equipment was working when deployed and when picked up (and by assumption throughout the entire period). Detector field settings (e.g., sensitivity, frequency, etc.) should follow the recommendations provided by the manufacturer. Surveyors should also save files produced by detectors (e.g., log files, status files, sensor files) as an excellent way to provide documentation when equipment was functioning within the survey period. Many types of detectors allow for setting timers that initiate and end recording sessions. This saves battery life as well as reducing the number of extraneous noise files recorded. However, if the units are visited when the timer is off, the surveyor cannot verify that the unit is functioning properly. This is particularly important in areas where no bat activity is recorded for the entire night or during the last portion of the night. In these cases, if the surveyor cannot demonstrate that the detector was indeed functioning properly throughout the survey period then the site will need to be re-sampled, unless adequate justification can be provided to the USFWS FO(s).

Selection of acoustic sites is similarly important. Suitable set-up of the equipment should result in high-quality call sequences that are adequate for species identification. Nights of sampling at individual sites that produce no bat calls may need to be re-sampled unless adequate justification (e.g., areas with significant bat population declines due to WNS) can be provided to the USFWS FO(s). Modifications of the equipment (e.g., changing the orientation) at the same location on subsequent nights may improve quantity and quality of call sequences recorded, which can be determined through daily data downloads. If modifications of the equipment do not improve call identification, then the detectors will need to be moved to a new location.



## APPENDIX C PHASE 2 ACOUSTIC SURVEYS

### Orientation

Detectors deployed near the ground (e.g., on a tripod) should be aimed 45 degrees or more above horizontal. Microphones deployed higher within the flight path/zone (e.g., on a pole) should be oriented horizontally. In some circumstances (e.g., forest openings), it might be desirable to aim a detector's microphone vertically. This has shown to record high-quality calls but precludes the use of weatherproofing for protection of the microphone, since no currently-approved weatherproofing system will adequately protect the microphone of a detector aimed vertically.

Deploy detectors at or below the lowest expected flight height of the bats but high enough above ground vegetation to avoid interference within the detection cone. Once acoustic sites are identified, photographs documenting the orientation, detection cone (i.e., "what the detector is sampling"), and relative position of the microphone should be taken for later submittal to the USFWS FO(s) as part of the acoustic survey report.

### Weather Conditions

If any of the following weather conditions exist at a survey site during acoustic sampling, note the time and duration of such conditions, and repeat the acoustic sampling effort for that night: (a) temperatures fall below 50°F (10°C) during the first 5 hours of survey period; (b) precipitation, including rain and/or fog, that exceeds 30 minutes or continues intermittently during the first 5 hours of the survey period; and (c) sustained wind speeds greater than 9 miles/hour (4 meters/second; 3 on Beaufort scale) during the first 5 hours of the survey period. At a minimum, nightly weather conditions for survey sites should be checked using the nearest NOAA National Weather Service station and summarized in the survey reports.

### Weatherproofing

Most bat detectors are not weatherproof when delivered from the factory. Recording without after-market weatherproofing is preferred as the addition of these systems may result in some signal degradation. **The decision to weatherproof detectors or not should be determined nightly based on the likelihood of precipitation in the survey area.**

For directional microphones, the use of a polyvinyl chloride (PVC) tube<sup>31</sup>, generally in the form of a 45-degree elbow the same diameter as the microphone (Britzke et al. 2010) is acceptable, if the situation requires the use of after-market weatherproofing. Attach the elbow to a weatherproof box that houses the main portion of the detector. Point the microphone into one end of the elbow and point the open end of the elbow in the direction to be monitored (generally 45 degrees to horizontal). Another option for weatherproofing detectors is to detach the microphone from the detector so that the detector can be placed in a weatherproof container but the microphone (tethered by a cable) remains unobstructed.

Other after-market weatherproofing systems may become available and approved by the USFWS provided they show that call quality and the number of calls recorded are comparable to those without weatherproofing.

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<sup>31</sup> The PVC option has only been tested with AnaBat detectors and directional microphones. It may not perform as well with other detector microphone combinations.

APPENDIX C  
PHASE 2 ACOUSTIC SURVEYS

MINIMUM LEVEL OF EFFORT

The number of acoustic survey sites required for a project will be dependent upon the overall acreage of suitable habitat proposed to be impacted by the action. To determine the acoustic survey effort, quantify the amount of suitable summer habitat within the project area.

Linear projects: a minimum of 2 detector nights per km (0.6 miles) of suitable summer habitat.

Non-linear projects: a minimum of 6 detector nights per 123 acres (0.5 km<sup>2</sup>) of suitable summer habitat.

3 or more detector locations per 123 acre "site" shall be sampled until at least 6 detector nights has been completed over the course of at least 2 calendar nights (may be consecutive).

