

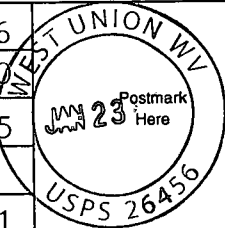
7013 2250 0001 6914 7660

U.S. Postal Service  
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For delivery information visit our website at [www.usps.com](http://www.usps.com)

**OFFICIAL USE**

Postage	\$ .46
Certified Fee	3.10
Return Receipt Fee (Endorsement Required)	2.55
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.11</b>



Sent To Civil & Environmental Consultants,  
 Street, Apt. No., or PO Box No. 333 Baldwin Road  
 City, State, ZIP+4 Pittsburgh, PA 15205

PS Form 3800, August 2006 See Reverse for Instructions

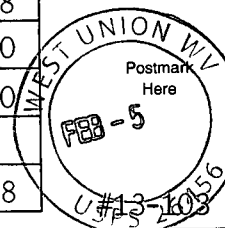
7013 2250 0001 6914 7769

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

**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



Sent To Carol Cottrill  
 Street, Apt. No., or PO Box No. 3839 Smithton Road  
 City, State, ZIP+4 West Union, WV 26456

PS Form 3800, August 2006 See Reverse for Instructions

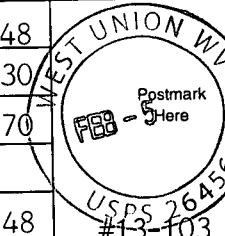
7013 2250 0001 6914 7783

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**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



Sent To Elizabeth Connor  
 Street, Apt. No., or PO Box No. 501 Brush Run Rd  
 City, State, ZIP+4 West Union, WV 26456

PS Form 3800, August 2006 See Reverse for Instructions

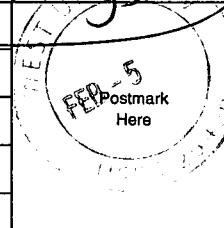
7013 2250 0001 6914 7868

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

**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



Sent To Stan and Louise Crossman  
 Street, Apt. No., or PO Box No. 233 Sisk Lane  
 City, State, ZIP+4 Salem, WV 26426

PS Form 3800, August 2006 See Reverse for Instructions

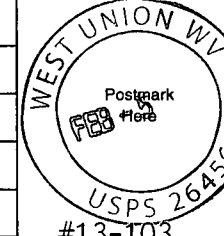
7013 2250 0001 6914 7776

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**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



Sent To Louanne Fatora  
 Street, Apt. No., or PO Box No. 3839 Smithton Rd  
 City, State, ZIP+4 West Union, WV 26456

PS Form 3800, August 2006 See Reverse for Instructions

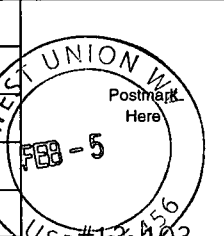
7013 2250 0001 6914 7790

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**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



Sent To Mirijana Beram  
 Street, Apt. No., or PO Box No. 615 Riggins Run Rd  
 City, State, ZIP+4 West Union, WV 26456

PS Form 3800, August 2006 See Reverse for Instructions

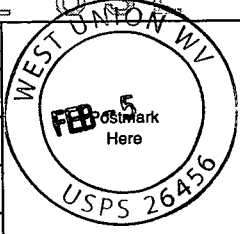
7013 2250 0001 6914 7752

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**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



#13-103

Sent To **Susan Cleaver**  
 Street, Apt. No.; or PO Box No. **1625 Nazareth Farm Rd**  
 City, State, ZIP+4 **Center Point-Salem, WV 26426**  
 PS Form 3800, August 2006 See Reverse for Instructions

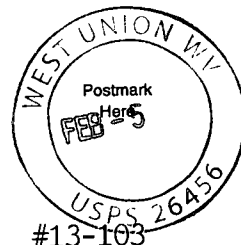
7013 2250 0001 6914 7745

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**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



#13-103

Sent To **Sally Cockey**  
 Street, Apt. No.; or PO Box No. **699 Retriever Run Rd**  
 City, State, ZIP+4 **West Union, WV 26456**  
 PS Form 3800, August 2006 See Reverse for Instructions

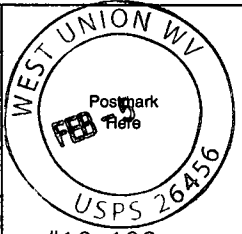
7013 2250 0001 6914 7738

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**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



#13-103

Sent To **Christina Woods**  
 Street, Apt. No.; or PO Box No. **1585 Broad Run Rd**  
 City, State, ZIP+4 **Center Point, WV 26339**  
 PS Form 3800, August 2006 See Reverse for Instructions

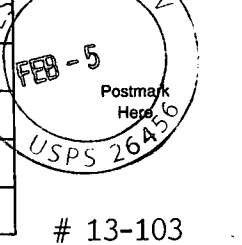
7013 2250 0001 6914 7721

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Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



# 13-103

Sent To **Wayne Woods**  
 Street, Apt. No.; or PO Box No. **1585 Broad Run Road**  
 City, State, ZIP+4 **Center Point, WV 26339**  
 PS Form 3800, August 2006 See Reverse for Instructions

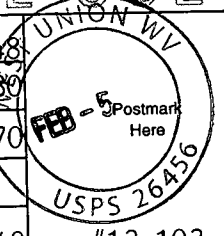
7013 2250 0001 6914 7714

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Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



#13-103

Sent To **J. Douglas Geelhaar**  
 Street, Apt. No.; or PO Box No. **2430 Little Buck Run, Box 154**  
 City, State, ZIP+4 **New Milton, WV 26411**  
 PS Form 3800, August 2006 See Reverse for Instructions

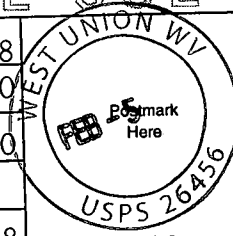
7013 2250 0001 6914 7707

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**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



#13-103

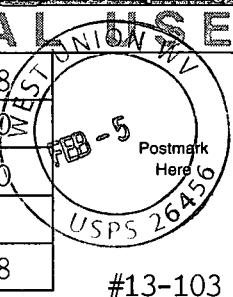
Sent To **Tina DelPrete**  
 Street, Apt. No.; or PO Box No. **4805 Riggins Run**  
 City, State, ZIP+4 **West Union, WV 26456**  
 PS Form 3800, August 2006 See Reverse for Instructions

7013 2250 0001 6914 7806

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**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



#13-103

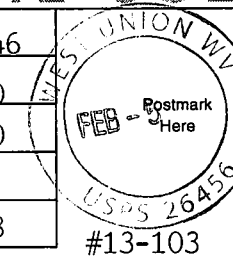
Sent To  
**Jody Mohr**  
Street, Apt. No., or PO Box No. 2328 Miletus Rd  
City, State, ZIP+4 Salem, WV 26426  
PS Form 3800, August 2006 See Reverse for Instructions

7013 2250 0001 6914 7820

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**OFFICIAL USE**

Postage	\$ .46
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



#13-103

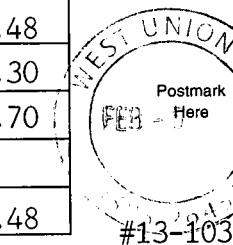
Sent To  
**Jim Shreves**  
Street, Apt. No., or PO Box No. 3770 Oxford Road  
City, State, ZIP+4 Pullman, WV 26421  
PS Form 3800, August 2006 See Reverse for Instructions

7013 2250 0001 6914 7844

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**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



#13-103

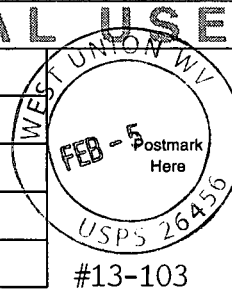
Sent To  
**Civil & Environmental Consult. Inc.**  
Street, Apt. No., or PO Box No. 333 Baldwin Road  
City, State, ZIP+4 Pittsburgh, PA 15205  
PS Form 3800, August 2006 See Reverse for Instructions

7013 2250 0001 6914 7813

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**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



#13-103

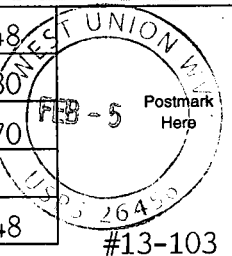
Sent To  
**Eva Shreves**  
Street, Apt. No., or PO Box No. 3770 Oxford Road  
City, State, ZIP+4 Pullman WV 26421  
PS Form 3800, August 2006 See Reverse for Instructions

7013 2250 0001 6914 7837

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**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



#13-103

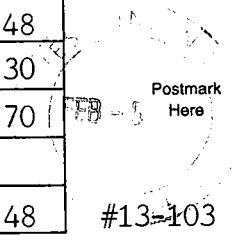
Sent To  
**Jonette Kirkwood**  
Street, Apt. No., or PO Box No. 203 Court St.  
City, State, ZIP+4 West Union, WV 26456  
PS Form 3800, August 2006 See Reverse for Instructions

7013 2250 0001 6914 7851

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**OFFICIAL USE**

Postage	\$ .48
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
<b>Total Postage &amp; Fees</b>	<b>\$ 6.48</b>



#13-103

Sent To  
**Mark West Liberty**  
Street, Apt. No., or PO Box No. 218 Swisher Lane  
City, State, ZIP+4 West Union, WV 26456  
PS Form 3800, August 2006 See Reverse for Instructions

**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: #13-103

Civil & Environmental  
Consultants, Inc.  
333 Baldwin Road  
Pittsburgh, PA 15205

 2. Article Number  
(Transfer from service label)

7013 2250 0001 6914 7844

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature

X *Sue Nagel*

- 
- Agent
- 
- 
- Addressee

B. Received by (Printed Name)

*Sue Nagel*

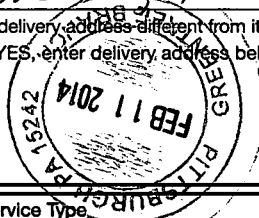
C. Date of Delivery

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

3. Service Type

- XY
- 
- Certified Mail
- 
- Express Mail
- 
- 
- Registered
- 
- Return Receipt for Merchandise
- 
- 
- Insured Mail
- 
- C.O.D.

4. Restricted Delivery? (Extra Fee)

 Yes

UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

• Sender: Please print your name, address, and ZIP+4 in this box •

**FILED**

**2014 FEB 18 PM 12:22**

**SECURITY SERVICES  
COUNTY CLERK  
DODD RIDGE COUNTY, WV**

an Wellings  
Doddridge Co. Flood Plain MGT.  
8 E. Court St  
West Union, WV 26456



**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:

Civil & Environmental Consultants  
 333 Baldwin Road  
 Pittsburgh, PA 15205

2. Article Number

(Transfer from service label)

7013 2250 0001 6914 7660

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature

X *Susan Nagel* Agent Addressee

B. Received by (Printed Name)

*Sue Nagel*

C. Date of Delivery

*1/27/14*D. Is delivery address different from item 1?  Yes

If YES, enter delivery address below:

 No

3. Service Type

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

4. Restricted Delivery? (Extra Fee)

 Yes

UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

- Sender: Please print your name, address, and ZIP+4 in this box •

Dan Wellings  
Doddrige Co. Flood Plain  
Room 102  
118 E. Court St.  
West Union, WV 26456

BETTA A. ROGER  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

2014 JAN 30 AM 10:59

FILED



**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: #13-103

Sally Cockey  
699 Retriever Run Rd  
West Union, WV 26456

2. Article Number  
(Transfer from service label)

7013 2250 0001 6914 7745

PS Form 3811, July 2013

Domestic Return Receipt

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature

X

B. Received by (Printed Name)

D. Is delivery address different from item 1?  Yes

If YES, enter delivery address below:  No

C. Date of Delivery

Agent  
 Addressee

SPS 26456

3. Service Type

Certified Mail®

Priority Mail Express™

Registered

Return Receipt for Merchandise

Insured Mail

Collect on Delivery

4. Restricted Delivery? (Extra Fee)

Yes



UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

**FILED**

**2014 FEB -7 PM 12:24**

**BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV**

• Sender: Please print your name, address, and ZIP+4® in this box •

**Don Wellings  
Doddridge Co. Flood Plain MGT.  
118 E. Court St  
West Union, WV 26456**

**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: #13-103  
 Tina DelPrete  
 4805 Riggins Run  
 West Union, WV 26456

2. Article Number  
 (Transfer from service label)

7013 2250 0001 6914 7707

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature

*\*Tina Del Prete*

Agent

Addressee

B. Received by (Printed Name)

*Tina Del Prete*

C. Date of Delivery

*2-6-14*

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

3. Service Type

Certified Mail®

Priority Mail Express™

Registered

Return Receipt for Merchandise

Insured Mail

Collect on Delivery

4. Restricted Delivery? (Extra Fee)  Yes

UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

**FILED**

**2014 FEB -7 PM 12:24**

**BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV**

• Sender: Please print your name, address, and ZIP+4® in this box •

Dan Wellings  
Doddridge Co. Flood Plain MGT.  
118 E. Court St  
West Union, WV 26456

**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: #13-103

Louanne Fatora  
3839 Smithton Rd  
West Union, WV 26456

2. Article Number  
(Transfer from service label)

7013 2250 0001 6914 7776

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature

X

*Charles L. Catlett*

Agent

Addressee

B. Received by (Printed Name)

C. Date of Delivery

2-7-14

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

3. Service Type

X

Certified Mail

Express Mail

Registered

Return Receipt for Merchandise

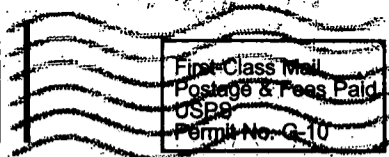
Insured Mail

C.O.D.

4. Restricted Delivery? (Extra Fee)

Yes

UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

07 FEB 2014 PM 2

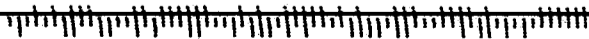
• Sender ~~PS~~ Please print your name, address, and ZIP+4 in this box •

FILED

2014 FEB 10 AM 11:55

DEBRA A. ROGERS  
COUNTY CLERK  
BOONVILLE, WV  
BOONVILLE COUNTY, WV

1100 E. Court St  
West Union, WV 26456  
Flood Plain MGT.



**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: #13-103

Carol Cottrill  
3839 Smithton Road  
West Union, WV 26456

2. Article Number  
(Transfer from service label)

7013 2250 0001 6914 7769

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature

*Carol Cottrill*

Agent

Addressee

B. Received by (Printed Name)

C. Date of Delivery

2-7-14

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

3. Service Type

Certified Mail

Express Mail

Registered

Return Receipt for Merchandise

Insured Mail

C.O.D.

4. Restricted Delivery? (Extra Fee)

Yes

UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

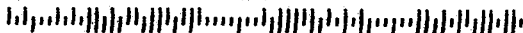
- Sender: Please print your name, address, and ZIP+4 in this box •

**FILED**

**2014 FEB 10 AM 11:35**

**BETH A. ROGERS  
COUNTY CLERK  
DEEDS & RECORDS  
BOONVILLE COUNTY, WV**

an Wellings  
Boonville Co. Flood Plain MGT.  
18 E. Court St  
West Union, WV 26456



**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: #13-103

Stan and Louise Crossman  
233 Sisk Lane  
Salem, WV 26426

2. Article Number  
(Transfer from service label)

7013 2250 0001 6914 7868

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature

X *S. Crossman*

Agent

Addressee

B. Received by (Printed Name)

*S. Crossman*

C. Date of Delivery

*2/12/14*

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

3. Service Type

Certified Mail

Express Mail

Registered

Return Receipt for Merchandise

Insured Mail

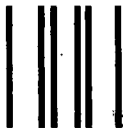
C.O.D.

4. Restricted Delivery? (Extra Fee)

Yes



UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

• Sender: Please print your name, address, and ZIP+4<sup>®</sup> this box •

Dan Wellings  
Doddrige Co. Flood Plain M...  
118 E. Court St  
West Union, WV 26456

DODDRIDGE COUNTY, WV  
BETHA GERS  
COUNTY CLERK  
2014 FEB 13 AM 11:46

FILED



**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: #13-103

Mirijana Beram  
615 Riggins Run Rd  
West Union, WV 26456

2. Article Number  
(Transfer from service label)

7013 2250 0001 6914 7790

**COMPLETE THIS SECTION**

A. Signature

*Mirijana Beram*

Agent

Addressee

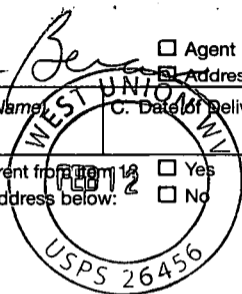
B. Received by (Printed Name)

C. Date of Delivery

D. Is delivery address different from item 1?  
If YES, enter delivery address below:

Yes

No



3. Service Type

Certified Mail

Express Mail

Registered

Return Receipt for Merchandise

Insured Mail

C.O.D.

4. Restricted Delivery? (Extra Fee)

Yes

UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

• Sender: Please print your name, address, and ZIP+4 on this box •

Dan Wellings  
Doddridge Co. Flood Plain MGMT.  
118 E. Court St  
West Union, WV 26456

BETH A. ANDERSON  
COUNTY CLERK  
DODDRIDGE COUNTY WV

2014 FEB 13 AM 11:46

FILED

6456126227



**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: #13-103

Eva Shreves  
3770 Oxford Road  
Pullman, WV 26421

2. Article Number  
(Transfer from service label)

7013 2250 0001 6914 7813

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature

X



Agent

Addressee

B. Received by (Printed Name)

J. M. Shreves

C. Date of Delivery

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

3. Service Type

X

Certified Mail

Express Mail

Registered

Return Receipt for Merchandise

Insured Mail

C.O.D.

4. Restricted Delivery? (Extra Fee)

Yes

UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

• Sender: Please print your name, address, and ZIP+4 on this box.

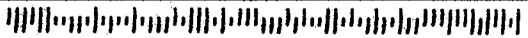
Dan Wellings  
Doddrige Co. Flood Plain MGT.  
118 E. Court St  
West Union, WV 26456

BETH A. JUDGES  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

FEB - 7 PM 12: 24

FILED

26456126227



**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: #13-103

Wayne Woods  
 1585 Broad Run Road  
 Center Point, WV 26339

2. Article Number  
 (Transfer from service label)

7013 2250 0001 6914 7721

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature

X 

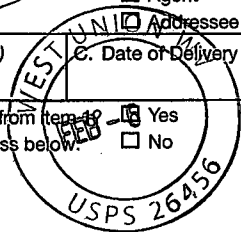
Agent

Addressee

B. Received by (Printed Name)

C. Date of Delivery

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



3. Service Type

Certified Mail®

Priority Mail Express™

Registered

Return Receipt for Merchandise

Insured Mail

Collect on Delivery

4. Restricted Delivery? (Extra Fee)

Yes

UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

• Sender: Please print your name, address, and ZIP+4® in this box•

**FILED**

**2014 FEB -7 PM 12:24**

**BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV**

Dan Wellings  
Doddridge Co. Flood Plain MGT.  
118 E. Court St  
West Union, WV 26456



**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: #13 - 103

Jonette Kirkwood  
203 Court St  
West Union, WV 26456

2. Article Number  
(Transfer from service label)

7013 2250 0001 6914 7837

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature

X *Jonette Kirkwood*

- Agent  
 Addressee

B. Received by (Printed Name)

C. Date of Delivery

2-6-14

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

3. Service Type

- Certified Mail  Express Mail  
 Registered  Return Receipt for Merchandise  
 Insured Mail  C.O.D.