For example:

- 3 detectors for 2 nights each (can sample the same location or move within the site)
- 2 detectors for 3 nights each (must sample at least 3 locations [i.e., must move at least 1 of the detectors for 1 night])
- 1 detector for 6 nights (must sample at least 3 locations)

The acoustic sampling period for each site must begin at sunset<sup>32</sup> and ends at sunrise each night of sampling.

ANALYSIS OF RECORDED ECHOLOCATION CALLS

**Step 5. Optional coarse screening - for high frequency (HF) or myotid calls (depending on available filters) or Proceed to Step 6.**

- a) If no positive detection of HF calls ( $\geq 35$  kHz) or myotid calls, no further summer surveys necessary.
- b) If positive detection of HF or myotid calls, then
  - i) proceed to Step 6 for further acoustic analysis; **OR**
  - ii) assume presence of Indiana bats and coordinate with the USFWS FO(s);  
**OR**
  - iii) assume presence and proceed to **Phase 3**.

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<sup>32</sup> Surveys may need to start a little earlier or later than official sunset times (i.e., at "dusk") in some settings such as a deep/dark forested valleys or ridge tops to avoid missing early-flying bats or capturing late-flying birds, respectively. Sunset tables for the location of survey can be found at:

[http://aa.usno.navy.mil/data/docs/RS\\_OneYear.php](http://aa.usno.navy.mil/data/docs/RS_OneYear.php)

APPENDIX C  
PHASE 2 ACOUSTIC SURVEYS

**Step 6. Conduct Additional Acoustic Analyses for each site that had HF or Myotis calls from Step 5 or ALL sites if Step 5 was not conducted.**

Two or more of the currently available 'candidate' acoustic bat ID programs<sup>33</sup> must be used. Beginning with acoustic data from night one at each acoustic site, run each night's data for each site through a minimum of two candidate acoustic ID programs. Review results by night and site from each acoustic ID program used and flag each file indicating a positive probable detection of Indiana bats<sup>34</sup>.

- a) If no detections of probable Indiana bats by any candidate programs used in analysis, then no further summer surveys necessary.
- b) If detections of probable Indiana bats by any candidate programs used in analysis, then
  - i) proceed to Step 7 for qualitative ID; **OR**
  - ii) assume presence of Indiana bats and coordinate with the USFWS FO(s); **OR**
  - iii) assume presence and proceed to Phase 3.

**Step 7. Conduct Qualitative Analysis of probable Indiana bat calls from Step 6.**

Qualitative analysis<sup>35</sup> must also include a comparison of the results of each acoustic ID program by site and night (including: number of call files flagged as probable Indiana bats by each tool used; an evaluation of other species identified by the acoustic ID program; individual file level agreements and disagreements on Indiana bats between programs; and a qualitative analysis of ALL probable Indiana bat call sequences to further evaluate that the correct ID has been recommended by the program used).

- a) If no visual confirmation of probable Indiana bats, then no further summer surveys necessary.
- b) If visual confirmation of probable Indiana bats, then
  - i) assume presence of Indiana bats and coordinate with the USFWS FO(s); **OR**
  - ii) assume presence and proceed to Phase 3.

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<sup>33</sup> Candidate programs are listed at

<http://www.fws.gov/midwest/Endangered/mammals/inba/surveys/inbaAcousticSoftware.html>

<sup>34</sup> The candidate acoustic identification programs all have implemented a maximum-likelihood estimator (MLE) at this time. If the analysis of collected calls at a given site on a given night results in the probable presence of Indiana bats with high levels of certainty ( $P < 0.05$ ), then select one of the options available in Step 6b.

<sup>35</sup> Qualitative analysis of each acoustic site and night with probable detections of Indiana bats during Step 6 should include the entire night's call data and not just those files making it through the acoustic analysis tools as probable Indiana bats in Step 6.

APPENDIX C  
PHASE 2 ACOUSTIC SURVEYS

SUBMISSION OF ACOUSTIC SURVEY RESULTS

Provide results of acoustic surveys to the appropriate USFWS FO(s) in accordance with previously agreed upon<sup>36</sup> timeframes. Each acoustic survey report should include the following:

1. Copy of habitat assessment (if not previously provided)
2. Explanation of any modifications from original survey plan (e.g., altered site locations)<sup>37</sup>
3. Description of acoustic monitoring sites, survey dates, duration of survey, weather conditions, and a summary of findings
4. Map identifying acoustic monitoring locations and a corresponding table including the GPS coordinates
5. Full names of all personnel conducting acoustic surveys, including those that selected acoustic sites and deployed detectors, and include copies of state and federal permits (if applicable)
6. Table with information on acoustic monitoring and resulting data, including but not limited to: detector GPS coordinates, survey dates, survey hours
7. Description of acoustic detector brand(s) and model(s) used, microphone type, use of weatherproofing, acoustic monitoring equipment settings (e.g., sensitivity, audio and data division ratios), deployment data (i.e., deployment site, habitat, date, time started, time stopped, orientation), and call analysis methods used
8. Acoustic analysis software program output/summary results by site (i.e., number of calls detected, species composition, MLE results)
9. Photographs of each acoustic site documenting the location of the detector, the orientation of the detector, and the detection cone (i.e., what the detector sampled.
10. A description of how proper functioning of bat detectors was verified
11. Any other information requested by the local USFWS FO(s) related to the project

REFERENCES

Britzke, E.R., B.A. Slack, M.P. Armstrong, and S.C. Loeb. 2010. Effects of orientation and weatherproofing on the detection of bat echolocation calls. *Journal of Fish and Wildlife Management* 1(2):136-141.

<sup>36</sup> As discussed in the Introduction, we encourage coordination with USFWS FO(s) prior to implementation of any surveys to ensure that all parties agree upon the need for surveys, the methods proposed, and the decisions from various survey results.

<sup>37</sup> If the USFWS previously agreed upon the study plan we need to understand whether the revised work still accomplished the agreed upon methods.

APPENDIX C  
PHASE 2 ACOUSTIC SURVEYS

Hayes, J. P. 2000. Assumption and practical considerations in the design and interpretation of echolocation-monitoring studies. *Acta Chiropterologica* 2:225-236.

MacKenzie, D.I., and J.A Royle. 2005. Designing occupancy studies: general advice and allocating survey effort. *Journal of Applied Ecology* 42:1105-1114.

Weller, T. J., and C. J. Zabel. 2002. Variation in bat detections due to detector orientation in a forest. *Wildlife Society Bulletin* 30:922-930.

APPENDIX D  
PHASE 4 RADIO-TRACKING

PERSONNEL

**Transmitter Attachment:** A qualified biologist<sup>38</sup> who is experienced in handling Indiana bats and attaching radio transmitters must perform transmitter attachments, as further explained in the protocol below.

**Tracking:** Biological technicians and/or a qualified biologist who is experienced in tracking transmittered bats must be present and actively involved in all tracking activities for Indiana bats as further explained in the protocol below.

METHODS

If one or more Indiana bats are captured, the following radio-tracking protocols will be applicable:

1. Biologists should coordinate in advance with USFWS FO(s) regarding recommendations for the number and distribution of transmitters (e.g., prioritization of sex/age, maximum number per site) and whether foraging data would be beneficial to collect. Also, professional judgment should be used to determine whether attachment of transmitters could compromise the health of a bat. Since the maximum holding times for Indiana bats targeted for radio-tracking is 45 minutes, or as allowed in federal and state permits, surveyors should be prepared to place transmitters on bats immediately following their capture to minimize holding times.
2. The radio transmitter, adhesive, and any other markings (e.g., wing bands) should weigh less than 5% of pre-attachment body weight (American Society of Mammalogists 1998), but must not weigh more than 10% of a bat's total body weight (Kurta and Murray 2002) and must comply with any USFWS and state permits. In all cases, the lightest transmitters capable of the required task should be used, particularly with pregnant females and volant juveniles. With pregnant bats, biologists should always use the lightest transmitter possible but no more than 5% of their expected non-pregnant weight.
3. Proposed radio telemetry equipment (e.g., receivers, antennas, and transmitters) and frequencies should be coordinated with the appropriate state natural resource agency and USFWS FO(s).
4. The qualified biologist or biological technician(s) should track all radio-tagged bats captured to diurnal roosts in accordance with permit requirements. We generally recommend tracking until the transmitter fails, fall off, or cannot be located for at least 7 days and should conduct a minimum of 2 evening emergence counts at each identified

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<sup>38</sup> A qualified biologist is an individual who holds a USFWS Recovery Permit (Federal Fish and Wildlife Permit) for federally-listed bats in the state/region in which they are surveying and/or has been authorized by the appropriate state agency to mist-net for Indiana bats. Several USFWS offices maintain lists of qualified bat surveyors, and if working in one of those states with authorizations in lieu of a Recovery Permits, the individual will either need to be on that list or submit qualifications to receive USFWS approval prior to conducting any field work.

APPENDIX D  
PHASE 4 RADIO-TRACKING

roost (See Appendix F for Emergence Survey Protocols). However, biologists are encouraged to continue radio-tracking efforts for the life of the transmitter. Biologists should contact the USFWS FO(s) immediately if they plan to cease tracking efforts before the 7-day tracking period ends. If landowner access is denied, approximate roost locations (i.e., coordinates) should be determined using triangulation.

5. Daily radio telemetry searches for roosts must be conducted during daylight hours and should be conducted until the bat(s) is located or for a minimum of 4 hours of ground or 1 hour of aerial-searching effort per tagged bat per day for 7 days. However, multiple bats captured at the same net location or nearby may be tracked simultaneously. Once a signal is detected, tracking should continue until the roost is located. At a minimum, biologists should document all ground and aerial-searching effort for all bats not recovered during radio-tracking for submittal with the survey report. For each roost identified during tracking, the biologist should complete a "USFWS Indiana Bat Roost Datasheet" (Appendix D).
6. To minimize potential for disease transmission, any equipment that comes in contact with bats should be kept clean and disinfected, following approved protocols; this is particularly a concern relative to WNS. Protocols are posted at <http://www.whitenosesyndrome.org/>. Federal and state permits may also have specific equipment restrictions and disinfection requirements.