4. Restricted Delivery? (Extra Fee)  Yes



UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

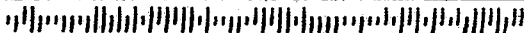
• Sender: Please print your name, address, and ZIP+4 in this box •

FILED

2014 FEB -7 PM 12:22

BETH A. ROGERS  
COUNTY CLERK  
OF BRIDGE COUNTY WV

Wellings  
Bridge Co. Flood Plain MGT.  
110 E. Court St  
West Union, WV 26456



**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: #13-103

J. Douglas Geelhaar  
 2430 Little Buck Run, Box 154  
 New Milton, WV 26411

2. Article Number  
 (Transfer from service label)

7013 2250 0001 6914 7714

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature

x *J. D. Geelhaar*

- Agent  
 Addressee

B. Received by (Printed Name)

*GEELHAAR*

C. Date of Delivery

*2-6-14*

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

3. Service Type

- Certified Mail®  Priority Mail Express™  
 Registered  Return Receipt for Merchandise  
 Insured Mail  Collect on Delivery

4. Restricted Delivery? (Extra Fee)  Yes

UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

• Sender Please Print your name, address, and ZIP+4® in this box •

**FILED**

**2014 FEB -7 PM 12:24**

**BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV**

Dan Wellings  
Doddridge Co. Flood Plain MGT.  
118 E. Court St  
West Union, WV 26456

6126227



**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: #13-103

Jim Shreves  
3770 Oxford Road  
Pullman, WV 26421

2. Article Number  
(Transfer from service label)

7013 2250 0001 6914 7820

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature

X



Agent

Addressee

B. Received by (Printed Name)

JIM SHREVES

C. Date of Delivery

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

3. Service Type

XX

Certified Mail

Express Mail

Registered

Return Receipt for Merchandise

Insured Mail

C.O.D.

4. Restricted Delivery? (Extra Fee)

Yes

UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

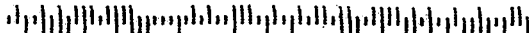
• Sender: Please print your name, address, and ZIP+4 in this box •

FILED

2014 FEB -7 PM 12:34

BEITH A. ROGERS  
COUNTY CLERK  
RODGEE COUNTY, WV

Wellings  
Rodrigue Co. Flood Plain MGT.  
E. Court St  
West Union, WV 26456



**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: #13-103

Christina Woods  
 1585 Broad Run Rd  
 Center Point, WV 26339

2. Article Number  
 (Transfer from service label)

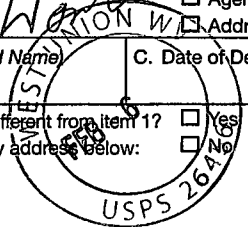
7013 2250 0001 6914 7738

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature  X *H. Woods*  Agent  Addressee

B. Received by (Printed Name) C. Date of Delivery

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



3. Service Type  
 Certified Mail®  Priority Mail Express™  
 Registered  Return Receipt for Merchandise  
 Insured Mail  Collect on Delivery

4. Restricted Delivery? (Extra Fee)  Yes

UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

• Sender: Please print your name, address, and ZIP+4® in this box •

**FILED**

**2014 FEB -7 PM 12:24**

**BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV**

Dan Wellings  
Doddridge Co. Flood Plain MGT.  
18 E. Court St  
West Union, WV 26456

6426227



**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:

CME Engineering LP  
 Att: Mark Stanley  
 975 Georges Station Rd, Suite 100  
 Greensburg, PA 15601

## 2. Article Number

(Transfer from service label)

7013 2250 0001 6914 7684

**COMPLETE THIS SECTION ON DELIVERY**

## A. Signature

 *Lisa Bevan*
 Agent Addressee

## B. Received by (Printed Name)

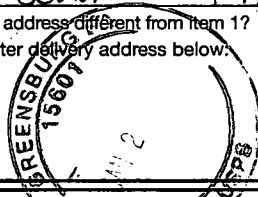
LISA BEVAN

## C. Date of Delivery

1/27/14

D. Is delivery address different from item 1?  Yes

If YES, enter delivery address below:

 No

## 3. Service Type

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

## 4. Restricted Delivery? (Extra Fee)

 Yes



UNITED STATES POSTAL SERVICE



First-Class Mail  
Postage & Fees Paid  
USPS  
Permit No. G-10

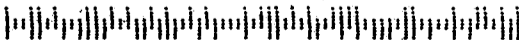
**FILED**

**2014 JAN 29 AM 11:19**

**BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV**

• Sender: Please print your name, address, and ZIP+4 in this box •

.....  
Dan Wellings  
Doddridge Co. Flood Plain MGT.  
Room 102  
118 E. Court St.  
West Union, WV 26456





FILED

2014 FEB 27 AM 11:55

BETH A. ROGERS  
COUNTY CLERK  
DODD RIDGE COUNTY, WV

**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.

Article Addressed to: #13-103  
 Susan Cleaver  
 625 Nazareth Farm Rd  
 Center Point - Salem, WV  
 26426

2. Article Number  
 (Transfer from service label)

7013 2250 0001 6914 7752

PS Form 3811, July 2013

Domestic Return Receipt

PLACE STICKER AT TOP OF ENVELOPE TO THE RIGHT  
 OF THE RETURN ADDRESS, FOLD AT DOTTED LINE

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature  Agent  
 X  Addressee

B. Received by (Printed Name) C. Date of Delivery

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

3. Service Type  
 Certified Mail®  Priority Mail Express™  
 Registered  Return Receipt for Merchandise  
 Insured Mail  Collect on Delivery

4. Restricted Delivery? (Extra Fee)  Yes

**FLOODPLAIN PERMIT APPLICATION  
PUBLIC MEETING  
FOR  
MARKWEST SHERWOOD FACILITY**

Notice is hereby given to the public and those concerned area residents whom have sent a properly and timely filed objection to the Doddridge County Clerk of the County Commission's Office , many anonymously, to the granting or denying of the **MARKWEST** Doddridge County Floodplain application #13-103.

There will be a public meeting prior to granting or denying **MARKWEST** Doddridge County Floodplain Application #13-103 for **additional temporary stockpiles** of earth to be located in the FEMA designated special flood hazard area for construction of Sherwood Plant 4 & 5. Said public meeting will occur as part of the regularly scheduled **February 18, 2014 Doddridge County Commissioners meeting beginning at 6 PM at the Doddridge County Courthouse.**

Evidence will be taken or given by interested persons or parties.

This is **NOT** a forum on **MARKWEST** or the gas industry. Evidence will be limited to the impact of granting or denying additional temporary stockpiles of earth in the FEMA designated floodplain as it relates to the **DODDRIDGE COUNTY FLOODPLAIN ORDINANCE.**

Dan Wellings, PS

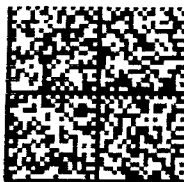
Doddridge County Floodplain Manager

Dan Wellings  
Doddridge Co Flood Plain MGT  
Room 102  
118 East Court St.  
West Union, WV 26456

**CERTIFIED MAIL™**



7013 2250 0001 6914 7783



015H14161808

**\$6.48**

02/05/14

Mailed From 26456

HASLER

US POSTAGE

2014 FEB 10 AM 11:36

BETTY A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

UTTF

Elizabeth Connor  
501 Brush Run Rd  
West Union WV 26456

2

NIXIE 250 7E 1009 0002 / 07 / 04

RETURN TO SENDER  
NOT DELIVERABLE AS ADDRESSED  
UNABLE TO FORWARD

BC: 26456126227 \*0671-10734-05-42

26456126227



**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: #13-103

Elizabeth Connor  
501 Brush Run Rd  
West Union, WV 26456

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature

X

Agent

Addressee

B. Received by (*Printed Name*)

C. Date of Delivery

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

3. Service Type

Certified Mail

Express Mail

Registered

Return Receipt for Merchandise

Insured Mail

C.O.D.

4. Restricted Delivery? (*Extra Fee*)

Yes

2. Article Number

(*Transfer from service label*)

7013 2250 0001 6914 7783

**FLOODPLAIN PERMIT APPLICATION  
PUBLIC MEETING  
FOR  
MARKWEST SHERWOOD FACILITY**

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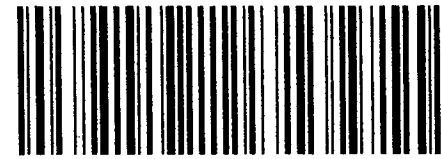
This is **NOT** a forum on **MARKWEST** or the gas industry. Evidence will be limited to the impact of granting or denying additional temporary stockpiles of earth in the FEMA designated floodplain as it relates to the **DODDRIDGE COUNTY FLOODPLAIN ORDINANCE.**

Dan Wellings, PS

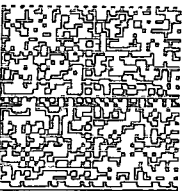
Doddridge County Floodplain Manager

Dan Wellings  
Doddridge Co. Flood Plain MGT.  
118 E. Court St  
West Union, WV 26456

**CERTIFIED MAIL™**



7013 2250 0001 6914 7851



015H14161808  
**HASLER**  
\$6.48  
02/05/14  
Mailed From 26456  
**US POSTAGE**

- INSUFFICIENT ADDRESS
- ATTEMPTED NOT KNOWN
- NO SUCH NUMBER/ STREET
- NOT DELIVERABLE AS ADDRESSED
- UNABLE TO FORWARD

UCS

OTHER

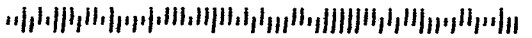
Liberty

**RTS**  
RETURN TO SENDER

Unclaimed

2-6  
2-12  
2-21

26456270018





PLACE STICKER AT TOP OF ENVELOPE TO THE RIGHT  
OF THE RETURN ADDRESS, FOLD AT DOTTED LINE

**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: #13-103

Mark West Liberty  
218 Swisher Lane  
West Union, WV 26456

2. Article Number  
(Transfer from service label)

7013 2250 0001 6914 7851

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature  Agent  
**X**  Addressee

B. Received by (Printed Name) C. Date of Delivery

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

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

4. Restricted Delivery? (Extra Fee)  Yes

**FLOODPLAIN PERMIT APPLICATION  
PUBLIC MEETING  
FOR  
MARKWEST SHERWOOD FACILITY**

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Dan Wellings, PS

Doddridge County Floodplain Manager

Check Date: 12/6/2013

Invoice Number	Date	Voucher	Amount	Discounts	Previous Pay	Net Amount
12052013	12/5/2013	000000230911	1,000.00			1,000.00
Doddrige County Commission\		TOTAL				1,000.00
Operating Account	60	11261				

# 13-103

Mark West Sherwood  
Processing Plant 4 & 5

98057

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

Michael Headley  
Sheriff of Doddridge County

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

## Doddridge County, West Virginia

No. 1195

Date: January 6, 2014  
\*\*\*Customer copy\*\*\*

Received: #13-103 civil & environmental Markwest sherwood Processir \$1,000.00

In Payment For: 318 Building Permits (LP)

For: 12-Flood Plain Ordinance #20 Fund

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

Michael Headley  
Sheriff of Doddridge County

Check Date: 12/30/2013

Invoice Number	Date	Voucher	Amount	Discounts	Previous Pay	Net Amount
12202013-	12/20/2013	000000231823	515.00			515.00
Doddridge County Commission		TOTAL				515.00
Operating Account	4	11261				

98740



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

Michael Headley  
Sheriff of Doddridge County

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

## Doddridge County, West Virginia

No. 1196

Date: January 6, 2014  
\*\*\*Customer copy\*\*\*

Received: #13-103 civil & environmental markwest sherwood Processir \$515.00

In Payment For: 318 Building Permits (LP)

For: 12-Flood Plain Ordinance #20 Fund

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

Michael Headley  
Sheriff of Doddridge County

Doddridge County Sheriff  
Flood Plain Ordinance Fund

1076

69-217/515

DATE February 28, 2014

PAY TO THE ORDER OF CME ENGINEERING

\$ 4,486.44\*\*\*\*\*

Four Thousand Four Hundred Eighty-Six Dollars and 44/100\*\*\*\*\*

DOLLARS

Security features included. Details on back.



*Ralph Sandora*  
*Beth A. Rogers*  
MP Sheriff

MEMO Inv#: 0035145(\$2,131.96)  
Inv#: 0035146(\$2,354.48 Client-0000875

001076

051502175

1196499

Sherwood 4 and 5 - Doddridge County, WV  
 Opinion of Probable Construction Costs - Construction in the Floodplain  
 Project #: 110-811  
 December 2013

Item	Units	Quantity	Unit Cost	Total Cost
Earth Work	CY	58000	\$ 3.50	\$ 203,000.00
<b>Total</b>	-	-	-	\$ 203,000.00

Fee for first \$100,000 cost → \$ 1,000

Fee for next \$103,000 cost  
 \$5.00 x 103 → \$ 515

Correct fee → \$ 1,515.00

Amount submitted

12/06/2013

application

\$ 1,000.00

Need additional

\$ 515.00

Received  
 \$ 515.00  
 on Jan 3, 2014  
 Application process began  
 [Signature]  
 01/03/14



**DODDRIDGE COUNTY  
FLOODPLAIN APPLICATION PERMIT FEES**

**Accessory Building and/or Appurtenant Structures** ----- \$100.00  
(examples: garage, storage or pole building, carport)  
(the total cost of which do not exceed \$10,000.00)

**Accessory Building and/or Appurtenant Structures, Additions and/or Substantial Improvement to Single Family Residential or Manufactured Homes, New Single or Multi-Family Residential and Commercial Structures or Substantial Improvement to existing Commercial Structures, Commercial Land Use Changes and Land Altering Activities**  
(commercial structures includes buildings used for business purposes)  
(the total costs of which exceed \$10,000.00 but do not exceed \$50,000.00) ----- \$250.00

**Accessory Building and/or Appurtenant Structures, Additions and/or Substantial Improvement to Single Family Residential or Manufactured Homes, New Single or Multi-Family Residential and Commercial Structures or Substantial Improvement to existing Commercial Structures, Commercial Land Use Changes and Land Altering Activities**  
(commercial structures includes buildings used for business purposes)  
(the total costs of which exceed \$50,000.00 plus \$2.00 per \$1,000.00 to cover costs over \$50,000.00) ----- \$350.00

**New Industrial Structures or Additions and/or Substantial Improvement to Existing Industrial Structures, changes in Land Use and Land Altering Activities for Industrial purposes**  
(industrial structures includes oil and/or natural gas wells, roads, bridges, tank pads, and Buildings used or associated with oil and natural gas purposes)  
(the total costs of which do not exceed \$100,000.00) ----- \$500.00

**New Industrial Structures or Additions and/or Substantial Improvement to Existing Industrial Structures, changes in Land Use and Land Altering Activities for Industrial purposes**  
(industrial structures includes oil and/or natural gas wells, roads, bridges, tank pads, and Buildings used or associated with oil and natural gas purposes)  
(the total costs of which exceed \$100,000.00 plus \$5.00 per \$1,000.00 in costs over \$100,000.00) ----- \$1,000.00

**Maximum Fee: In no event shall any Floodplain Application Permit Fee charged under the Doddridge County Floodplain Ordinance exceed the sum of \$25,000.00.**

PERMIT NO. #13-103

**DODDRIDGE COUNTY  
FLOODPLAIN DEVELOPMENT  
PERMIT**

PURPOSE FOR PERMIT: MARK WEST HERWOOD PLANT 4+5

ISSUED TO MARK WEST

ADDRESS: 218 SWISHER LANE WEST UNION WU 26456

PROJECT ADDRESS: 218 SWISHER LANE WEST UNION WU 26456

ISSUED BY: Ralph J. [Signature]

DATE: 3-4-14

CONSTRUCTION MUST START WITHIN 180 DAYS FROM ISSUED DATE. PERMIT EXPIRES IN 12 MONTHS FROM ISSUED DATE. IF EXTENTION IS NEEDED A REQUEST MUST BE MADE IN WRITING STATING A REASON FOR THE EXTENTION.

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

Legal Advertisement:  
Doddridge County  
Floodplain Permit Application

Please take notice that on the 3<sup>rd</sup> day of January, 2014

**MARK WEST LIBERTY – SHERWOOD PROCESSING PLANT 4 & 5**

**#13-103**

filed an

application for a Floodplain Permit to develop land located at or  
about: **SURFACE OWNERS: Dennis H. Powell**

**GRANT DISTRICT, D/B: 200/532, T/M SHEET 19, LOT 32**

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

Any interested persons who desire to comment shall present  
the same in writing by **January 23<sup>rd</sup>, 2014.**

Delivered to the:

Clerk of the County Court

118 E. Court Street, West Union, WV 26456.

Beth A Rogers, Doddridge County Clerk

Dan Wellings, Doddridge County Flood Plain Manager

\*\*\*\*\*  
\* P. 01 \*  
\* TRANSACTION REPORT \*  
\* FEB-05-2014 WED 03:37 PM \*  
\* FOR: DODDRIDGE CO. CLERK 304 873 1840 \*  
\* SEND \*  
\* DATE START RECEIVER TX TIME PAGES TYPE NOTE M# DP \*  
\* FEB-05 03:37 PM 3048731600 32" 1 FAX TX OK 865 \*  
\* TOTAL : 32S PAGES: 1 \*  
\*\*\*\*\*

**FLOODPLAIN PERMIT APPLICATION  
PUBLIC MEETING  
FOR  
MARKWEST SHERWOOD FACILITY**

Notice is hereby given to the public and those concerned area residents whom have sent a properly and timely filed objection to the Doddridge County Clerk of the County Commission's Office , many anonymously, to the granting or denying of the **MARKWEST** Doddridge County Floodplain application #13-103.

There will be a public meeting prior to granting or denying **MARKWEST** Doddridge County Floodplain Application #13-103 for **additional temporary stockpiles** of earth to be located in the FEMA designated special flood hazard area for construction of Sherwood Plant 4 & 5. Said public meeting will occur as part of the regularly scheduled **February 18, 2014 Doddridge County Commissioners meeting beginning at 6 PM at the Doddridge County Courthouse.**

Evidence will be taken or given by interested persons or parties.