SUBMISSION OF RADIO-TRACKING RESULTS

Phase 4 radio-tracking results should be included with the Phase 2 or 3 mist-netting report and submitted to the appropriate USFWS FO(s). Each report should include the following information related to radio-tracking efforts:

1. Copy of prior phase reports (if not previously provided)
2. Explanation of any modifications from original survey plan (e.g., number of transmitters used, frequency of transmitters changed)<sup>39</sup>
3. Map and narrative detailing all ground and aerial searching effort for all bats not recovered during radio-tracking and relative to the negotiated or agreed effort as determined by the appropriate USFWS FO(s)
4. Map summarizing Indiana bat data collected from summer surveys for the proposed project (e.g., project area boundary and results from the site habitat assessment, acoustic survey, mist-net survey, radio-tracking, and emergence surveys)
5. Full names and permit numbers of personnel who attached transmitters to Indiana bats and full names of all personnel conducting radio-tracking efforts
6. Photographs of all roosts identified during radio-tracking
7. Legible copies of all original USFWS Indiana Bat Roost Datasheets
8. Any other information requested by the local USFWS FO(s) where work was conducted

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<sup>39</sup> If the USFWS previously agreed upon the study plan we need to understand whether the revised work still accomplished the agreed upon methods

APPENDIX D  
PHASE 4 RADIO-TRACKING

REFERENCES

- American Society of Mammalogists. 1998. Guidelines for the capture, handling and care of mammals. *Journal of Mammalogy* 79:1416-1431.
- Kurta, A., and S. Murray. 2002. Philopatry and migration of banded Indiana Bats (*Myotis sodalis*) and effects of radio transmitters. *Journal of Mammalogy* 83:585-589.



APPENDIX D  
PHASE 4 RADIO-TRACKING

USFWS INDIANA BAT ROOST DATASHEET

Biologists (Full Name): \_\_\_\_\_ Date: \_\_\_\_\_

UTM: Zone \_\_\_\_\_ Easting \_\_\_\_\_ Northing \_\_\_\_\_ OR

LAT \_\_\_\_\_ LONG \_\_\_\_\_

Property Owner: \_\_\_\_\_ Phone# \_\_\_\_\_

State \_\_\_\_\_ County \_\_\_\_\_ Site # \_\_\_\_\_

Roost # \_\_\_\_\_ Roost Name: \_\_\_\_\_

*Roost Tree Data*

Species: \_\_\_\_\_ Live \_ Snag \_ Other \_

(if other, explain) \_\_\_\_\_

DBH (in or cm) \_\_\_\_\_ Total Height (ft or m) \_\_\_\_\_

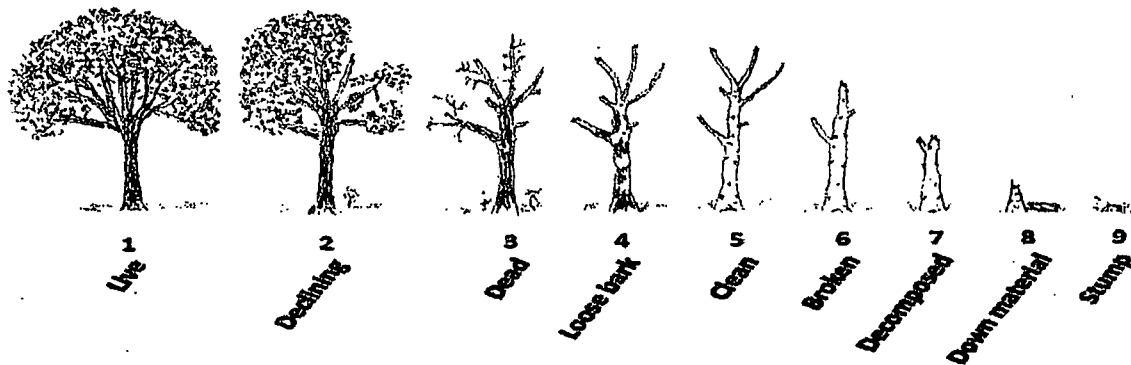
Height of roost area (if known) \_\_\_\_\_ Dist. from capture site \_\_\_\_\_

Roost position aspect (deg) \_\_\_\_\_

Exfoliating bark on bole (%) \_\_\_\_\_ Describe: sloughing \_ platy \_ tight \_

Cavities present? \_ If so, describe: \_\_\_\_\_

Roost Decay State: 1 2 3 4 5 6 7 8 9 Other



APPENDIX D  
PHASE 4 RADIO-TRACKING

Roost tree or snag canopy position: Co-Dominant \_ Suppressed \_  
Dominant \_\_\_\_\_