This is **NOT** a forum on **MARKWEST** or the gas industry. Evidence will be limited to the impact of granting or denying additional temporary stockpiles of earth in the FEMA designated floodplain as it relates to the **DODDRIDGE COUNTY FLOODPLAIN ORDINANCE.**

Dan Wellings, PS  
Doddridge County Floodplain Manager

TRANSACTION REPORT

P. 01

JAN-03-2014 FRI 04:35 PM

FOR: DODDRIDGE CO. CLERK

304 873 1840

SEND

DATE	START	RECEIVER	TX TIME	PAGES	TYPE	NOTE	M#	DP
JAN-03	04:34 PM	93048731600	26"	1	FAX TX	OK	798	

TOTAL : 26S PAGES: 1

Legal Advertisement:

Doddridge County

Floodplain Permit Application

Please take notice that on the 3<sup>rd</sup> day of January, 2014

**MARK WEST LIBERTY – SHERWOOD PROCESSING PLANT 4 & 5**

**#13-103**

filed an

application for a Floodplain Permit to develop land located at or about: **SURFACE OWNERS: Dennis H. Powell**

**GRANT DISTRICT, D/B: 200/532, T/M SHEET 19, LOT 32**

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

Any interested persons who desire to comment shall present the same in writing by **January 23<sup>rd</sup>, 2014.**

Delivered to the:

Clerk of the County Court

118 E. Court Street, West Union, WV 26456.

Beth A Rogers, Doddridge County Clerk

Dan Wellings, Doddridge County Flood Plain Manager

#13-103  
Mark West - Sherwood  
Processing Plant 4-5

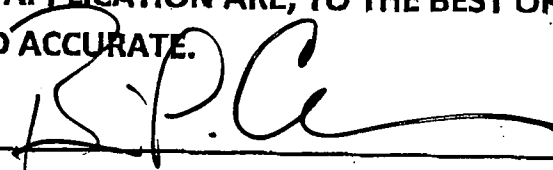
# DODDRIDGE COUNTY FLOODPLAIN DEVELOPMENT PERMIT APPLICATION

**FILED**  
2013 DEC 06 PM 1:53  
BRITTA A. ROGERS  
CLERK  
DODDRIDGE COUNTY, WV

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

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

APPLICANT'S SIGNATURE  
(AGENT)



DATE 12-6-13

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

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

APPLICANT'S NAME: Mark West Liberty - Kevin Sturgill

ADDRESS: 218 SWISHER LANE, WEST UNION, WV 26456

TELEPHONE NUMBER: 724-514-4319

**BUILDER'S NAME:** ANDERSON EXCAVATING, LLC  
**ADDRESS:** 343 WILLIAMS ROAD, MORGANTOWN, WV 26501  
**TELEPHONE NUMBER:** 304-983-2296

**ENGINEER'S NAME:** CIVIL & ENVIRONMENTAL CONSULTANTS, INC - ANDREW GULLONE  
**ADDRESS:** 333 BALDWIN ROAD, PITTSBURGH, PA 15205  
**TELEPHONE NUMBER:** 412-429-2324

**PROJECT LOCATION:**

**NAME OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT)** DENNIS H. POWELL

**ADDRESS OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT)** \_\_\_\_\_

216 SWISHER LANE, WEST UNION, WV 26456

**DISTRICT:** GRANT DISTRICT

**DATE/FROM WHOM PROPERTY** \_\_\_\_\_

**PURCHASED:** 8/8/1986 FROM ILA POWELL

**LAND BOOK DESCRIPTION:** \_\_\_\_\_

**DEED BOOK REFERENCE:** DBV 200 PAGE 532

**TAX MAP REFERENCE:** SHEET 19 LOT 32

**EXISTING BUILDINGS/USES OF PROPERTY:** SHED / FARM LAND

**NAME OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY** DENNY H. POWELL

**ADDRESS OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY** 216 SWISHER LANE, WEST UNION, WV 26456

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

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

**A. STRUCTURAL DEVELOPMENT**

**ACTIVITY**

**STRUCTURAL TYPE**

- New Structure
- Addition
- Alteration
- Relocation
- Demolition
- Manufactured/Mobil Home

- Residential (1 - 4 Family)
- Residential (more than 4 Family)
- Non-residential (floodproofing)
- Combined Use (res. & com.)
- Replacement

**B. OTHER DEVELOPMENT ACTIVITIES:**

- Fill             Mining             Drilling             Pipelining
- Grading
- Excavation (except for STRUCTURAL DEVELOPMENT checked above)
- Watercourse Altercation (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)

**C. STANDARD SITE PLAN OR SKETCH**

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

**ACTUAL TOTAL CONSTRUCTION COSTS OF THE COMPLETE DEVELOPMENT IRRESPECTIVE OF WHETHER ALL OR ANY PART OF THE SUBJECT PROPOSED CONSTRUCTION PROJECT IS WITHIN THE FLOODPLAIN \$ 203,000**

**D. ADJACENT AND/OR AFFECTED LANDOWNERS:**



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

NAME: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

NAME: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

NAME: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

NAME: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

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

NAME: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

NAME: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

NAME: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

NAME: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

N/A PROPOSED IMPACTS ARE WITHIN THE SUBJECT PROPERTY

**E. CONFIRMATION FORM**

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

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

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

NAME (PRINT): RICHARD B. CROMER  
 (AGENT)  
 SIGNATURE: [Signature] DATE: 12-6-13

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

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

**THE PROPOSED DEVELOPMENT:**

THE PROPOSED DEVELOPMENT IS LOCATED ON:

FIRM Panel: 145 C  
 Dated: 11-4-2011

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

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

Unavailable

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

See section 4 for additional instructions.

SIGNED Ralph JonesDATE 3-4-14**SECTION 4: ADDITIONAL INFORMATION REQUIRED (To be completed by  
Floodplain Administrator/Manager or his/her representative)**

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

- A plan showing the location of all existing structures, water bodies, adjacent roads, lot dimensions and proposed development.
- Development plans, drawn to scale, and specifications, including where applicable: details for anchoring structures, storage tanks, proposed elevation of lowest floor; (including basement or crawl space), types of water resistant materials used below the first floor, details of flood proffing of utilities located below the first floor and details of enclosures below the first floor. Also \_\_\_\_\_
- Subdivision or other development plans (If the subdivision or development exceeds 50 lots or 5 acres, whichever is the lesser, the applicant must provide 100-year flood elevations if they are not otherwise available).
- Plans showing the extent of watercourse relocation and/or landform alterations.
- Top of new fill elevation \_\_\_\_\_ Ft. NGVD (MSL).  
For floodproofing structures applicant must attach certification from registered engineer or architect.
- Certification from a registered engineer that the proposed activity in a regulatory floodway will not result in any increase in the height of the 100-year flood. A copy of all data and calculations supporting this finding must also be submitted.
- Manufactured homes located in a floodplain area must have a West Virginia Contractor's License and a Manufactured Home Installation License as required by the Federal Emergency Management Agency (FEMA).

Other:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

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

SIGNED \_\_\_\_\_ DATE \_\_\_\_\_

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

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

CONDITIONS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

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

COMPLETE 1 OR 2 BELOW:

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

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

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

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

**INSPECTIONS:**

DATE: \_\_\_\_\_ BY: \_\_\_\_\_  
DEFICIENCIES ? Y/N

COMMENTS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

Certificate of Compliance issued: DATE: \_\_\_\_\_ BY: \_\_\_\_\_

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

**PERMIT NUMBER:** \_\_\_\_\_

**PERMIT DATE:** \_\_\_\_\_

**PURPOSE –**

**CONSTRUCTION LOCATION:** \_\_\_\_\_

**OWNER'S ADDRESS:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

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

**SIGNED** \_\_\_\_\_ **DATE** \_\_\_\_\_

Hearing Date: 4/29/2014

DODDRIDGE COUNTY FLOODPLAIN

**STOP WORK ORDER NOTICE**

To: MARK WEST SHERWOOD

\_\_\_\_\_  
\_\_\_\_\_

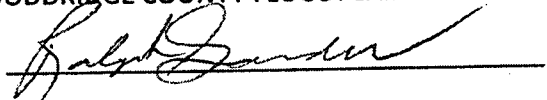
PURSUANT TO THE DODDRIDGE COUNTY FLOODPLAIN ORDINANCE ENACTED MAY 07, 2013,  
SECTION 7.7 (A) (1), YOU ARE ORDERED TO STOP ALL WORK, DEVELOPMENT AND CONSTRUCTION  
AT:

LOCATION: 218 SWISHER LAKE  
WEST UNION, WV 26456  
SHERWOOD 445 PERMIT # 13-103  
\_\_\_\_\_

FOR NON-COMPLIANCE WITH THE DODDRIDGE COUNTY FLOODPLAIN  
ORDINANCE, AND /OR CONDITIONS OF PERMIT, AND/OR DIRECTIVES OF THE  
FLOODPLAIN MANAGER.

DATE: 4/10/14

DODDRIDGE COUNTY FLOODPLAIN MANAGER



RALPH SANDORA, PRESIDENT DODDRIDGE COUNTY COMMISSION

DODDRIDGE COUNTY FLOODPLAIN MANAGER



SERVICE ACCETED BY HAND DELIVERY THIS 10 DAY OF April, 2014

BY E.L. Wilson

(DODDRIDGE CO REPRESENTATIVE)

SIGNATURE (PERSON RECEIVING NOTICE) 

(PRINT NAME OF PERSON RECEIVING NOTICE) Kevin Sturgill

(PRINT TITLE PERSON RECEIVING NOTICE) Project Manager

(PRINT COMPANY NAME OF PERSON RECEIVING NOTICE) Markwest

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west virginia department of environmental protection

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Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Ms. Ginger Mullins  
Chief, Regulatory Branch  
Huntington District, Corps of Engineers  
502 Eighth Street  
Huntington, West Virginia 25701-2070

Re: State 401 Water Quality Certification,  
Public Notice No. 2011-753-OHR,  
MarkWest Liberty Midstream & Resources,  
LLC, Sherwood Natural Gas Processing  
Facility Expansion, unnamed tributaries to  
Buckeye Creek, near Smithburg, Doddridge  
County, West Virginia; WQC 130006.

Dear Ms. Mullins:

The West Virginia Department of Environmental Protection-Division of Water and Waste Management (WVDEP-DWWM), in conjunction with the West Virginia Division of Natural Resources - Wildlife Resources Section (WVDNR-WRS), has completed review of the above-referenced project.

The applicant proposes to impact a total of 2052 linear feet (lf) of stream (1470 lf intermittent and 582 lf ephemeral), 6.21 acres of palustrine emergent wetland and 2.838 acres of palustrine open water wetland in conjunction with the expansion of a natural gas processing facility. The wetlands and 62 lf of ephemeral stream will be completely filled by the proposed discharges, while 1,990 lf of stream impacts are associated with the installation of culverts.

The purpose of the project is to expand the existing Sherwood Natural Gas Processing Facility to meet the incoming demand of raw natural gas. The existing facility was designed to process 600 million standard cubic feet per day, and the expansion will allow the facility to process 1 billion standard cubic feet per day. The project will encompass approximately 75.90 acres.

Utilizing the West Virginia Stream and Wetland Valuation Metric resulted in a total of 1483.45 stream debits and 15.26 wetland debits. To compensate for impacts resulting from this

Promoting a healthy environment.

Ms. Ginger Mullins

Page 2

April 4, 2014

project, the applicant has proposed to use the West Virginia Department of Environmental Protection In-Lieu Fee (ILF) program.

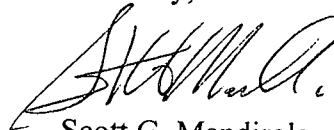
In order to comply with the state's water quality certification and water quality standards regulations the following special conditions must be met:

Special Conditions:

1. Prior to impacts, the applicant will purchase 1483.45 stream credits and 15.26 wetland credits from the ILF program.
2. The stormwater detention ponds as depicted on the Erosion and Sediment Control Plans, Phase 2, February 11, 2014, for NPDES Permit Number WV0115924, Registration Number WVR 310068, shall be designed, constructed and maintained for no increase in runoff from the facility up to the 100 year, 24 hour design storm event. These ponds shall remain in place and be maintained for the life of the facility.

State 401 Certification, as required by the Clean Water Act, is granted subject to the above special conditions and the attached 401 standard conditions. Certification shall be effective fifteen (15) days after receipt unless appealed under title 47, Series 5A, Section 7 of the Code of State Regulations, State Certification of Activities Requiring a Federal Permit. The appeal must be in writing and set forth the action complained of and the grounds upon which the appeal is based. It should be directed to: Director, Division of Water and Waste Management, West Virginia Department of Environmental Protection, 601 57<sup>th</sup> Street SE, Charleston, West Virginia 25304: ATTENTION: 401 Certification Program.

Sincerely,



Scott G. Mandirola  
Director

SGM/wir

cc: Mr. Rick Lowry  
MarkWest Liberty Midstream & Resources, LLC  
4600 J. Barry Court, Suite 500  
Canonsburg, Pennsylvania 15317  
U.S. Environmental Protection Agency - Jessica Martinsen  
U.S. Fish and Wildlife Service - Laura Hill  
WVDNR-Wildlife Resources Section, Elkins - Roger Anderson  
WVDEP - Glenn McLernon  
WVDEP - Bradley Swiger

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION  
CONDITIONS REQUIRED FOR SECTION 404/10 PERMITS  
ISSUANCE AND STATE CERTIFICATION AS REQUIRED BY SECTION 401

Applicant: MarkWest Liberty Midstream & Resources, LLC  
WQC No.: 130006  
Public Notice No. 2011-753-OHR  
Date: April 4, 2014

1. 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 West Virginia Department of Environmental Protection, Division of Water and Waste Management in concurrence with the West Virginia Division of Natural Resources.
2. 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 waterbody. All spills shall be promptly reported to the State Center for Pollution, Toxic Chemical and Oil Spills, 1-800-642-3074.
3. 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: Cadmium 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.
4. Land disturbances, which are integral to the completion of the permitted activity and 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 West Virginia Department of Environmental Protection, Division of Water and Waste Management, if applicable. Best Management Practices for Sediment and Erosion Control, as described in the West Virginia Department of Environmental Protection's Erosion and Sediment Control Best Management Practice Manual, 2006, or similar documents prepared by the West Virginia Division of Highways may be used. These handbooks are available from the respective agency offices.

5. 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.
6. All permit modifications must be re-certified.
7. Equipment for handling and conveying materials at this facility will be designed and operated to prevent dumping or spilling materials into the watercourse. Necessary steps will be taken to prevent materials spilled or stored onshore from washing into the watercourse as a result of clean-up activities, natural runoff or flooding. Excessive dust will also be controlled and kept out of the watercourse.
8. The permittee will provide written notice of the proposed start-up date to the WVDEP-Environmental Enforcement (EE), fifteen days in advance of initiation of any activity authorized by the certification. The address for EE is 601 57th Street SE, Charleston, West Virginia 25304..
9. Stream activities permitted under the US Army Corps of Engineers 404 Program require that a West Virginia Public Lands Corporation Right of Entry be obtained. Application for this authorization should be made to the West Virginia Division of Natural Resources, Office of Lands and Streams, Building 74, Room 200, 324 Fourth Avenue, South Charleston, West Virginia 25303, or by contacting them at 304-558-3225. Any activity within the 100-year floodplain requires approval from the appropriate Floodplain Manager. The following website provides a statewide listing of Floodplain Managers in West Virginia:  
[www.dhsem.wv.gov/mitigation/floodplain/Pages/default.aspx](http://www.dhsem.wv.gov/mitigation/floodplain/Pages/default.aspx)
10. Should potentially hazardous waste materials be located, the permittee will advise the WVDEP, Division of Waste Management and Waste Management (Hazardous Waste Section), telephone (304) 926-0495, prior to disturbance of material.
11. The permittee shall provide a copy of the State 401 Certification to the construction contractor. A copy of the State 401 Certification shall be available at the project site until such time as the project is complete.
12. The permittee will comply with water quality standards as contained in the WV Code of State Regulations, Requirements Governing Water Quality Standards Title 47, Series 2.

Ralph:

CME Engineering reviewed the applications dated July 16, 2013 and December 2013 relating to the MarkWest Sherwood 4 and 5 Natural Gas Processing Plant. Based on the hydraulic calculations prepared by Civil and Environmental Consultants, the increase in the floodplain due to the activities relating to the plant development are summarized as follows:

- July 16, 2013 (Road Crossing, Truck Loading Area and Temp Stockpiles) – 100-year flood increase of 0.31 feet
- December 2013 (Temporary Stockpiles) – 100-year flood increase of 0.26 feet

It shall be noted that both hydraulic analyses above are independent of each other and show the increase from a pre-development condition (prior to site development) to the proposed condition. The numbers above should not be added together to determine the overall impacts.

Let me know if you have questions.

**Kevin L. Yoder, P.E.**

**Project Director I**

CME Management LLC

General partner of CME Engineering LP

27 East Main Street

Frostburg, Maryland

Phone (301) 689-1700 ext. 2101

Fax (301) 689-5177

Cell (814) 233-5995



DEPARTMENT OF THE ARMY  
HUNTINGTON DISTRICT, CORPS OF ENGINEERS  
502 EIGHTH STREET  
HUNTINGTON, WEST VIRGINIA 25701-2070

REPLY TO  
ATTENTION OF

APR 15 2014

Regulatory Division  
Energy Resources Branch  
LRH-2011-753-OHR—Buckeye Creek

Mr. Richard Lowry  
MarkWest Liberty Midstream & Resources, LLC  
4600 J. Barry Court, Suite 500  
Canonsburg, Pennsylvania 15317

Dear Mr. Lowry:

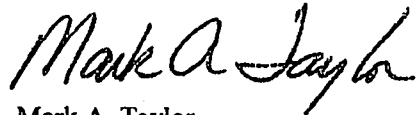
Enclosed are one original and one copy of Department of the Army (DA) Permit Number 2011-753-OHR, authorizing you to discharge of fill material into a total of 2,052 linear feet (lf) of streams, 2.84 acres (ac) of open water and 6.23 ac of wetland in association with the Sherwood Natural Gas Processing Facility Expansion. All of the wetlands, the open water and 62 lf of ephemeral stream will be completely filled by the fill discharges. A total of 1,990 lf of stream (1,470 lf of intermittent stream and 520 lf of ephemeral stream) will be impacted by fill discharges associated with the installation of culvert pipes. The discharges of fill material will be associated with grading of the site to facilitate the construction of four additional cryogenic recovery plants and three de-ethanizers (where the ethane portion of the raw natural gas is separated and sent separately to other processing plants). Compensatory mitigation for the proposed discharges of fill material into waters of the United States will consist of payments to the West Virginia Department of Environmental Protection's In-Lieu Fee Program: \$1,186,757.91 for the purchase of 1,483.42 stream credits; \$170,280 for the purchase of open water credits; and, \$745,200 for the purchase of 12.42 ac wetland credits. This project will be located in unnamed tributaries to Buckeye Creek and adjacent wetlands located on Swisher Lane west of Sherwood, Doddridge County, West Virginia.

The original copy of this permit is for your records. The enclosed copy of the authorization must be supplied to the project engineers responsible for the construction activities.

If any changes in the location and plans of the work are found necessary, revised plans must be submitted to this office for approval as required by law, before work is initiated. It is imperative that this office be notified two weeks prior to the commencement of construction, and again upon completion of activities.

If you have any questions, please contact Jim Spence of the Energy Resources Branch at 304-399-5210 or [james.b.spence@usace.army.mil](mailto:james.b.spence@usace.army.mil).