*Surrounding Habitat Condition*

Canopy closure at roost (%) \_\_\_\_\_

Approximate woodlot size (ac or ha) \_\_\_\_\_ Distance to non-forest (ft or m) \_\_\_\_\_

Describe forest/woodlot current condition (mature, partially cut-over, burned, insect damage, etc.) \_\_\_\_\_

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Additional Comments \_\_\_\_\_

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APPENDIX E  
PHASE 4 EMERGENCE SURVEYS

PERSONNEL

Qualified biologists<sup>40</sup>, biological technicians, and any other individuals deemed qualified by a local USFWS FO may conduct emergence surveys for Indiana bats by following the protocols below.

EMERGENCE SURVEYS FOR KNOWN INDIANA BAT ROOSTS

The following protocols should begin as soon as feasible after identification of a diurnal roost (ideally that night):

1. Bat emergence surveys should begin one half hour before sunset<sup>41</sup> and continue until at least one hour after sunset or until it is otherwise too dark to see emerging bats. The surveyor(s) should be positioned so that emerging bats will be silhouetted against the sky as they exit the roost. Tallies of emerging bats should be recorded every few minutes or as natural breaks in bat activity allow. There should be at least one surveyor per roost. Surveyors must be close enough to the roost to observe all exiting bats but not close enough to influence emergence. That is, do not stand directly beneath the roost, do not make noise or carry on a conversation, and minimize use of lights (use a small flashlight or similar to record data, if necessary). Do not shine a light on the roost as this may prevent or delay bats from emerging. Use of an infra-red, night vision, or thermal-imaging video camera or spotting scope is encouraged but not required. Likewise, use of an ultrasonic bat detector may aid in identifying the exact timing of bats emerging and may be used to help differentiate between low- and high-frequency bats species, and therefore, is strongly recommended. If multiple roosts are known within a colony, then simultaneous emergence surveys are encouraged to estimate population size. [Note: If a roost cannot be adequately silhouetted, then the local USFWS FO(s) should be contacted to discuss alternative survey methods].
2. Bat activity is affected by weather; therefore emergence surveys should not be conducted when the following conditions exist: (a) temperatures that fall below 50°F (10°C); (b) precipitation, including rain and/or fog, that exceeds 30 minutes or continues intermittently during the survey period; and (c) sustained wind speeds greater than 9 miles/hour (4 meters/second; 3 on Beaufort scale).
3. Surveyors should use the attached (or similar) "Bat Emergence Survey Datasheet".

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<sup>40</sup> A qualified biologist is an individual who holds a USFWS Recovery Permit (Federal Fish and Wildlife Permit) for federally-listed bats in the state/region in which they are surveying and/or has been authorized by the appropriate state agency to mist-net for Indiana bats. Several USFWS offices maintain lists of qualified bat surveyors, and if working in one of those states with authorizations in lieu of a Recovery Permits, the individual will either need to be on that list or submit qualifications to receive USFWS approval prior to conducting any field work.

<sup>41</sup> Surveys may need to start a little earlier or later than one half hour before official sunset times (i.e., before "dusk") in some settings such as deep/dark forested valleys or ridge tops, respectively. Sunset tables for the location of survey can be found at: [http://aa.usno.navy.mil/data/docs/RS\\_OneYear.php](http://aa.usno.navy.mil/data/docs/RS_OneYear.php)

APPENDIX E  
PHASE 4 EMERGENCY SURVEYS

4. Surveyors should also complete an "Indiana Bat Roost Datasheet" for each roost known to be used by one or more Indiana bats (see Appendix D for an example).
5. Completed datasheets should be included in reports prepared for the USFWS.

EMERGENCY SURVEYS FOR POTENTIAL INDIANA BAT ROOSTS

In some limited cases (e.g., individual hazard tree removal during the active season), surveyors may have the option of conducting emergency surveys for individual potential Indiana bat roosts to determine use prior to removal. The following protocol applies to these surveys:

1. Consult with the local USFWS FO(s) to determine whether a tree(s) that needs to be felled/ cleared may be potential roosting habitat for Indiana bats and whether conducting an emergency survey is an appropriate means of avoiding take of Indiana bats<sup>42</sup>. In general, the USFWS only approves of conducting emergency surveys as a means of avoiding direct take of bats for projects that only affect a very small number of potential roosts (e.g., less than or equal to 10)<sup>43</sup>. An online directory of USFWS offices is available at: <http://www.fws.gov/offices/directory/listofficemap.html>.
2. If the USFWS FO(s) approves/concurs with Step 1, then follow the emergency guidelines for Emergency Surveys for Known Indiana Bat Roosts (above) to determine if any bats are roosting in the tree(s).
3. At the conclusion of the emergency survey:
  - a. If no bats were observed emerging from the potential roost(s), then it may be felled immediately. If safety concerns dictate that a tree cannot be felled immediately (i.e., in the dark), then the tree(s) should be felled as soon as possible after sunrise on the following day. If a tree is not felled during the daytime immediately following an emergency survey, then the survey has to be repeated, because bats may switch roosts on a nightly basis. Immediately after the tree is felled, a visual inspection of the downed tree must be completed to ensure that no bats were present, injured, or killed. The USFWS FO(s) should be contacted immediately, if bats are discovered during this inspection.

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<sup>42</sup> If a potential bat roost tree poses an imminent threat to human safety or property, then emergency consultation procedures should be followed as appropriate. (50 CFR §402.05). If a hazard tree does not pose an imminent threat, then the USFWS requests that it be felled during the bat's inactive season (i.e., generally from October – March, but contact the FO for specific dates for your area.) When possible, felling of potential roost/hazard trees should be avoided during the primary maternity period (June – July) to avoid potential adverse effects to non-volant pups.

<sup>43</sup> Areas containing >10 hazard trees will be assessed by the USFWS on a case-by-case basis with the project proponent.

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- b. If **1 or more** bats (regardless of species, because species identification cannot reliably be made during visual emergence counts alone) are observed emerging from the roost, then it should **not** be felled, and the USFWS FO(s) should be contacted the next working day for further guidance.

SUBMISSION OF EMERGENCE SURVEY RESULTS

Emergence survey results should be included with the mist-netting survey report, unless the survey was completed as an evaluation of potential roosts, and should be submitted to the appropriate USFWS FO(s) for review. Each survey report should include the following information related to emergence survey efforts:

1. Copy of prior phase reports (if not previously provided)
2. Explanation of any modifications from the Phase 4 emergence count study plan (e.g., number of potential roosts surveyed), if applicable
3. Summary of roost emergence data
4. Map identifying location of roost(s) identified during radio-tracking and/or emergence surveys for Indiana bat(s) including GPS coordinates
5. Full names of personnel present during emergence survey efforts and who conducted emergence surveys of roosts
6. Photographs of each identified roost
7. Copies of all "Emergence Survey" and "Indiana Bat Roost" datasheets
8. Any other information requested by the local USFWS FO(s) where work was conducted
9. Copy of the pre-approved site-specific written authorization from USFWS and/or state natural resource agency (if required)



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PHASE 4 EMERGENCE SURVEYS

Site Name/ #: \_\_\_\_\_ Roost Name/ #: \_\_\_\_\_

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Time	Number of Bats Leaving Roost*	Comments / Notes
Total Number of Bats Observed Emerging from the Roost/Feature During the Survey:		

\* If any bats return to the roost during the survey, then they should be subtracted from the tally.

**Describe Emergence:** Did bats emerge simultaneously, fly off in the same direction, loiter, circle, disperse, etc. If a radio-tagged bat was roosting in the tree, at what time did it emerge?

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**Appendix F. ALPHABETICAL LIST OF SURVEYORS QUALIFIED\* TO CONDUCT  
INDIANA BAT SURVEYS IN WEST VIRGINIA - Updated December, 2012**