Sincerely,



Mark A. Taylor  
Chief, Energy Resources Branch

Enclosures (2)

Copy furnish letter and copy of permit to:

Mr. Gregory Gies  
U.S. Environmental Protection Agency  
Environmental Programs Branch  
1650 Arch Street (3ES30)  
Philadelphia, Pennsylvania 19103-2029

Ms. Wilma Reip  
WVDEP  
601 57th St  
Charleston, West Virginia 25304

Mr. Roger Anderson  
West Virginia Division of Natural  
Resources  
PO Box 67  
Elkins, West Virginia 26241

Mr. John Schmidt  
U.S. Fish and Wildlife Service  
694 Beverly Pike  
Elkins, West Virginia 26241

Ms. Susan M. Pierce  
WV Division of Culture & History  
FR 12-309-DO-6  
1900 Kanawha Blvd, E.  
Charleston, West Virginia 25305-0300

Ms. Jaquelyn D. Kester  
Civil & Environmental Consultants, Inc.  
99 Cambridge Place  
Bridgeport, West Virginia 26330

District Supervisor  
West Virginia Conservation Agency West  
Fork District  
84 Ollie Lane  
Mt. Clare, West Virginia 26408

**DEPARTMENT OF THE ARMY PERMIT**

Permittee: MarkWest Liberty Midstream & Resources, LLC

Permit No. : 2011-753-OHR—Buckeye Creek

Issuing Office: Huntington District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

**Project Description:** You are authorized to discharge fill material into waters of the U.S. in association with the Sherwood Natural Gas Processing Facility Expansion in association with the attached plans dated September 10, 2013. This project will involve the discharge fill material into a total of 2,052 lf of streams, 2.84 ac of open water and 6.23 ac of wetland. All of the wetlands, the open water and 62 lf of ephemeral stream will be completely filled by the fill discharges. A total of 1,990 lf of stream (1,470 lf of intermittent stream and 520 lf of ephemeral stream) will be impacted by fill discharges associated with the installation of culvert pipes. The discharges of fill material will be associated with grading of the site to facilitate the construction of four additional cryogenic recovery plants and three de-ethanizers (where the ethane portion of the raw natural gas is separated and sent separately to other processing plants). Compensatory mitigation for the discharges of fill material into waters of the U.S. will consist of payments to the West Virginia Department of Environmental Protection's In-Lieu Fee Program: \$1,186,757.91 for the purchase of 1,483.42 stream credits; \$170,280 for the purchase of open water credits; and, \$745,200 for the purchase of 12.42 ac wetland credits.

**Project Location:** The project is located in unnamed tributaries to Buckeye Creek and adjacent wetlands located on Swisher Lane west of Sherwood, Doddridge County, West Virginia.

**Permit Conditions:**

**General Conditions:**

1. The time limit for completing the work authorized ends on December 31, 2019. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.
3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.
4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.
5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.



6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

**Special Conditions:**

See attached page titled, "Special Conditions for the Permit Issued to MarkWest Liberty Midstream & Resources, LLC, Sherwood Natural Gas Processing Facility Expansion, 2011-753-OHR—Buckeye Creek."

**Further Information:**

1. **Congressional Authorities:** You have been authorized to undertake the activity described above pursuant to:
  - ( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).
  - (x) Section 404 of the Clean Water Act (33 U.S.C. 1344).
  - ( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).
2. **Limits of this authorization:**
  - a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.
  - b. This permit does not grant any property rights or exclusive privileges.
  - c. This permit does not authorize any injury to the property or rights of others.
  - d. This permit does not authorize interference with any existing or proposed Federal project.
3. **Limits of Federal Liability:** In issuing this permit, the Federal Government does not assume any liability for the following:
  - a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.
  - b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.
  - c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.
  - d. Design or construction deficiencies associated with the permitted work.

- e. Damage claims associated with any future modification, suspension, or revocation of this permit.
- 4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.
- 5. Reevaluation of Permit Decision: This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:
  - a. You fail to comply with the terms and conditions of this permit.
  - b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).
  - c. Significant new information surfaces, which this office did not consider in reaching the original public interest decision.

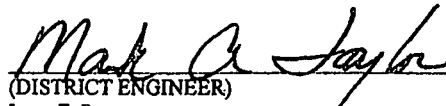
Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

- 6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

 \_\_\_\_\_ 4/15/14 \_\_\_\_\_  
 (PERMITEE) (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

*for*  \_\_\_\_\_ 4-15-14 \_\_\_\_\_  
 (DISTRICT ENGINEER) (DATE)  
 Leon F. Parrott  
 Colonel, Corps of Engineers

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

\_\_\_\_\_  
 (TRANSFEEE) (DATE)

**Special Conditions for the Permit Issued to  
MarkWest Liberty Midstream & Resources, LLC  
Sherwood Natural Gas Processing Facility Expansion  
2011-753-OHR—Buckeye Creek**

1. This authorization remains contingent upon, and must be constructed in accordance with, the attached drawings. If project plans change that include additional impacts to waters of the United States (U.S.), the permittee shall contact the U.S. Army Corps of Engineers, Huntington District, Regulatory Division (Corps) to obtain authorization prior to discharging fill material in waters of the U.S. as part of this project. If project plans change that reduces actual impacts to waters of the U.S., the permittee shall contact the Corps to approve proposed changes to the Compensatory Mitigation Plan (CMP).
2. The West Virginia Section 401 Individual water quality certification, issued by the West Virginia Department of Environmental Protection on April 4, 2014, is attached hereto and made a part of this Section 404 permit. All conditions attached to or contained therein are hereby incorporated by reference as being special conditions of the Section 404 permit.
3. The permittee is required to apply for and secure all necessary permits, certifications or other approvals from federal, state or local regulatory agencies, including a floodplain permit from the Doddridge County Commission, prior to commencing construction activity. These other federal, state or local approvals and all conditions attached to or contained therein are hereby incorporated by reference as being special conditions of this DA permit.
4. The proposed project will result in the permanent discharge of fill material into 2,052 linear feet (lf) of streams, 2.84 acres (ac) of open water and 6.23 ac of emergent wetland. To compensate for the proposed fills, you have proposed to make a payment into the West Virginia In-Lieu Fee (WVILF) program ("In-Lieu Mitigation Fees" account), administered by the West Virginia Department of Environmental Protection (WVDEP).

Please forward a check in the amount of \$1,186,757.91 to the WVILF to provide compensatory mitigation for 2,052 lf of permanent stream fill, \$170,280 to provide compensatory mitigation for 2.84 ac of permanent open water fill, and \$745,200 to provide compensatory mitigation for 6.23 ac of permanent PEM wetland fill within 60 calendar days of this Department of the Army 404 permit approval. After making the required payment, please forward the WVILF Payment Receipt to our office. If the required payment is not received by WVDEP within 60 calendar days of this permit authorization, your permit may be revoked.

Mail WVILF Payment and Completed Participant Information Sheet to:  
Mr. Glenn McLernon  
West Virginia Department of Environmental Protection  
601 57th Street, SE  
Charleston, West Virginia 25304

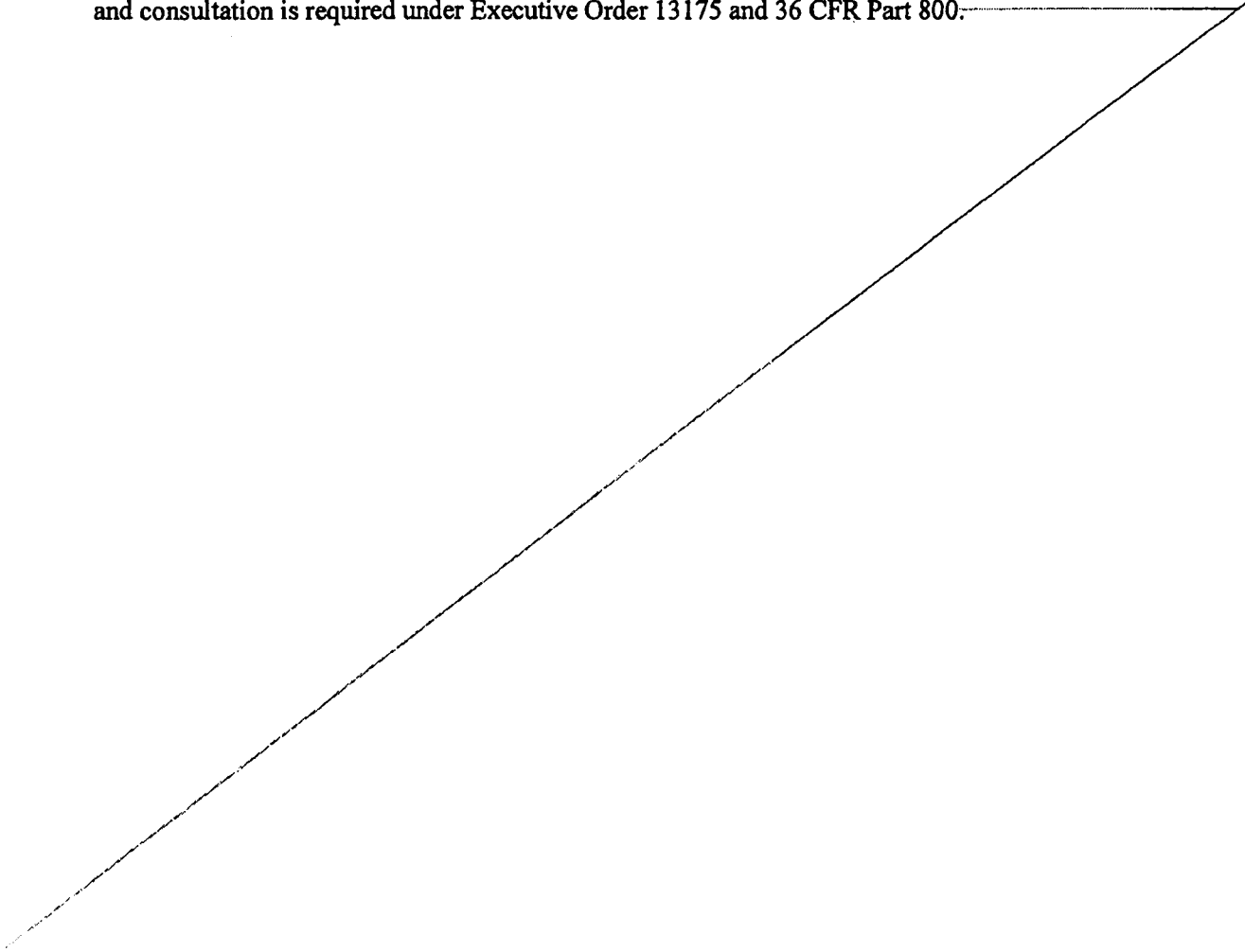
5. The project lies within the range of the Indiana bat (*Myotis sodalis*), a Federally-listed endangered species and the northern long-eared bat (*Myotis septentrionalis*), a proposed

Federally-listed endangered species. Summer habitat requirements for these species are not well defined but the following are considered important:

- a. Dead or live trees and snags with peeling or exfoliating bark, split tree trunks and/or branches, or cavities which may be used as maternity roosts;
- b. Live trees (such as shagbark hickory and oaks) which have exfoliating bark; and
- c. Stream corridors, riparian areas and upland woodlots that provide forage sites.

Suitable habitat for the Indiana bat and northern long-eared bat may be located within the forested areas of the project site. You shall preserve trees and associated habitats exhibiting any of the characteristics listed above. For the expansion project area, should suitable habitat be present that cannot be saved during construction activities, these trees shall not be cut between April 1 and November 14.

6. In the event any previously unknown historic or archaeological sites, artifacts, or human remains are uncovered while accomplishing the activity authorized by this permit, the permittee must immediately cease all work to that area and contact the county law enforcement office (only if finding human remains), the Corps and the West Virginia Division of Culture and History. The Corps will complete Federal, state and tribal coordination required to comply with the National Historic Preservation Act and applicable state and local laws and regulations. Federally recognized tribes are afforded a government-to-government status as sovereign nations and consultation is required under Executive Order 13175 and 36 CFR Part 800.





**HYDRAULIC STUDY OF BUCKEYE CREEK**

**SHERWOOD GAS PROCESSING PLANT  
DODDRIDGE COUNTY, WEST VIRGINIA**

**Prepared for:**

**MARKWEST LIBERTY MIDSTREAM & RESOURCES, LLC**

**Prepared by:**

**CIVIL & ENVIRONMENTAL CONSULTANTS, INC.  
PITTSBURGH, PENNSYLVANIA**

**CEC Project 110-811**

**December 2013**



December 3, 2013

Mr. Daniel Wellings, PS  
Doddridge County Floodplain Manager  
HC 68, Box 5  
West Union, WV 26456

**FILED**  
2013 DEC 10 PM 1:54  
BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

Dear Mr. Wellings:

Subject: Proposed Sherwood Gas Processing Plant 4 & 5  
County Road 50/34  
Doddridge County, West Virginia  
CEC Project 110-811

Civil & Environmental Consultants, Inc. (CEC) has been hired as a consultant to provide professional engineering services to MarkWest Liberty Midstream & Resources, LLC (MarkWest). MarkWest is planning to expand their Sherwood Gas Processing Plant with two more plants. As part of this project, temporary stockpiles will be added to the site.

MarkWest was issued a Floodplain Permit on August 28, 2013 for the Sherwood Gas Processing Plants 4 and 5 Expansion. MarkWest now plans to add additional temporary stockpiles as part of the construction of the gas processing plants. On behalf of MarkWest, CEC is requesting a revised permit that includes the additional area for the temporary stockpiles.

CEC conducted a flood study for this area to demonstrate the impact that the temporary stockpiles, will have on the existing floodplain for the 100-year storm event. Based on the analysis, CEC does not anticipate any significant increase to the floodwater elevation caused by this temporary construction, and no properties aside from the subject property of Dennis H. Powell's will be impacted. The existing BFE at river station 33+04.54 is 813.09 feet and is proposed to increase 0.28 feet to 813.37 feet. This location is where the greatest increase in flood elevation would be expected to occur, which is upstream of the proposed temporary stockpiles. CEC is providing the stamped, signed engineer's seal stating that the additional temporary stockpiles should not increase the floodplain area or raise flood elevations within the federal allowable limit of increase of one foot.

As part of this revised flood study, CEC performed an additional survey to acquire more accurate and current topography for the stream, overbanks, and newly constructed bridge between stations 25+54.54 (Section T) and 0+00 (Section NN). The new bridge was constructed with a deck elevation of approximately 812, providing 3.5 feet more vertical flow area than the design that was modeled in the original flood study. As such, the originally proposed increase in water surface elevation of 0.07 feet resulting from the new bridge has been changed to a decrease in water surface elevation. Because the topography is no longer consistent with the original DEM data from the August 28, 2013 Floodplain Permit, water surface elevations cannot be compared between the two studies. However, since the newly constructed bridge decreases the water surface elevation, all increases in water surface elevation in the revised flood study result from

the proposed temporary stockpiles and represent the cumulative impact of the Sherwood Gas Processing Plants 4 and 5 on the floodplain.

Please contact us at 412-429-2324 if you have any questions.

Very truly yours,

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.



Edward J. Fink, P.E., CPESC, CPSWQ  
Project Manager



Richard P. Celender, C.E.T., CPESC, CPSWQ  
Principal





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## APPENDICES

Appendix A – Site Location and Soils Maps

Appendix B – FEMA Flood Information Study and Rate Map

Appendix C – Hydraulic Calculations for Existing and Proposed Conditions

Appendix D – Existing and Proposed Floodway Maps and Cross Section Output

Appendix E – HEC-RAS Summary of Existing and Proposed Hydraulic Calculations

Appendix F – Doddridge County Floodplain Permits





## 1.0 INTRODUCTION

### 1.1 BACKGROUND

MarkWest Liberty Midstream & Resources, LLC (MarkWest) has contracted Civil & Environmental Consultants, Inc. (CEC) to perform a flood study as part of the construction of Plant 4 and Plant 5 of the Sherwood Gas Processing Plant located approximately one-half-mile east of the intersection of U.S. Route 50 and County Route 20 along County Route 50/34 in Doddridge County, West Virginia. A Floodplain Permit was issued on August 28, 2013 to MarkWest for the Sherwood Gas Processing Plants 4 and 5 Expansion. This permit included grading improvements for Plants 1-5, the truck unloading area, an access road with a new bridge from County Road 50/34, and temporary stockpiles. The original permit is included in Appendix F.

MarkWest now plans to add additional temporary stockpiles as part of the construction of the gas processing plants. The earthmoving operations will include the placement of excess material in temporary stockpiles adjacent to Buckeye Creek. A site location map has been provided in Appendix A. The new Doddridge County Floodplain Application is included in Appendix F.

As part of this revised flood study, CEC performed an additional survey to acquire more accurate and current topography for the stream, overbanks, and newly constructed bridge between stations 25+54.54 (Section T) and 0+00 (Section NN). The new bridge was constructed with a deck elevation of approximately 812, providing 3.5 feet more vertical flow area than the design that was modeled in the original flood study. As such, the originally proposed increase in water surface elevation of 0.07 feet resulting from the new bridge has been changed to a decrease in water surface elevation. Because the topography is no longer consistent with the original DEM data from the August 28, 2013 Floodplain Permit, water surface elevations cannot be compared between the two studies. However, since the newly constructed bridge decreases the water surface elevation, all increases in water surface elevation in the revised flood study result from the proposed temporary stockpiles and represent the cumulative impact of the Sherwood Gas Processing Plants 4 and 5 on the floodplain.



## 1.2 PURPOSE

The purpose of this study is to perform a Hydrologic and Hydraulic (H&H) analysis of the existing 100-year floodplain of Buckeye Creek and estimate the effect on the floodplain by the six (6) proposed temporary fill stockpiles. The H&H analysis will be used to compare the existing and proposed 100-year floodplain water surface elevations (WSELs) of Buckeye Creek upstream and downstream of the proposed stockpiles. This comparison will show the theoretical impacts, if any, of the proposed temporary fill stockpiles along the study area of the tributary as it relates to the 100-year floodplain WSELs.

## 1.3 SCOPE OF SERVICES

CEC has performed this H&H analysis of the existing and proposed conditions along a portion of Buckeye Creek upstream and downstream of the proposed grading improvements for the 100-year floodplain WSELs. The following scope of services was performed in order to achieve the above-stated purpose:

- Additional topographic information was collected by CEC to supplement the available topographic digital elevation models (DEM, USGS 3-meter) provided by West Virginia Statewide Addressing and Mapping Board (WVSAMB). It included:
  - New bridge survey elevations;
  - Topographic survey of the access road from County Route 50/34;
  - Topographic survey of existing grade at various locations along the reach.
- Performance of hydraulic analyses utilizing the Hydrologic Engineering Center River Analysis System (HEC-RAS) program to perform a detailed backwater analysis of Buckeye Creek for the existing and proposed conditions during the 100-year, 24-hour storm event. The study included:
  - Development of an appropriate number of stream cross-sections for use in the HEC-RAS model;
  - Development of a model of the existing terrain and floodplain, which was used as a baseline;



- Development of a floodplain that delineated the boundary of the 100-year flood in Buckeye Creek under existing conditions; and
- Development of a floodplain plan that delineated the boundary of the 100-year flood in Buckeye Creek under proposed conditions that include the installation of the six proposed stockpiles.
- Preparation of this hydraulic analysis report that summarizes our calculations and findings.