<p>BHE Environmental, Inc. 11733 Chesterdale Road Cincinnati, OH 45246 phone: 513-326-1500 fax: 513-326-1178</p>	<p>URS Corporation Contact: Ryan Leiberher 4507 North Front Street, Suite 200 Harrisburg, PA 17110 phone: 717-635-7901 email: <a href="mailto:ryan_leiberher@urscorp.com">ryan_leiberher@urscorp.com</a></p>
<p>Environmental Solutions and Innovations, LLC Contact: Dr. Virgil Brack, Jr. 4525 Este Avenue Cincinnati, OH 45232 phone: 513-451-1777 fax: 513-235-1076 email: <a href="mailto:vbrack@environmentalsi.com">vbrack@environmentalsi.com</a></p>	<p>Vesper Environmental, LLC Contact: Michael Cooper 108 Laurel Street Hurley, NY 12443 phone: 845-594-6718 email: <a href="mailto:mcooper@vesperenvironmental.com">mcooper@vesperenvironmental.com</a></p>
<p>Mr. John MacGregor 102 Restk Court Nicolsville, KY 40356 phone: 859-885-4363 email: <a href="mailto:jrmacgregor@bigfoot.com">jrmacgregor@bigfoot.com</a></p>	<p>Apogee Environmental &amp; Archaeological, Inc. Contact: Joel Beverly PO Box 338 Ermine, KY 41815 phone: 606-633-7677 fax: 606-632-2626 email: <a href="mailto:joelbeverly@hotmail.com">joelbeverly@hotmail.com</a></p>
<p>Dr. Karen Campbell Biology Department Albright College Reading, PA 19614 phone: 610-921-2381</p>	<p>Biodiversity Research Institute Contact: Tim Divoll 652 Main Street Gorham, ME 04038 phone: 207-887-7160 email: <a href="mailto:tim.divoll@briloon.org">tim.divoll@briloon.org</a></p>
<p>Eco-Tech, Inc. Contact: Lee Droppelman PO Box 8 Frankfort, KY 40602-0008 phone: 502-695-8060 fax: 502-695-8061 email: <a href="mailto:myotis2000@aol.com">myotis2000@aol.com</a></p>	<p>HDR Environmental, Operations &amp; Construction, Inc. Contact: John Timpone 610 West Hubbard Avenue, Suite 227 Coeur d'Alene, ID 83814 phone: 208-665-3984 cell: 520-308-8947 email: <a href="mailto:john.timpone@hdrinc.com">john.timpone@hdrinc.com</a></p>
<p>Sanders Environmental, Inc. Contact: Chris Sanders PO Box 185 Centre Hall, PA 16828-0185 phone: 814-364-8776 cell: 814-659-8257 email: <a href="mailto:sanders@batgate.com">sanders@batgate.com</a></p>	<p>Dr. Lynn Robbins Southwest Missouri State University Biology Department 901 South National Springfield, MO 65804 phone: 417-836-5366</p>
<p>Civil &amp; Environmental Consultants, Inc. Contact: Ryan Slack 1 North Pennsylvania Street, Suite 1100 Indianapolis, IN 46204 phone: 877-746-0749 fax: 317-655-7778 email: <a href="mailto:rslack@cecinc.com">rslack@cecinc.com</a></p>	<p>Western Ecosystems Technology, Inc. Contact: Kevin Murray 408 West Sixth Street Bloomington, IN 47404 phone: 812-340-4318 email: <a href="mailto:kmurray@west-inc.com">kmurray@west-inc.com</a></p>

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<p>Mr. John Chenger          Bat Conservation &amp; Management          905 Thornton Drive          Mechanicsburg, PA 17055          phone: 717-795-7527          email: <a href="mailto:jchenger@batmanagement.com">jchenger@batmanagement.com</a></p>	<p>Copperhead Environmental Consulting, Inc.          Contact: Mark Gumbert          11641 Richmond Road; PO Box 73          Paint Lick, KY 40461          phone: 859-925-9012          cell: 859-619-6242          fax: 859-925-9816          email: <a href="mailto:mwgumbert@copperheadconsulting.com">mwgumbert@copperheadconsulting.com</a></p>
<p>Skybax Ecological Services, LLC          Contact: Gary Libby          107 Vanwinkle Grove          Berea, KY 40403          phone: 859-302-2897          email: <a href="mailto:garylubby@windstream.net">garylubby@windstream.net</a></p>	<p>Mountain State Biosurveys, LLC          Contact: Keith Johnson          6703 Ohio River Road          Lesage, WV 25537          phone: 304-762-2453          email: <a href="mailto:kjohnson@mtnstatebio.com">kjohnson@mtnstatebio.com</a></p>
<p>Pittsburgh Wildlife &amp; Environmental, Inc.          Contact: Neil Bossart          853 Beagle Club Road          McDonald, PA 15057          phone: 724-796-5137          cell: 717-860-7679          email: <a href="mailto:nbossart@windstream.net">nbossart@windstream.net</a></p>	<p>Compliance Monitoring Labs, Inc.          Contact: J.D. Wilhide          50 Caney Branch Road, Suite 1          Chapmanville, WV 25508          phone: 304-855-0140          email: <a href="mailto:jd_wilhide@cml.net">jd_wilhide@cml.net</a></p>
<p>Appalachian Technical Services          Contact: Chris Isaac          PO Box 3537          Wise, VA 24293          phone: 276-328-4200          email: <a href="mailto:cisaac@atsone.com">cisaac@atsone.com</a></p>	<p>Normandeau Associates          Contact: Mick O'Mahony          400 Reading Pike          Building A, Suite 101          Stowe, PA 19464          phone: 484-945-2631          email: <a href="mailto:momahony@normandeau.com">momahony@normandeau.com</a></p>
<p>Jackson Environmental Consulting Services, LLC          Contact: Jeremy Jackson, Shane Prescott          114 North 3<sup>rd</sup> Street, Suite 1          Richmond, KY 40475          phone: 859-623-0499          email: <a href="mailto:jlj@jacksonenvironmental.com">jlj@jacksonenvironmental.com</a></p>	<p>Redwing Ecological Services, Inc.          Contact: Benjamin Deetsch          129 S. Sixth Street          Louisville, KY 40202          phone: 502-625-3009          email: <a href="mailto:bdeetsch@redwingeco.com">bdeetsch@redwingeco.com</a></p>
<p>Davey Resource Group          Contact : Jennifer Hickey          3728 Fishcreek Road          Stow, OH 44224          email: <a href="mailto:jessica.hickey@davey.com">jessica.hickey@davey.com</a></p>	<p>Stantec Consulting Services, Inc.          Contact: James Kiser          1901 Nelson Miller Parkway          Louisville, KY 40223-2177          phone: 502-396-3199          email: <a href="mailto:james.kiser@stantec.com">james.kiser@stantec.com</a></p>
<p>Wildlife Specialists, LCL          Contact: James Hart          2785 Hills Creek Road          Wellsboro, PA 17257          phone: 570-376-2255          email: <a href="mailto:jahart@pa.net">jahart@pa.net</a></p>	<p>AllStar Ecology, LLC          Contact: Sheila Captain          1582 Meadowdale Road          Fairmont, WV 26554          phone: 304-816-3490; 866-213-2666 (toll free)          cell: 734-678-8901          email: <a href="mailto:sheila@allstarecology.com">sheila@allstarecology.com</a></p>
<p>Skelly &amp; Loy, Inc.          Contact: Julie Zeyzus          449 Eisenhower Boulevard, Suite 300          Harrisburg, PA 17111          phone: 800-892-6532          cell: 412-443-6745          email: <a href="mailto:jzeyzus@skellyloy.com">jzeyzus@skellyloy.com</a></p>	<p>Alliance Consulting, Inc.          Contact: Braden Hoffman          124 Philpott Lane          Beaver, WV 25813          phone: 304-255-0491          email: <a href="mailto:bhoffinan@aci-wv.com">bhoffinan@aci-wv.com</a></p>

## APPENDIX E

\* This list includes individuals who are qualified to conduct surveys for Indiana bats, or those who are company contacts, and may not include all individuals qualified to conduct such surveys. Inclusion of names on this list does not constitute endorsement by the WV Division of Natural Resources (WVDNR), the US Fish and Wildlife Service, nor any other government agency. A WV Scientific Collecting Permit will be required from the WVDNR to sample bats in WV. Note that various techniques are used to sample for and study bats, including mist-netting, Anabat detectors, and radio-telemetry. Some individuals on this list may not be qualified to conduct all three techniques.

# The Doddridge Independent

## The Doddridge Independent PUBLISHER'S CERTIFICATE

I, Michael D. Zorn, Publisher of The Doddridge Independent, A newspaper of general circulation published in the town of West Union, Doddridge County, West Virginia, do hereby certify that:


Please take notice that on the (5th) of (October), 2018, (CEC on behalf of Dominion Energy) filed an application for a Floodplain Permit (#18-529) to develop land located at or about (Route 23); Coordinates: 39.370189 N, -80.601075 W. The Application is on file with the Floodplain Manager of the County and may be inspected or copied during regular business hours in accordance to WV Code Chapter 29B Freedom of Information, Article 1 Public Records and county policy and procedures. Any interested persons who desire to

was published in The Doddridge Independent  
2 times commencing on Friday, October 12, 2018 and  
Ending on Friday, October 19, 2018 at the request of:

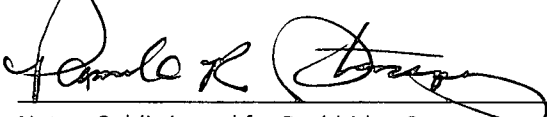
**George Eidel, Doddridge County Floodplain  
Manager & Doddridge County Commission**

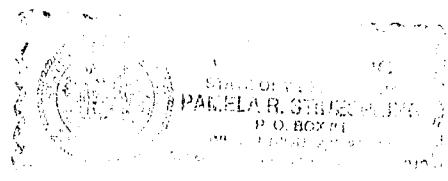
Given under my hand this Friday, October 19, 2018

The publisher's fee for said publication is:  
**\$ 31.05 1st Run/\$ 23.29 Subsequent Runs**  
**This Legal Ad Total: \$ 54.34**

  
\_\_\_\_\_  
Michael D. Zorn  
Publisher of The Doddridge Independent

Subscribed to and sworn to before me on  
this date: 10, 22, 18

  
\_\_\_\_\_  
Notary Public in and for Doddridge County  
My Commission expires on  
The 17<sup>th</sup> day of March 2019



Floodplain Public Notice - Legal  
Please take notice that on the (5th) of (October), 2018, (CEC on behalf of Dominion Energy) filed an application for a Floodplain Permit (#18-529) to develop land located at or about (Route 23); Coordinates: 39.370189 N, -80.601075 W. The Application is on file with the Floodplain Manager of the County and may be inspected or copied during regular business hours in accordance to WV Code Chapter 29B Freedom of Information, Article 1 Public Records and county policy and procedures. Any interested persons who desire to comment shall present the same in writing by (November 5, 2018) (20 calendar days after the announcement at the regularly scheduled Doddridge County Commission Meeting) delivered to the Floodplain Manager of the County at 105 Court Street, Suite #3, West Union, WV 2645. This project is for streambank Stabilization C2 10/12 - 10/19