#### **1.4 AUTHORIZATION**

This study was performed as authorized by MarkWest.

#### **1.5 STANDARD OF CARE**

The services provided by CEC were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the civil engineering profession practicing contemporaneously under similar conditions in the locality of the project. No warranty, express or implied, is made.



## 2.0 HYDROLOGIC ANALYSIS

### 2.1 METHODOLOGY

The Federal Emergency Management Agency (FEMA) conducted a Flood Insurance Study (FIS) for Doddridge County, West Virginia, October 4, 2011. According to this study, Buckeye Creek discharges 5,150 cubic feet per second (cfs) at its upstream confluence with Long Run during the 100-year, 24-hour storm event. The FEMA FIS is included in Appendix B.

In order to maintain conditions similar to the FIS, the discharge of 5,150 cfs and the known water surface elevation of 811 were used during the hydraulic analysis, as described in Section 4. The FEMA Flood Insurance Rate Map is provided in Appendix B.



### 3.0 HYDRAULIC ANALYSIS

The U.S. Army Corps of Engineers HEC-RAS computer software was utilized to analyze the hydraulic capacity and project water surface elevations (WSELs) along Buckeye Creek during the 100-year, 24-hour design storm evaluations. The Buckeye Creek study area boundary extended from approximately 2,460 feet downstream of the new bridge location to approximately 1,045 feet upstream of the new bridge location. A map of the cross section locations utilized for the hydraulic analysis is located in Appendix D.

#### 3.1 EXISTING CONDITIONS

A HEC-RAS model for the existing conditions was created using as-built survey information collected by CEC, DEM data, and the FEMA FIS for Doddridge County, WV dated October 4, 2011.

The new bridge located at Station 24+60.04 is a single span bridge, 30 feet wide, and 45 feet long with a deck elevation of 812 feet (determined by the as-built survey). This new bridge was designed to be at the same stream location and have a deck elevation of 808.5, which was used in the previous HEC-RAS model for the August 28, 2013 permit. Because of the increase in bridge deck elevation, the bridge actually decreases the water surface elevation rather than slightly increasing it, as was shown in the original permit. An existing bridge that was previously permitted to be removed once this new bridge was constructed is still planned to be removed. As such, only the new bridge is included in the existing conditions flood study model.

New topography was also collected for the stream and overbanks between stations 25+54.54 (Section T) and 0+00 (Section NN) during the survey. This topography is more accurate and current than the DEM topography used in the original flood study, so it is used in place of the DEM topography in the existing flood study model.



The HEC-RAS input and output data for the model is provided in Appendix C. The map in Appendix D also shows the estimated lateral extent of the floodplain resulting from the 100-year, 24-hour design storm.

Included in Appendix E is the HEC-RAS summary table for the estimated water surface elevations in Buckeye Creek resulting from the 100-year, 24-hour design storm at each analyzed cross-section based on the existing conditions.

### **3.2 PROPOSED CONDITIONS**

The HEC-RAS model for the proposed conditions was developed by revising the Buckeye Creek cross-sections to include the proposed temporary stockpiles. The elevations of the temporary stockpiles vary and are shown on the map in Appendix D. The proposed temporary stockpiles are located between cross-sections G (32+04.54) and DD (16+04.54).

The HEC-RAS input and output data for the proposed conditions model have been provided in Appendix C. The HEC-RAS summary table for proposed conditions for each cross section is summarized in the hydraulic calculations in Appendix E. In addition, a summary table for the comparison of the 100-year existing and proposed water surface elevations is located at the end of Appendix E.



## 4.0 CONCLUSIONS

The following conclusions are presented based on the results of engineering analyses using the HEC-RAS model.

### 4.1 EXISTING CONDITIONS

The existing conditions, as previously described, were evaluated to estimate the WSEL at the temporary stockpile locations. The water surface elevation at Station 33+04.54, three cross sections upstream of the most upstream proposed temporary stockpile, is 813.09 feet, based on the HEC-RAS existing conditions model. Appendix E contains a summary table of the HEC-RAS results. Also provided are graphical results of the HEC-RAS analysis for the 100-year design storm at numerous sections along Buckeye Creek. Based on these analyses, the following conclusions were developed:

- The 100-year, 24-hour design storm will not overtop the new bridge at Station 24+60.04; and
- The 100-year, 24-hour design storm will inundate approximately 53 acres, as shown in Drawing SP01 in Appendix D.

### 4.2 PROPOSED CONDITIONS

The proposed HEC-RAS model was setup to analyze the installation of the six temporary stockpiles. The water surface elevation at Station 33+04.54, three cross sections upstream of the most upstream proposed temporary stockpile, is 813.37 feet. Appendix E contains a summary table of the HEC-RAS results for Buckeye Creek considering the proposed temporary stockpiles. Also provided are graphical results of the HEC-RAS analysis for the 100-year design storm at numerous sections along Buckeye Creek. The section locations are shown in drawing SP01 in Appendix D. Based on these analyses, the following conclusions were developed:

- The 100-year, 24-hour design storm will not overtop the new bridge at Station 24+60.04;



- The 100-year, 24-hour design storm will inundate approximately 45 acres as shown on Drawing SP01 in Appendix D.
- The 100-year, 24-hour design storm will increase the flood elevation a maximum of 0.28 feet at Station 33+04.54, three sections upstream of the most upstream proposed temporary stockpile.
- The water surface elevation increase at Station 35+04.54, approximately 315 feet downstream from the subject property line, is 0.08 feet.

### 4.3 SUMMARY

The hydraulic analysis was prepared to provide a comparison between the post-development floodplain conditions along Buckeye Creek and the existing conditions.

The installation of the temporary stockpiles will increase the flood elevation by a maximum of 0.28 feet. This increase is within the federal allowable limit of increase of one (1) foot and does not pose any additional flooding hazard to properties adjacent to Buckeye Creek within the study area.



**FLOODPLAIN PERMIT APPLICATION  
PUBLIC MEETING  
FOR  
MARKWEST SHERWOOD FACILITY**

Notice is hereby given to the public and those concerned area residents whom have sent a properly and timely filed objection to the Doddridge County Clerk of the County Commission's Office , many anonymously, to the granting or denying of the **MARKWEST** Doddridge County Floodplain application #13-103.

There will be a public meeting prior to granting or denying **MARKWEST** Doddridge County Floodplain Application #13-103 for **additional temporary stockpiles** of earth to be located in the FEMA designated special flood hazard area for construction of Sherwood Plant 4 & 5. Said public meeting will occur as part of the regularly scheduled **February 18, 2014 Doddridge County Commissioners meeting beginning at 6 PM at the Doddridge County Courthouse.**

Evidence will be taken or given by interested persons or parties.

This is **NOT** a forum on **MARKWEST** or the gas industry. Evidence will be limited to the impact of granting or denying additional temporary stockpiles of earth in the FEMA designated floodplain as it relates to the **DODDRIDGE COUNTY FLOODPLAIN ORDINANCE.**

Dan Wellings, PS

Doddridge County Floodplain Manager

13-103

# CME

ENGINEERING

814-443-3344  
Fax: 814-444-0365

April 23, 2014

Mr. Ralph Sandora & Edwin Wriston  
Doddridge County Floodplain Manager  
118 East Court Street  
West Union, West Virginia 26456

RE: Sherwood 4 and 5 Natural Gas Processing Plant  
Mark West Liberty Midstream and Resources, LLC  
Doddridge County, West Virginia

Mr. Sandora & Mr. Wriston:

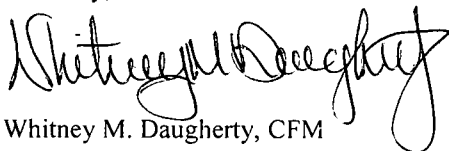
As requested, CME Engineering LP (CME) has reviewed the hydraulic study prepared by Civil & Environmental Consultants (CEC) relating to the Mark West Midstream and Resources, LLC (Mark West) Sherwood 4 and 5 Natural Gas Processing Plant. Mark West proposes to construct temporary stockpiles within the floodplain of Buckeye Creek.

CME finds that the hydraulic study prepared by CEC was performed within standard engineering practice and appears to be in compliance with the Doddridge County Floodplain Ordinance. The study reveals there is a hydraulic jump that occurs at the proposed bridge that causes the water surface elevation of the floodplain to exceed the one foot maximum difference to the existing water surface elevation requirement. This is due to the abrupt elevation change of the creek bottom and the side abutments of the new bridge. These parameters cause the velocity of the floodplain to flow at an increased rate at the bridge. This occurrence of the hydraulic jump results in no further impacts to this location.

Section 7.2.B of the Doddridge County Ordinance states " All permits and plans shall be approved only after it has been determined that the proposed work to be undertaken will be in conformance with the requirements of this Ordinance, State and Federal Laws, Ordinances, and Regulations." It is the responsibility of the permittee (Mark West) to obtain all required permits. Therefore, CME recommends conditional approval of the application pending receipt of any and all required federal or state permits.

CME appreciates the opportunity to assist Doddridge County on this project. Please contact Mark Stanley at (724) 672-4842 or me at (814) 443-3344 if you have any questions.

Sincerely,



Whitney M. Daugherty, CFM  
Engineering Technician IV  
CME Management LLC  
General partner of CME Engineering LP

CC: Mark Stanley, CME  
CME File 0875-S010

# Doddridge County Flood Plain

INVOICE 13-103 & 14-123

118 East Court St, Room 102

West Union WV 26456

304-873-2631

Mark West Corporation Headquarter 303-925-9200

Mark West Engery Partners

Accounts Payable

1515 Arapahoe Street, Tower 1, Suite 1600

Denver, Co 50202

**BALANCE DUE**

Upon Receipt

**\$1,504.00**

Reimbursement for the review of the Sherwood Processing Plant 4 & 5, Permit # 13-103 and the review of The Master Plan for the Sherwood Plan, Permit # 14-123.

Item Description	Quantity	Price Per	Total
Invoice #0035501			\$1,087.00
Invoice #0035502			\$417.00
		Subtotal	\$1,504.00
		Tax - 0%	\$0.00
TOTAL			\$1,504.00

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**COPY**

**CME Engineering**  
975 Georges Station Road  
Suite 100  
Greensburg, PA 15601  
(724) 672-4800

Doddridge County  
Attn: Ralph Sandora  
Flood Plain Manager  
118 E. Court Street  
West Union, WV 26456

INVOICE NO : 0035502  
DATE : March 06, 2014  
CLIENT CODE : 0000875  
PROJECT CODE : W011

Page 1 of 1

Flood Plain CEC Final App

For period through: 02/28/2014

Non-Professional Services Rendered	Amount
Professional services performed for review of Sherwood Plant Final Plan.	
Project Director III	
3.00 Hours @ \$ 139.00	417.00
<b>TOTAL FEES:</b>	<b>\$417.00</b>
<b>TOTAL AMOUNT DUE:</b>	<b>\$417.00</b>

PAYMENT DUE UPON RECEIPT

A finance charge of 1.5% per month will be assessed on all balances over 30 days.

**COPY**

**CME Engineering**  
975 Georges Station Road  
Suite 100  
Greensburg, PA 15601  
(724) 672-4800

Doddridge County  
Attn: Dan Wellings  
Flood Plain Manager  
118 E. Court Street  
West Union, WV 26456

INVOICE NO : 0035501  
DATE : March 06, 2014  
CLIENT CODE : 0000875  
PROJECT CODE: W010

Page 1 of 1

Flood Plain CEC Application

For period through: 02/28/2014

For Professional Services Rendered	Amount
Professional services performed for review of Sherwood Plant Flood Plain Plan.	
Project Director III	5.50 Hours @ \$ 139.00 764.50
Project Director II	2.50 Hours @ \$ 129.00 322.50
<b>TOTAL FEES:</b>	<b>\$1,087.00</b>
<b>TOTAL AMOUNT DUE:</b>	<b>\$1,087.00</b>

PAYMENT DUE UPON RECEIPT

A finance charge of 1.5% per month will be assessed on all balances over 30 days.

# Doddridge County Flood Plain

INVOICE 13-103 & 14-123

118 East Court St, Room 102

West Union WV 26456

304-873-2631

**Mark West Liberty Midstream & Resources, LLC**

4600 J. Barry Court, Suite 500

Canonsburg, Pa 15317

**BALANCE DUE**

Upon Receipt

**\$9696.55**

Reimbursement for CME Engineering review of the Sherwood Processing Plant 4 & 5, Permit # 13-103 and the review of The Master Plan for the Sherwood Plan, Permit # 14-123. Enclosed are the copies of the original invoices. If you have any questions please contact Beth Kellar or Catie Slater at 304-873-2631.

Item Description	Quantity	Price Per	Total
Invoice No. 0035145			2,131.96
0035246			2,354.48
0035618			1,042.50
0035743			2,754.00
0035875			774.00
0035876			639.61
		Subtotal	\$9696.55
		Tax - 0%	\$0.00
		<b>TOTAL</b>	<b>\$9696.55</b>

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Sent Invoice  
on 4/28/14  
Catie

**CME Engineering**  
 975 Georges Station Road  
 Suite 100  
 Greensburg, PA 15601  
 (724) 672-4800

Please make checks payable to:  
 "CME Management LLC"  
 And remit to the following address:  
 CME Management LLC  
 PO Box 644872  
 Pittsburgh, PA 15264-4872

Doddridge County  
 Attn: Dan Wellings  
 Flood Plain Manager  
 118 E. Court Street  
 West Union, WV 26456

INVOICE NO: 0035145  
 DATE: February 06, 2014  
 CLIENT CODE: 0000875  
 PROJECT CODE: W010

Page 1 of 1

Flood Plain CEC Application

For period through: 01/31/2014

For Professional Services Rendered:		Amount
Professional services performed for review of Sherwood Plant Flood Plain Plan.		
Project Director III	8.50 Hours @ \$ 139.00	1,181.50
Project Director II	6.00 Hours @ \$ 129.00	774.00
	<b>TOTAL FEES:</b>	<b>\$1,955.50</b>
01/31/14 Mileage		176.46
	<b>TOTAL EXPENSES:</b>	<b>\$176.46</b>
<b>TOTAL AMOUNT DUE:</b>		<b>\$2,131.96</b>

*[Handwritten Signature]*

020-718-230 - 2131.96

**FILED**

2014 FEB 12 AM 11:35

BETH A. ROGERS  
 COUNTY CLERK  
 DODDRIDGE COUNTY, WV

FEB 28 2014  
 1076

PAYMENT DUE UPON RECEIPT  
 A finance charge of 1.5% per month will be assessed on all balances over 30 days.

**CME Engineering**  
 975 Georges Station Road  
 Suite 100  
 Greensburg, PA 15601  
 (724) 672-4800

Please make checks payable to:  
 "CME Management LLC"  
 And remit to the following address:  
 CME Management LLC  
 PO Box 644872  
 Pittsburgh, PA 15264-4872

Doddridge County  
 Attn: Dan Wellings  
 Flood Plain Manager  
 118 E. Court Street  
 West Union, WV 26456

INVOICE NO : 0035246  
 DATE : February 19, 2014  
 CLIENT CODE : 0000875  
 PROJECT CODE: W010

Page 1 of 1

Flood Plain CEC Application

For period through: 02/15/2014

For Professional Services Rendered:		Amount
Professional services performed for review of Sherwood Plant Flood Plain Plan.		
Project Director III	5.00 Hours @ \$ 139.00	695.00
Project Director II	12.00 Hours @ \$ 129.00	1,548.00
Engineer Technician IV	1.50 Hours @ \$ 74.00	111.00
	<b>TOTAL FEES:</b>	<b>\$2,354.00</b>
02/15/14 Postage		0.48
	<b>TOTAL EXPENSES:</b>	<b>\$0.48</b>
<b>TOTAL AMOUNT DUE:</b>		<b>\$2,354.48</b>

*Robert Gandy*

020-718-230 - \$2,354.48

FEB 20 2014

1076

PAYMENT DUE UPON RECEIPT  
 A finance charge of 1.5% per month will be assessed on all balances over 30 days.



**CME Engineering**  
 975 Georges Station Road  
 Suite 100  
 Greensburg, PA 15601  
 (724) 672-4800

Please make checks payable to:  
 "CME Management LLC"  
 And remit to the following address:  
 CME Management LLC  
 PO Box 644872  
 Pittsburgh, PA 15264-4872

Doddridge County  
 Attn: Ralph Sandora  
 118 E. Court Street  
 West Union, WV 26456

INVOICE NO : 0035618  
 DATE : March 21, 2014  
 CLIENT CODE : 0000875  
 PROJECT CODE : W011

Page 1 of 1

Flood Plain CEC Final App

For period through: 03/15/2014

For Professional Services Rendered	Amount
Professional services performed for review of Sherwood Plant Final Plan.	
Project Director III	
7.50 Hours @ \$ 139.00	1,042.50
<b>TOTAL FEES:</b>	<b>\$1,042.50</b>
<p>020-718-230 — 1042.50</p> <p>APR 01 2014 1084</p> <p><i>Ralph Sandora</i></p>	
<b>TOTAL AMOUNT DUE:</b>	<b>\$1,042.50</b>

PAYMENT DUE UPON RECEIPT

A finance charge of 1.5% per month will be assessed on all balances over 30 days.

**CME Engineering**  
 975 Georges Station Road  
 Suite 100  
 Greensburg, PA 15601  
 (724) 672-4800

Please make checks payable to:  
 "CME Management LLC"  
 And remit to the following address:  
 CME Management LLC  
 PO Box 64872  
 Pittsburgh, PA 15264-4872

Doddridge County  
 Attn: Ralph Sandora  
 Flood Plain Manager  
 118 E. Court Street  
 West Union, WV 26456

INVOICE NO : 0035743  
 DATE : April 04, 2014  
 CLIENT CODE : 0000875  
 PROJECT CODE: W010

Page 1 of 1

Flood Plain CEC Application

For period through: 03/31/2014

For Professional Services Rendered:	Amount
Professional services performed for review of Sherwood Plant Flood Plain Plan.	
Project Director III	4.50 Hours @ \$ 139.00 625.50
Project Director II	16.50 Hours @ \$ 129.00 2,128.50
<b>TOTAL FEES:</b>	<b>\$2,754.00</b>
<b>TOTAL AMOUNT DUE:</b>	<b>\$2,754.00</b>

020-718-230



APR 14 2014  
 1085

PAYMENT DUE UPON RECEIPT

A finance charge of 1.5% per month will be assessed on all balances over 30 days.

**CME Engineering**  
 975 Georges Station Road  
 Suite 100  
 Greensburg, PA 15601  
 (724) 672-4800

Please make checks payable to:  
 "CME Management LLC"  
 And remit to the following address:  
 CME Management LLC  
 PO Box 644372  
 Pittsburgh, PA 15264-4872

Doddridge County  
 Attn: Ralph Sandora  
 Flood Plain Manager  
 118 E. Court Street  
 West Union, WV 26456

INVOICE NO : 0035875  
 DATE : April 17, 2014  
 CLIENT CODE : 0000875  
 PROJECT CODE : W010

Page 1 of 1

Flood Plain CEC Application

For period through: 04/12/2014

For Professional Services Rendered	Amount
Professional services performed for review of Sherwood Plant Flood Plain Plan.  Project Director II 6.00 Hours @ \$ 129.00 <b>TOTAL FEES:</b>	774.00 <hr/> <b>\$774.00</b>
<p style="text-align: center;">020 - 718 - 230</p>	
<p style="text-align: right;"><b>TOTAL AMOUNT DUE:</b></p>	<p style="text-align: right;"><b>\$774.00</b></p>

PAYMENT DUE UPON RECEIPT

A finance charge of 1.5% per month will be assessed on all balances over 30 days.

**CME Engineering**  
 975 Georges Station Road  
 Suite 100  
 Greensburg, PA 15601  
 (724) 672-4800

Please make checks payable to:  
 "CME Management LLC"  
 And remit to the following address:  
 CME Management LLC  
 PO Box 644872  
 Pittsburgh, PA 15264-4872

Doddridge County  
 Attn: Ralph Sandora  
 Flood Plain Manager  
 118 E. Court Street  
 West Union, WV 26456

INVOICE NO : 0035876  
 DATE : April 17, 2014  
 CLIENT CODE : 0000875  
 PROJECT CODE : W011

Page 1 of 1

Flood Plain CEC Final App

For period through: 04/12/2014

For Professional Services Rendered	Amount
Professional services performed for review of Sherwood Plant Final Plan.	
Project Director III 4.50 Hours @ \$ 139.00	625.50
<b>TOTAL FEES:</b>	<b>\$625.50</b>
04/10/14 Conference Call	14.11
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<b>TOTAL AMOUNT DUE:</b>	<b>\$639.61</b>

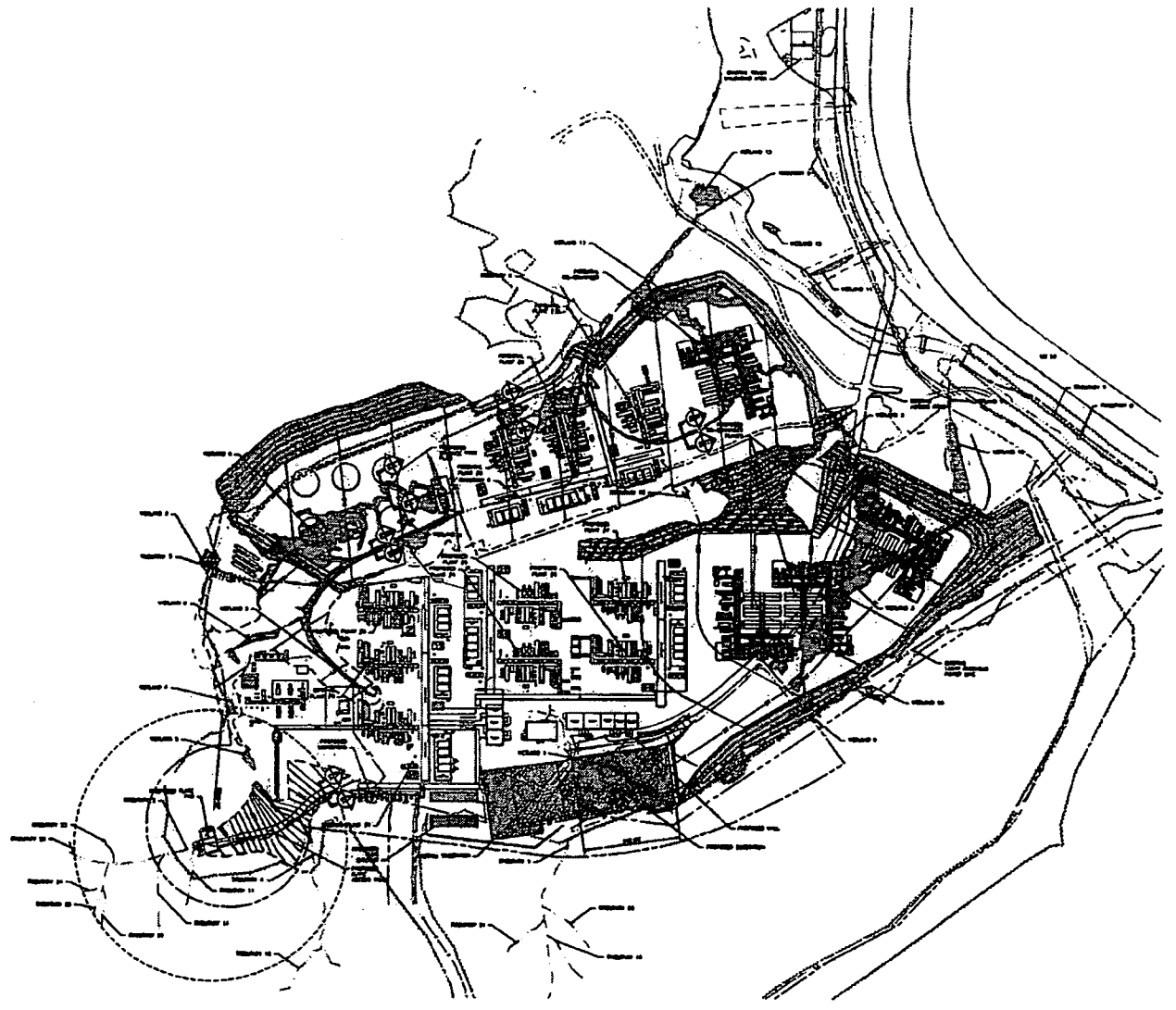
020-718-230

PAYMENT DUE UPON RECEIPT

A finance charge of 1.5% per month will be assessed on all balances over 30 days.



NORTH



**LEGEND**

---	Proposed Pipeline
---	Proposed Road
---	Proposed Utility
---	Proposed Building
---	Proposed Structure
---	Proposed Equipment
---	Proposed Storage
---	Proposed Tank
---	Proposed Well
---	Proposed Valve
---	Proposed Meter
---	Proposed Control
---	Proposed Instrument
---	Proposed Piping
---	Proposed Structure
---	Proposed Equipment
---	Proposed Storage
---	Proposed Tank
---	Proposed Well
---	Proposed Valve
---	Proposed Meter
---	Proposed Control
---	Proposed Instrument
---	Proposed Piping

**NOTES**

1. All dimensions are in feet.
2. All elevations are in feet above sea level.
3. All bearings are in degrees, minutes, and seconds.
4. All distances are in feet.
5. All bearings are in degrees, minutes, and seconds.
6. All distances are in feet.
7. All bearings are in degrees, minutes, and seconds.
8. All distances are in feet.
9. All bearings are in degrees, minutes, and seconds.
10. All distances are in feet.

**ALTERNATIVE IMPACT STATE**

Alternative	Impact	Significance	Mitigation
1	...	...	...
2	...	...	...
3	...	...	...
4	...	...	...
5	...	...	...
6	...	...	...
7	...	...	...
8	...	...	...
9	...	...	...
10	...	...	...

**GREENWOOD NATURAL GAS PROCESSING FACILITY EXPANSION PROPOSED SITE PLAN**

**MARKWEST LIBERTY MIDSTREAM & RESOURCES, LLC**  
SHERWOOD GAS PROCESSING PLANT  
GODDRIDGE COUNTY, WEST VIRGINIA

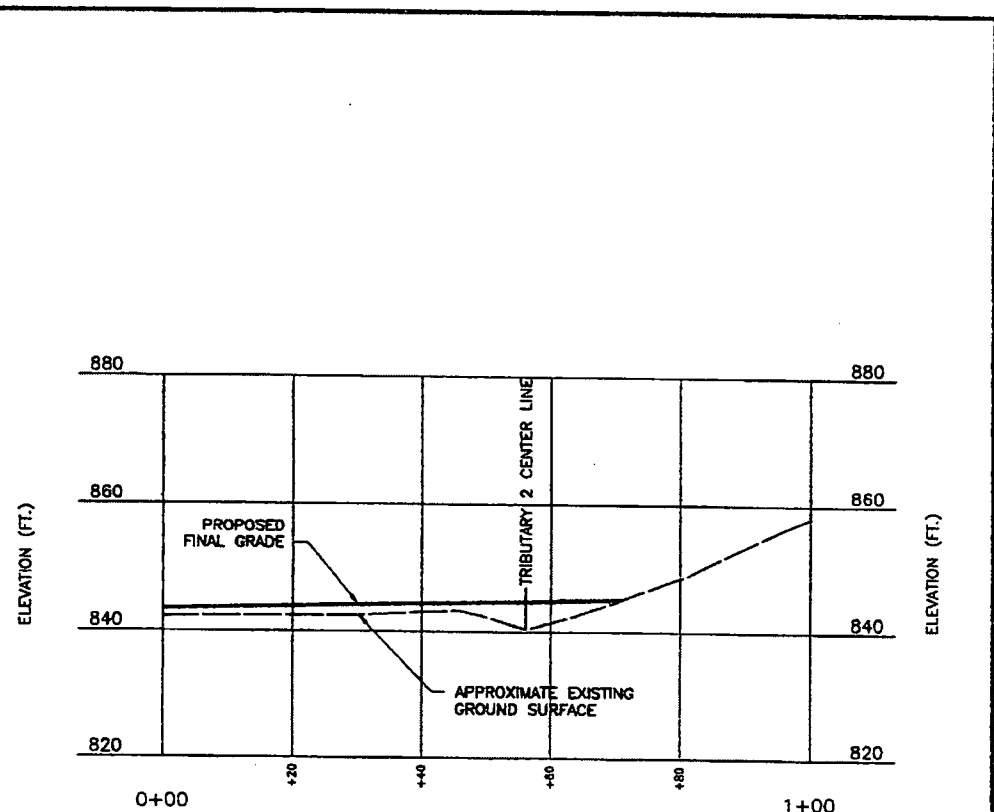
C&E  
Environmental Consultants, Inc.  
325 Harrison Ave. - Martinsburg, WV 25401  
(304) 261-5555

NO. 1	DATE	BY	CHECKED	APPROVED

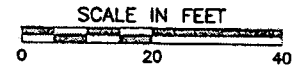
2



P:\071110-811-CADD\DWG\TASK 4004 PLANTS 4 AND 5\110-811-4004 -- CIVIL\DWG\RD 04 LS(11/12/2013 - North) - DP: 11/12/2013 11:45 AM



**SECTION A**  
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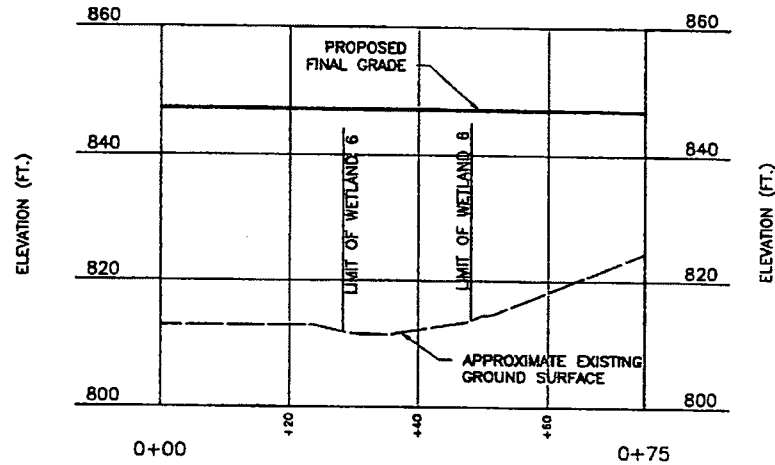
\*HAND SIGNATURE ON FILE

**Civil & Environmental Consultants, Inc.**  
 333 Baldwin Road - Pittsburgh, PA 15205  
 412-429-2324 · 800-365-2324  
 www.cecinc.com

MARKWEST LIBERTY MIDSTREAM & RESOURCES, LLC  
 SHERWOOD GAS PROCESSING PLANT  
 DODDRIDGE COUNTY, WEST VIRGINIA  
 SHERWOOD GAS PROCESSING FACILITY  
 EXPANSION - SECTION A TRIBUTARY 2

DRAWN BY: KLL	CHECKED BY: WWT	APPROVED BY: JHW*	FIGURE NO: 6A
DATE: 11/6/13	DWG SCALE: 1"=20'	PROJECT NO: 110-811.4003	

P:\2011\110-811-0000\DWG\110-811-0000 PLANTS & AND 5\110-811-0000 - CP12.dwg/RE 6B] LS(11/12/2013 - Monday) - LF: 11/12/2013 11:44 AM



**SECTION B**  
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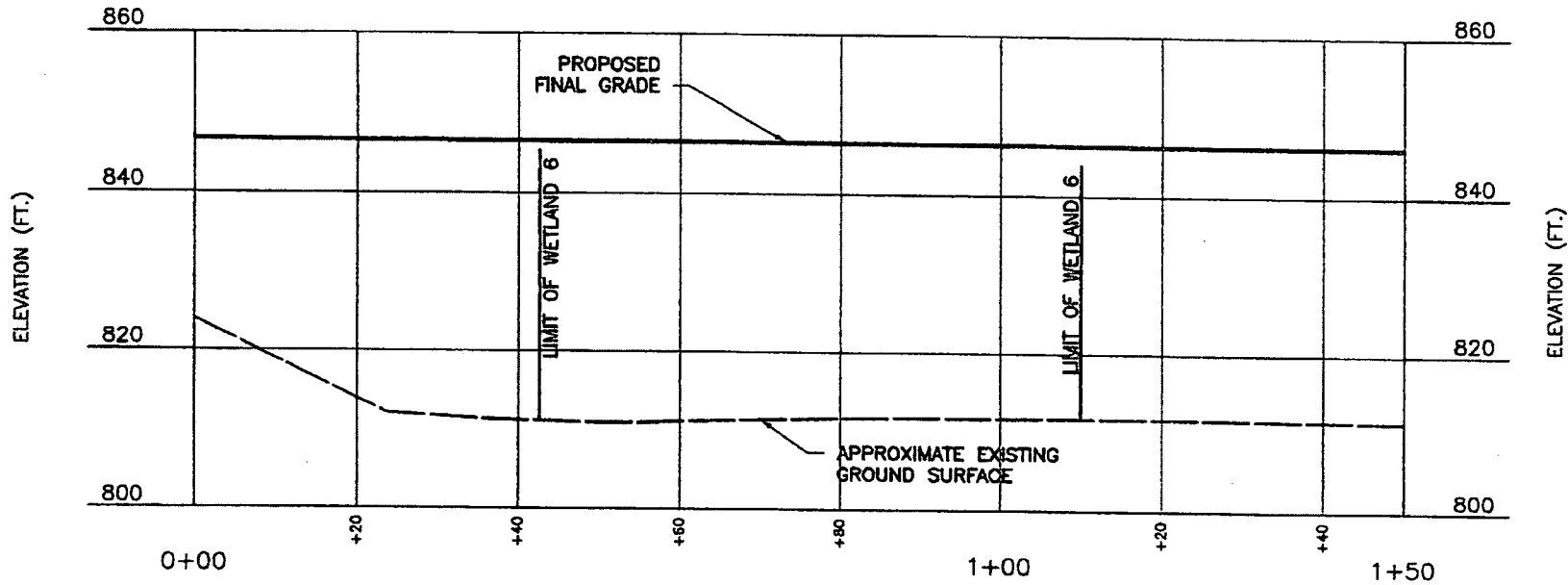
\*HAND SIGNATURE ON FILE

**Civil & Environmental Consultants, Inc.**  
333 Baldwin Road - Pittsburgh, PA 15206  
412-429-2324 · 800-365-2324  
www.cecinc.com

MARKWEST LIBERTY MIDSTREAM  
& RESOURCES, LLC  
SHERWOOD GAS PROCESSING PLANT  
DODDRIDGE COUNTY, WEST VIRGINIA  
SHERWOOD GAS PROCESSING FACILITY  
EXPANSION - SECTION B WETLAND 6

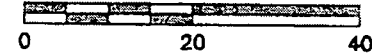
DRAWN BY: KLI	CHECKED BY: WWT	APPROVED BY: JHW*	FIGURE NO.:
DATE: 11/8/13	DWG SCALE: 1"=20'	PROJECT NO: 110-811.4003	<b>6B</b>






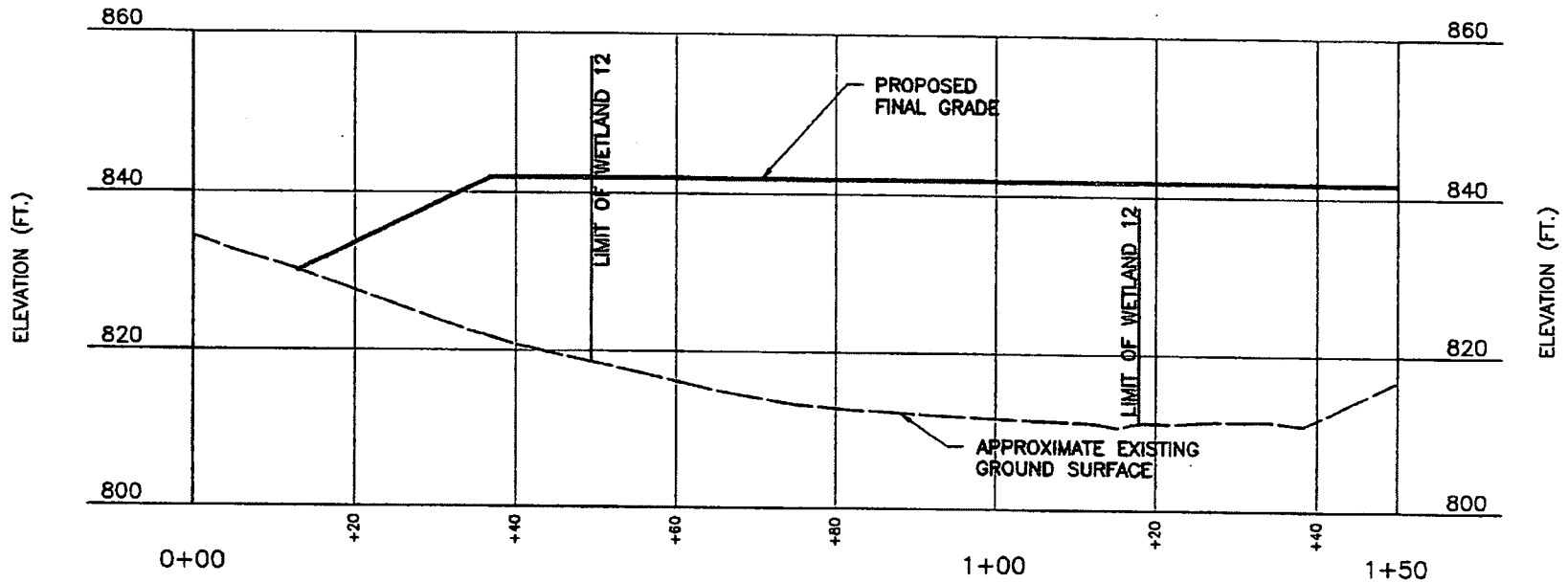
**SECTION C**  
SCALE H:1"=20'; V:1"=20'

SCALE IN FEET



\*HAND SIGNATURE ON FILE


 <b>Civil &amp; Environmental Consultants, Inc.</b> 333 Baldwin Road - Pittsburgh, PA 15205 412-429-2324 · 800-365-2324 www.cecinc.com		MARKWEST LIBERTY MIDSTREAM & RESOURCES, LLC SHERWOOD GAS PROCESSING PLANT DODDRIDGE COUNTY, WEST VIRGINIA					
		SHERWOOD GAS PROCESSING FACILITY EXPANSION - SECTION C WETLAND 6					
DRAWN BY:	KLL	CHECKED BY:	WWT	APPROVED BY:	JHW*	FIGURE NO.:	6C
DATE:	11/6/13	DWG SCALE:	1"=20'	PROJECT NO:	110-811.4003		



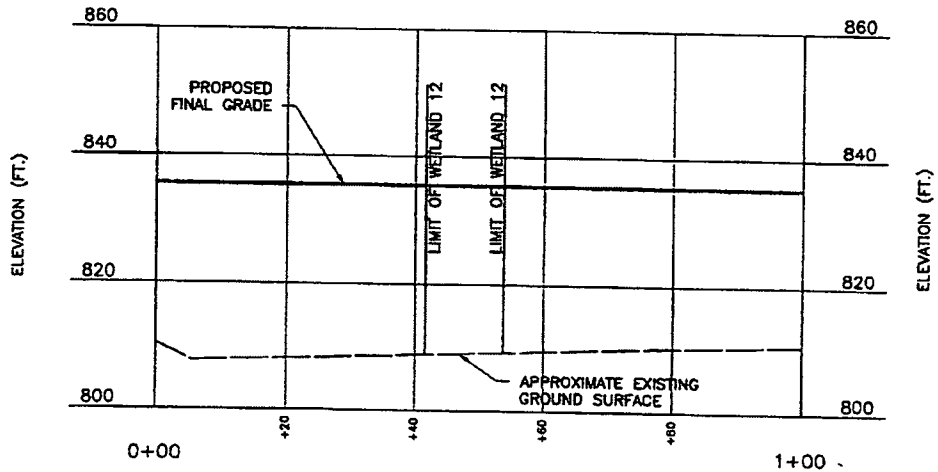
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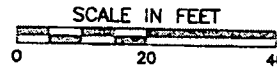
\*HAND SIGNATURE ON FILE

 <b>Civil &amp; Environmental Consultants, Inc.</b> 333 Baldwin Road - Pittsburgh, PA 15205 412-429-2324 · 800-365-2324 www.cecinc.com		MARKWEST LIBERTY MIDSTREAM & RESOURCES, LLC SHERWOOD GAS PROCESSING PLANT DODDRIDGE COUNTY, WEST VIRGINIA	
		SHERWOOD GAS PROCESSING FACILITY EXPANSION - SECTION D WETLAND 12	
DRAWN BY: <b>KLI</b>	CHECKED BY: <b>WWT</b>	APPROVED BY: <b>JHW*</b>	FIGURE NO.:
DATE: <b>11/6/13</b>	DWG SCALE: <b>1"=20'</b>	PROJECT NO: <b>110-811.4003</b>	<b>6D</b>

P:\2011\110-811-C000\Drawings\MSK 4004 PLANTS 4 AND 5\110-811-4004 - CP12.dwg/12/12/2013 - Monday - 11/12/2013 11:36 AM



**SECTION E**  
SCALE H:1"=20'; V:1"=20'



\*HAND SIGNATURE ON FILE



**Civil & Environmental Consultants, Inc.**

333 Baldwin Road - Pittsburgh, PA 15205  
412-429-2324 · 800-385-2324  
www.cecinc.com

MARKWEST LIBERTY MIDSTREAM  
& RESOURCES, LLC  
SHERWOOD GAS PROCESSING PLANT  
DODDRIDGE COUNTY, WEST VIRGINIA  
SHERWOOD GAS PROCESSING FACILITY  
EXPANSION - SECTION E WETLAND 12

DRAWN BY:	KLL	CHECKED BY:	WWT	APPROVED BY:	JHW*	FIGURE NO.:
DATE:	11/6/13	DWG SCALE:	1"=20'	PROJECT NO.:	110-811.4003	<b>6E</b>



**REFERENCE**  
 02/01/13 GOOGLE EARTH  
 SCREEN CAPTURE FROM GOOGLE EARTH PRO  
 EXTRACTED ON 11/11/2013, IMAGERY DATE: 2013



**LEGEND**

	EPHEMERAL STREAM
	INTERMITTENT STREAM
	WETLAND - PERM
	PROPOSED SHERWOOD FACILITY EXPANSION
	PREVIOUSLY PERMITTED SHERWOOD FACILITY

  
**Civil & Environmental Consultants, Inc.**  
 99 Cambridge Place - Bridgeport, WV 26330-2620  
 Ph: 304-633-3119 • Toll: 855-486-8539 • Fax: 304-633-3327  
 www.cecinc.com

MARKWEST LIBERTY MIDSTREAM & RESOURCES, LLC  
 SHERWOOD NATURAL GAS PROCESSING FACILITY EXPANSION  
 DODDRIDGE COUNTY, WEST VIRGINIA

**AQUATIC IMPACT MAP**

DRAWN BY: GSK	CHECKED BY: WWT	APPROVED BY: JHW	FIGURE NO: 3
DATE: 11/12/2013	SCALE: 1" = 400'	PROJECT NO: 110-811.4003	

FILED

2014 FEB 18 PM 3:21

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

---

Dan and Ralph,

See our PE's comments in response to CEC's. Hope this helps you all out tonight.

1. *The Hydraulic Study dated December 3, 2013 appears to model the existing bridge at the incorrect location within the existing conditions HEC-RAS analysis. [] recommends that Doddridge County require CEC to revise the HEC-RAS analysis and resubmit new calculations and revised surface water elevations demonstrating concurrence with the Doddridge County Floodplain Ordinance.*

Response: The existing bridge that was included in the July 2013 and July 2012 models was removed from the December 2013 model and replaced with the newly constructed bridge. As explained on pages 1-5 of the December 2013 narrative, CEC collected topographic survey of portions of Buckeye Creek and the surrounding areas. This information is more accurate than the original West Virginia DEM information that was used in the July 2013 and 2012 models. The July 2013 and 2012 models cannot be compared to the December 2013 model and therefore the existing bridge was removed. Also, the new bridge was constructed 3.5 feet higher than originally proposed and actually resulted in a decrease in water surface elevation. The new bridge was also included in both the existing and proposed models in order to illustrate the impact of the proposed temporary stockpiles.

**Comment:** Reviewers understand that the December 2013 model is a stand-alone model and solely independent of the July 2013 and July 2012 models. The basis of this comment is the location of the "existing" bridge defined in the existing model.

Based on their information, CEC may be able to ascertain that modeling the existing bridge in the proposed bridge location is the conservative model. However, it does not truly demonstrate the change in water surface elevation from existing conditions (prior to the removal of the original bridge) to the improvements permitted in the December 2013 submittal. CECs reason to model the new bridge in the existing and proposed models to solely demonstrate the impact of the temporary stockpiles is understood however, the total accumulated impact of the entire project cannot be determined without the existing model including the original bridge in the correct location.

2. *The total cumulative increase to date for the project is shown in the December 3, 2013 Hydraulic Study. Based on the current information provided, the increase is 0.28-feet and is below the requirements of Section 4.3 of the Doddridge County Floodplain Ordinance. The water surface increase may change depending on revised analysis as recommended above.*

Response: The water surface will not increase due to comment 1.

Comments: As noted in CEC's response to number #1 stating that DEM models are different between July 2012, July 2013 and December 2013, the total cumulated effect of this project on the floodplain cannot be determined from the information provided. To accurately determine the accumulated effect of the project, the existing 100-year water surface shown in the July 2013 (the revised version of the July 2012 submittal) and the proposed water surface from the December 2013 model must be located on similar datums.

3. *The temporary stockpiles are located a minimum of 200-feet (approximately) from the stream bank which is outside of the 100-foot setback as required by Section 6.1H.1 of the Doddridge County Floodplain Ordinance.*

Response: It is noted that the temporary stockpiles are outside the 100-foot setback.

Comments: Above response satisfies this comment.

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Sent

Spam (92)

[Empty]

Trash (22)

[Empty]

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[Edit]

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**Fwd: Sherwood Master Plan Flood Study**  
Wednesday, April 9, 2014 5:34 PM

**From:** "Ralph Sandora" <ralphsandora@gmail.com>

**To:** "Lorena Slater" <blslater.4774@yahoo.com>

Full Headers Printable View

1 Files 72KB Download All

PDF 72KB

Existing and Proposed

Save

----- Forwarded message -----

**From:** Gullone, Andrew <agullone@cecinc.com>

**Date:** Wed, Apr 9, 2014 at 10:12 AM

**Subject:** Sherwood Master Plan Flood Study

**To:** "Mark Stanley (mark.stanley@cmemgmt.com)" <mark.stanley@cmemgmt.com>, "Ralph Sandora (ralph.sandora@gmail.com)" <ralph.sandora@gmail.com>

**Cc:** "Celender, Rick" <rcelender@cecinc.com>, Richard Lowry <RLowry@markwest.com>, Robert McHale <RMcHale@markwest.com>

Mark,

Per our conversation, attached is a PDF containing the tables of the water surface elevations upstream of both the existing and proposed bridges. The first two tables demonstrate the backwater effect of each bridge. The third table compares the elevation difference between the backwater effects of the bridges. Based upon the results, the increase in water surface elevation caused by the backwater effects is less than one foot. Please let me know if you have any questions. Thank you for your help.

**Andrew R. Gullone, P.E., CPESC/ Project Manager**

Civil & Environmental Consultants, Inc.

333 Baldwin Road · Pittsburgh, PA 15205-1751

Toll-Free: 800-365-2324 · Direct: 412-249-3179 · Fax: 412-429-

2114

<http://www.cecinc.com>

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Buckeye Creek  
 100-Year Water Surface Elevations  
 Sherwood Gas Processing Plant - Doddridge County, WV  
 Project: 110-811.5001

Prepared BY: TGI  
 Date: 4/9/2014  
 Checked By: *ARK*  
 Date: *09-APR-2014*

Existing Bridge			
Section Upstream of Existing Bridge	Section ID	Water Surface Elevation	Water Surface Elevation Difference Between Sections
1st	R	811.37	
			1.60
2nd	Q	812.97	
			0.14
3rd	P	813.11	
			0.03
4th	O	813.14	

Proposed Bridge			
Section Upstream of Proposed Bridge	Section ID	Water Surface Elevation	Water Surface Elevation Difference Between Sections
1st	U	811.73	
			1.57
2nd	T	813.30	
			0.21
3rd	S	813.51	
			0.00
4th	R	813.51	

Summary Table						
Section Upstream of Existing Bridge	Section ID	Water Surface Elevation	Section Upstream of Proposed Bridge	Section ID	Water Surface Elevation	Elevation Difference Upstream of Bridge
1st	R	811.37	1st	U	811.73	0.36
2nd	Q	812.97	2nd	T	813.30	0.33
3rd	P	813.11	3rd	S	813.51	0.40
4th	O	813.14	4th	R	813.51	0.37



ralphsandora@gmail.com Search Mail Lorena Profile Sign Out Home

Inbox Contacts

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Inbox (19)

TurboTax No Tax Knowledge Needed: Sponsored

Drafts (2)

Fwd: Buckeye Creek Flood Study Thursday, April 3, 2014 2:12 PM

Sent

From: "Ralph Sandora" <ralphsandora@gmail.com>

Spam (74) [Empty]

To: "Lorena Slater" <blslater.4774@yahoo.com>

Trash (8) [Empty]

Full Headers Printable View

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----- Forwarded message -----
From: Ralph Sandora <ralphsandora@gmail.com>
Date: Thu, Apr 3, 2014 at 9:26 AM
Subject: Fwd: Buckeye Creek Flood Study
To: thebeamers@frontier.com

----- Forwarded message -----
From: Kevin Yoder <kevin.yoder@cmemgmt.com>
Date: Tue, Apr 1, 2014 at 11:41 AM
Subject: Buckeye Creek Flood Study
To: "Ralph Sandora (ralphsandora@gmail.com)" <ralphsandora@gmail.com>
Cc: Mark Stanley <mark.stanley@cmemgmt.com>

Ralph:

CME Engineering reviewed the applications dated July 16, 2013 and December 2013 relating to the MarkWest Sherwood 4 and 5 Natural Gas Processing Plant. Based on the hydraulic calculations prepared by Civil and Environmental Consultants, the increase in the floodplain due to the activities relating to the plant development are summarized as follows:

- July 16, 2013 (Road Crossing, Truck Loading Area and Temp Stockpiles) - 100-year flood increase of 0.31 feet
• December 2013 (Temporary Stockpiles) - 100-year flood increase of 0.26 feet

It shall be noted that both hydraulic analyses above are independent of each other and show the increase from a pre-development condition (prior to site development) to the proposed condition. The numbers above should not be added together to determine the overall impacts.

Let me know if you have questions.

Kevin L. Yoder, P.E.
Project Director I
CME Management LLC
General partner of CME Engineering LP
27 East Main Street
Frostburg, Maryland
Phone (301) 689-1700 ext. 2101
Fax (301) 689-5177
Cell (814) 233-5995

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----- Forwarded message -----

From: **Ralph Sandora** <[ralphsandora@gmail.com](mailto:ralphsandora@gmail.com)>  
Date: Thu, Apr 3, 2014 at 9:26 AM  
Subject: Fwd: Buckeye Creek Flood Study  
To: [thebeamers@frontier.com](mailto:thebeamers@frontier.com)

----- Forwarded message -----

From: **Kevin Yoder** <[kevin.yoder@cmemgmt.com](mailto:kevin.yoder@cmemgmt.com)>  
Date: Tue, Apr 1, 2014 at 11:41 AM  
Subject: Buckeye Creek Flood Study  
To: "Ralph Sandora ([ralphsandora@gmail.com](mailto:ralphsandora@gmail.com))" <[ralphsandora@gmail.com](mailto:ralphsandora@gmail.com)>  
Cc: Mark Stanley <[mark.stanley@cmemgmt.com](mailto:mark.stanley@cmemgmt.com)>

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Let me know if you have questions.

**Kevin L. Yoder, P.E.**  
**Project Director I**  
CME Management LLC  
General partner of CME Engineering LP  
27 East Main Street  
Frostburg, Maryland  
Phone (301) 689-1700 ext. 2101  
Fax (301) 689-5177  
Cell (814) 233-5995

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Ralph:

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- December 2013 (Temporary Stockpiles) – 100-year flood increase of 0.26 feet

It shall be noted that both hydraulic analyses above are independent of each other and show the increase from a pre-development condition (prior to site development) to the proposed condition. The numbers above should not be added together to determine the overall impacts.

Let me know if you have questions.

**Kevin L. Yoder, P.E.**

**Project Director I**

CME Management LLC

General partner of CME Engineering LP

27 East Main Street

Frostburg, Maryland

Phone (301) 689-1700 ext. 2101

Fax (301) 689-5177

Cell (814) 233-5995

# CME

ENGINEERING

February 28, 2014

301-689-1700  
Fax: 301-689-5177

Mr. Dan Wellings, PS  
Doddridge County Floodplain Manager  
HC 68 Box 5  
West Union, West Virginia 26456

RE: Sherwood 4 and 5 Natural Gas Processing Plant  
Mark West Liberty Midstream and Resources, LLC  
Doddridge County, West Virginia

FILED  
2014 MAR -3 AM 10:25  
BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

Mr. Wellings:

As requested, CME Engineering LP (CME) has reviewed the hydraulic study prepared by Civil & Environmental Consultants (CEC) relating to the Mark West Midstream and Resources, LLC (Mark West) Sherwood 4 and 5 Natural Gas Processing Plant. Mark West proposes to construct temporary stockpiles within the floodplain of Buckeye Creek.

CME finds that the hydraulic study prepared by CEC was performed within standard engineering practice and appears to be in compliance with the Doddridge County Floodplain Ordinance. Section 7.2.B of the Doddridge County Ordinance states " All permits and plans shall be approved only after it has been determined that the proposed work to be undertaken will be in conformance with the requirements of this Ordinance, State and Federal Laws, Ordinances, and Regulations." It is the responsibility of the permittee (Mark West) to obtain all required permits. Therefore, CME recommends conditional approval of the application pending receipt of any and all required federal or state permits.

CME appreciates the opportunity to assist Doddridge County on this project. Please contact me if you have any questions.

Sincerely,



Kevin L. Yoder, P.E., SIT  
Project Director II  
CME Management LLC  
General partner of CME Engineering LP

CC: Mark Stanley, CME  
CME File 0875-S010



Dan Wellings <wellingsd8@gmail.com>

**RE: Mark West - Sherwood 4 and 5 - Floodplain Application #13-103**

1 message

**Celender, Rick** <rancelender@cecinc.com>

Mon, Mar 3, 2014 at 9:36 AM

To: Dan Wellings <wellingsd8@gmail.com>

Cc: Robert McHale <RMcHale@markwest.com>, "rlowry@markwest.com" <rlowry@markwest.com>, "Gullone, Andrew" <agullone@cecinc.com>, "Fink, Edward" <efink@cecinc.com>

Dan,

Appended please find the requested letter related to the MarkWest Sherwood Plant Plants 4 & 5 Floodplain Application #13-103. Please let us know if you require any additional information related to this application.

Regards,

Rick

**Richard P. Celender, C.E.T., CPESC, CPSWQ / Principal**

Civil & Environmental Consultants, Inc.

333 Baldwin Road · Pittsburgh, PA 15205-1751

Direct: 412-249-2309 · Fax: 412-429-2114

Mobile: 412-760-0136 · <http://www.cecinc.com>

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**From:** Dan Wellings [mailto:wellingsd8@gmail.com]

**Sent:** Monday, March 03, 2014 9:01 AM

**To:** Celender, Rick

**Subject:** Re: Mark West - Sherwood 4 and 5

**FILED**  
**2014 MAR -3 AM 10:25**  
 BETH A. ROGERS  
 COUNTY CLERK  
 DODDRIDGE COUNTY, WV

Rick, Ed, Andrew,

Just happened to think, we will also need to make sure that we have a hard copy of all of the new study data, every thing done since the public meeting Feb. 11, 2014 and conference call, mailed to the Dodd. Co. Clerk's office to ensure that it becomes part of the floodplain application #13-103 file.

Rob,

I believe Ralph would still like for us to tour the Sherwood facility.

He would like to be shown where these temporary stockpiles will be located on the ground.

I was hoping to get Kevin Snead, WV FEMA, to attend also.

Ralph will need to call on him for assistance with the final grade application #14-123.

Thanks,

Dan

On Sat, Mar 1, 2014 at 1:45 PM, Celender, Rick <rcelender@cecinc.com> wrote:

Dan,

We will provide this letter on Monday. We will e-mail directly to you and provide a hard copy via mail.

The only other permit required for this work, The WVDEP NPDSW Permit Modification, has been approved by the DEP. No other permits are outstanding at this time for the work associated with the Sherwood Plants 4 & 5 floodplain permit.

Regards,

Rick

**Richard P. Celender, C.E.T., CPESC, CPSWQ / Principal**

Civil & Environmental Consultants, Inc.

333 Baldwin Road · Pittsburgh, PA 15205-1751

Direct: 412-249-2309 · Fax: 412-429-2114

Mobile: 412-760-0136 · <http://www.cecinc.com>

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**2014 MAR -3 AM 10: 25**  
**BETH A. ROGERS**  
**COUNTY CLERK**  
**DODDRIDGE COUNTY, WV**

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**FILED**  
2014 MAR -3 AM 10:25  
BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

**From:** Dan Wellings [mailto:wellingsd8@gmail.com]  
**Sent:** Saturday, March 01, 2014 10:32 AM  
**To:** Celender, Rick; Gullone, Andrew; Robert McHale  
**Subject:** Fwd: Mark West - Sherwood 4 and 5

Rick, Andrew, & Rob,

Will CEC/MarkWest supply Doddridge County with a letter signed and sealed by the licensed engineer in charge of the floodplain application #13-103 request for additional temporary stockpiles of earth as part of the construction of Sherwood Processing Plants 4 & 5 stating that MarkWest has met the requirements of Section 7.2.B of the Doddridge County Floodplain Ordinance which states: "All permits and plans shall be approved only after it has been determined that the proposed work to be undertaken will be in conformance with the requirements of this Ordinance, State and Federal Laws, Ordinances, and Regulations." Have all the necessary laws, ordinances, regulations, permits, etc. required been granted? What are applied for and awaiting?

Thanks,

Ralph Sandora

President Doddridge County Commission

Doddridge County Floodplain Manager

Dan Wellings

----- Forwarded message -----

From: **Kevin Yoder** <kevin.yoder@cmemgmt.com>  
Date: Fri, Feb 28, 2014 at 1:54 PM  
Subject: Mark West - Sherwood 4 and 5  
To: Dan Wellings <wellingsd8@gmail.com>, Ralph Sandora <ralphsandora@gmail.com>  
Cc: Mark Stanley <mark.stanley@cmemgmt.com>

Dan & Ralph:

Attached please find the letter recommending conditional approval of the Mark West application. Please contact me if you have any questions.

**Kevin L. Yoder, P.E.**

**Project Director I**

CME Management LLC

General partner of CME Engineering LP



**MarkWest-Sherwood-Floodplain-Appliction-No-13-103-Eng-Ltr-2014-03-03.pdf**

102K



# CME

ENGINEERING

301-689-1700  
Fax: 301-689-5177

February 28, 2014

Mr. Dan Wellings, PS  
Doddrige County Floodplain Manager  
HC 68 Box 5  
West Union, West Virginia 26456

RE: Sherwood 4 and 5 Natural Gas Processing Plant  
Mark West Liberty Midstream and Resources, LLC  
Doddrige County, West Virginia

Mr. Wellings:

As requested, CME Engineering LP (CME) has reviewed the hydraulic study prepared by Civil & Environmental Consultants (CEC) relating to the Mark West Midstream and Resources, LLC (Mark West) Sherwood 4 and 5 Natural Gas Processing Plant. Mark West proposes to construct temporary stockpiles within the floodplain of Buckeye Creek.

CME finds that the hydraulic study prepared by CEC was performed within standard engineering practice and appears to be in compliance with the Doddrige County Floodplain Ordinance. Section 7.2.B of the Doddrige County Ordinance states " All permits and plans shall be approved only after it has been determined that the proposed work to be undertaken will be in conformance with the requirements of this Ordinance, State and Federal Laws, Ordinances, and Regulations." It is the responsibility of the permittee (Mark West) to obtain all required permits. Therefore, CME recommends conditional approval of the application pending receipt of any and all required federal or state permits.

CME appreciates the opportunity to assist Doddrige County on this project. Please contact me if you have any questions.

Sincerely,



Kevin L. Yoder, P.E., SIF  
Project Director II  
CME Management LLC  
General partner of CME Engineering LP

CC: Mark Stanley, CME  
CME File 0875-S010

FILED  
2014 MAR -3 AM 10:24  
BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

March 3, 2014

Mr. Daniel Wellings, PS  
Doddridge County Floodplain Manager  
HC 68, Box 5  
West Union, WV 26456

FILED  
2014 MAR -3 AM 10:24  
BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

Dear Mr. Wellings:

Subject: Proposed Sherwood Gas Processing Plants 4 & 5  
County Road 50/34  
Doddridge County, West Virginia  
Floodplain Application #13-103  
CEC Project 110-811

Civil & Environmental Consultants, Inc. (CEC) has been hired as a consultant to provide professional engineering services to MarkWest Liberty Midstream & Resources, LLC (MarkWest). MarkWest is planning to expand their Sherwood Gas Processing Plant with two more plants. As part of this project, temporary stockpiles will be added to the site.

MarkWest was issued a Floodplain Permit on August 28, 2013 for the Sherwood Gas Processing Plants 4 and 5 Expansion. On behalf of MarkWest, CEC is requesting a revised floodplain permit that includes the additional area for the temporary stockpiles.

The proposed project will comply with the requirements of Section 7.2.B of the Doddridge County Floodplain Ordinance which states: "All permits and plans shall be approved only after it has been determined that the proposed work to be undertaken will be in conformance with the requirements of this Ordinance, State and Federal Laws, Ordinances, and Regulations."

All other required permits and approvals for the project have been granted and are attached.

Please contact us at 412-429-2324 if you have any questions.

Very truly yours,

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.

EDWARD J. FINK  
18669  
EDWARD J. FINK, P.E., CPESC, CPSWQ  
PROJECT MANAGER  
WEST VIRGINIA  
PROFESSIONAL ENGINEER

Richard P. Celender, C.E.T., CPESC, CPSWQ  
Principal

Enclosures

110-811-RC-Sherwood-Floodplain-Permit

**Celender, Rick**

---

**Subject:** FW: Modification Approval for WVR310068-A, Sherwood Gas Processing Plants in Doddridge Co., 33.67 Acres

**From:** DEP NPDESEP [mailto:DEP.NPDESEP@wv.gov]  
**Sent:** Tuesday, January 28, 2014 12:36 PM  
**To:** DEP NPDESEP; Richard Lowry; rseese@andersonexcavatingllc.com  
**Cc:** Cochran, Joseph W; Hodge, Timothy W; Swiger, Bradley C; Minigh, Christina D  
**Subject:** Modification Approval for WVR310068-A, Sherwood Gas Processing Plants in Doddridge Co., 33.67 Acres

Robert Mchale  
Markwest Liberty Midstream & Resources LLC  
601 Technology Dr., Ste 130  
Canonsburg, PA 15317

Physical Site Location: From Clarksburg, WV : Take Rt. 50 West Approximately 20 miles. Turn left onto Swisher Lane and arrive at site.

Please be advised that this e-mail constitutes approval and serves as Modification No. A of your existing General Permit Registration No. WVR310068 , dated the 31<sup>st</sup> day of October , 2013.

After review of your existing General Permit Registration and Permit Modification Application No. WVR310068 -A , the subject general permit registration is hereby modified to include a buttress fill near stock pile area 5. The disturbed acreage has increased from 33.0 acres to 33.67 acres an increase of 0.67 acres. The annual permit fee remains \$1000.00. All other terms and conditions of the subject registration shall remain in effect and unchanged.

If you have any questions relative to this approval, please do not hesitate to contact **Joseph Cochran** at (304) 926-0499 Ext. **1069** or by email at [joseph.w.cochran@wv.gov](mailto:joseph.w.cochran@wv.gov) .

Scott G. Mandirola, Director  
WV DEP-Division of Water & Waste Mgt.  
601 57<sup>th</sup> St. SE  
Charleston, WV 25304-2345  
Phone: (304) 926-0495  
Fax: (304) 926-0496

**FILED**  
2014 MAR -3 AM 10:24  
BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

Permit #  
13-103

**HYDRAULIC STUDY OF BUCKEYE CREEK**

**SHERWOOD GAS PROCESSING PLANT  
DODDRIDGE COUNTY, WEST VIRGINIA**

**Prepared for:**

**MARKWEST LIBERTY MIDSTREAM & RESOURCES, LLC**

**Prepared by:**

**CIVIL & ENVIRONMENTAL CONSULTANTS, INC.  
PITTSBURGH, PENNSYLVANIA**

**CEC Project 110-811**

**December 2013**



**Civil & Environmental Consultants, Inc.**

Pittsburgh

333 Baldwin Road | Pittsburgh, PA 15205 | p: 412-429-2324 f: 412-429-2114 | [www.cecinc.com](http://www.cecinc.com)

permit # 13-103



February 10, 2014

Mr. Dan Wellings, PS  
Doddridge County Floodplain Manager  
HC 68 Box 5  
West Union, West Virginia 26456

RE: Sherwood 4 and 5 Natural Gas Processing Plant  
Mark West Liberty Midstream and Resources, LLC  
Doddridge County, West Virginia

FILED  
2014 FEB 12 PM 1:35  
BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, W.VA.

Mr. Wellings:

[Redacted] has been contracted by Doddridge County to provide third-party engineering review of Hydraulic Studies prepared by Civil & Environmental Consultants, Inc. (CEC) relating to the Sherwood 4 and 5 Natural Gas Processing Plants for MarkWest Midstream and Resources, LLC (MarkWest).

**Purpose:**

The purpose of this report is to outline the findings of the review and concurrence of the CEC / MarkWest application with the Doddridge County Floodplain Ordinance

**Background:**

As per the scope of work outlined in [Redacted], the work performed as follows:

- Conduct a site visit to gather current information about the site, past history and cumulative impacts of the project to date as well as proposed impacts currently applied for by MarkWest.
- Review Doddridge County Floodplain Ordinances
- Review CEC / MarkWest Floodplain application
- Prepare a report outlining the findings of the review and concurrence of the CEC / MarkWest application with the Doddridge County Floodplain Ordinance

**Documents:**

The following documents were reviewed by [Redacted] as part of this review:

- Hydraulic Study of Buckeye Creek..... July 2012  
(Prepared by Civil & Environmental Consultants)
- Hydraulic Study of Buckeye Creek..... July 2012 / Revised July 2013  
(Prepared by Civil & Environmental Consultants)
- Hydraulic Study of Buckeye Creek..... December 2013  
(Prepared by Civil & Environmental Consultants)
- Doddridge County Floodplain Ordinance
- Flood Insurance Survey for Doddridge County ..... October 4, 2011



[REDACTED]

Mr. Dan Wellings, PS  
Hydraulic Study Review  
February 10, 2014  
Page 2 of 4

**Site Investigation**

On January 31, 2013, [REDACTED] personnel performed a site investigation to review the current conditions of the project area, the vegetative cover of the stream banks and overbanks and visually inspect the type of channel to compare to the data used in the Hec-Ras report prepared by CEC.

**Hydraulic Study Review**

[REDACTED] performed a review of the Hec-Ras reports dated July 2012, July 2013 and December 2013 to determine concurrence with the Doddridge County Floodplain Ordinance. A summary of the review is below:

**July 2012 Hydraulic Study of Buckeye Creek**

[REDACTED] performed a preliminary review of the Hydraulic Study of Buckeye Creek dated July 2012 that was approved on August 9, 2012 by Doddridge County. It was noted that the Hydraulic Study dated July 16, 2013 was a revision to the approved July 2012 application to add the construction of temporary stockpiles within the floodplain. Since the permit application dated July 16, 2013 is a more recent version of the submitted and approved application, [REDACTED] has performed a formal review on the July 16, 2013 Hydraulic Study and has provided comments. Refer to the following section.


**July 16, 2013 Hydraulic Study of Buckeye Creek**

Based on a review of the Hydraulic Study prepared by CEC, the purpose of this application is to revise the July 2012 submittal which included the construction of a road crossing and truck unloading area which added additional temporary stockpiles associated with construction of the gas processing plant within the 100-year floodplain.

Upon review of the Hydraulic Study, maps and calculations [REDACTED] notes the following:

- The project is located in Flood Zone AE as per FEMA Flood Insurance Rate Mapping (FIRM).
- The flow used in the Hec-Ras analysis, 5,150 cfs is the same used in the October 4, 2011 Flood Insurance Study of Doddridge County for Buckeye Creek and prepared by the Federal Emergency Management Agency.
- The Manning's "n" value used (0.035) for the stream is within normal ranges for a minor, straight, clean stream with some grass and weeds, little or no brush. The normal range Manning's "n" value for this type of stream is 0.030 to 0.040 as per Chow, 1959.
- The Manning's "n" value used (0.035) for the stream overbanks is within normal ranges for a pasture or meadow with high grass within the floodplain. The normal range Manning's "n" value for this type of stream overbank is 0.035 to 0.050 as per Chow, 1959.
- The existing bridge noted as "To Be Removed" is included in the existing water surface calculations but removed in the proposed water surface calculations. This demonstrates that the existing and proposed conditions were modeled correctly.
- The maximum increase in the 100-year floodplain elevation is 0.31-feet and occurs at the section prior to the proposed bridge (Section H).

FILED  
2014 FEB 12 PM 1:35  
BETH A. ROBERTS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV


  
Mr. Dan Wellings, PS  
Hydraulic Study Review  
February 10, 2014  
Page 3 of 4

FILED  
2014 FEB 12 PM 1:35  
BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WY

- As per drawing SP01 dated 07/03/2012 revised 07/08/2013 prepared by CEC, all temporary stockpiles appear to be outside of the 100-foot setback as required under Section 6.1.H.1 of the Doddridge County Floodplain Ordinance..

December 3, 2013 Hydraulic Study of Buckeye Creek

Based on a review of the Hydraulic Study prepared by CEC, the purpose of this project was to permit the construction of temporary stockpiles associated with construction of the gas processing plant within the 100-year floodplain.

Upon review of the Hydraulic Study, maps and calculations  notes the following:

- The project is located in Flood Zone AE as per FEMA Flood Insurance Rate Mapping (FIRM).
- The flow used in the Hec-Ras analysis, 5,150 cfs is the same used in the October 4, 2011 FIS Study of Doddridge County for Buckeye Creek and prepared by the Federal Emergency Management Agency. This value is also consistent with the flow used in the previous submittals.
- The Manning's "n" value used (0.035) for the stream is within normal ranges for a minor, straight, clean stream with some grass and weeds, little or no brush. The normal range Manning's "n" value for this type of stream overbank 0.030 to 0.040 as per Chow, 1959.
- The Manning's "n" value used (0.050) for the stream overbanks is within normal ranges for a pasture or meadow with high grass within the floodplain. The normal range Manning's "n" value for this type of stream overbank 0.035 to 0.050 as per Chow, 1959.
- The as-built bridge elevation is 3.5-feet higher than the elevation included in the July 16, 2013 Hydraulic Study. Therefore, the water surface elevation increase of the 100-year flood event outlined in the July 16, 2013 Hydraulic Study has been reduced. The Hec-Ras analysis performed in this submittal is a complete model and not dependent on previous studies. The total cumulative increase for the project to date is that shown in the December 3, 2013 submittal.
- The December 3, 2013 submittal models the existing bridge at Station 2460.04 (Section U) however, the existing bridge is located closer to 2603.43 (Section S). Relocating the existing bridge in the Hec-Ras model to its correct location will result in a revised water surface elevation. The revised water surface elevation will decrease between the location of the bridge as shown in the model and the correct location. The water surface upstream of the correct bridge will increase due to the backwater condition created by the existing bridge. Revising the model is required to accurately determine the accumulated water surface increase caused by work performed within the floodplain.
- The maximum increase in the 100-year floodplain elevation is 0.28-feet and occurs at the section prior to the first temporary stockpile (Section E).
- All temporary stockpiles appear to be outside of the 100-foot setback as per drawing SP01 dated 07/03/2012 revised 12/3/2013.

[REDACTED]

Mr. Dan Wellings, PS  
Hydraulic Study Review  
February 10, 2014  
Page 4 of 4

FILED  
2014 FEB 12 PM 1:35  
BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

**Conclusions:**

Based on a review of the documents as outlined previously [REDACTED] concludes the following:

1. The Hydraulic Study dated December 3, 2013 appears to model the existing bridge at the incorrect location within the existing conditions Hec-Ras analysis. [REDACTED] recommends that Doddridge County require CEC to revise the Hec-Ras analysis and resubmit new calculations and revised surface water elevations demonstrating concurrence with the Doddridge County Floodplain Ordinance.
2. The total cumulative increase to date for the project is shown in the December 3, 2013 Hydraulic Study. Based on the current information provided, the increase is 0.28-feet and is below the requirements of Section 4.3 of the Doddridge County Floodplain Ordinance. The water surface increase may change depending on revised analysis as recommended above.
3. The temporary stockpiles are located a minimum of 200-feet (approximately) from the stream bank which is outside of the 100-foot setback as required by Section 6.1.H.1 of the Doddridge County Floodplain Ordinance.

[REDACTED] appreciates the opportunity to submit this report to Doddridge County documenting the findings of the Hydraulic Study review related to the Sherwood 4 and 5 Natural Gas Processing Plant for Mark West Liberty Midstream and Resources, LLC. Please contact me if you have any questions.

Sincerely,

[REDACTED]





Mr. Ralph Sandora  
Hydraulic Study Review  
March 20, 2014  
Page 3 of 3

CME appreciates the opportunity to submit this report to Doddridge County documenting the findings of the Hydraulic Study review related to the Sherwood 4 and 5 Natural Gas Processing Plant for Mark West Liberty Midstream and Resources, LLC. Please contact me if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Kevin L. Yoder". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Kevin L. Yoder, P.E., SFC  
Project Director II  
CME Management LLC  
General partner of CME Engineering LP

CC: Mark Stanley, CME  
CME File 0875-S010

**DAN WELLINGS, PS**  
**DODDRIDGE CO. FLOODPLAIN MANAGER**  
**118 EAST COURT STREET, ROOM 102**  
**WEST UNION, WV 26456**  
**OFFICE PHONE: (304) 873 - 2631**  
**CELL PHONE: (304) 629 - 7249**  
**E-MAIL: [wellingsd8@gmail.com](mailto:wellingsd8@gmail.com)**

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

2014 JAN 23 PM 3:15

FILED

DATE: 01/23/2014

RE: PROPOSED SHERWOOD GAS PROCESSING PLANT 4 & 5  
COUNTY ROAD 50/34  
DODDRIDGE COUNTY, WEST VIRGINIA  
CEC PROJECT 110-811

Dear Mr. Celender,

As the Doddridge County Floodplain Manager I would like to inform Civil & Environmental Consultants, Inc. (CEC) as consultant to provide professional engineering services to MarkWest Liberty Midstream & Resources, LLC (MarkWest) that I have asked another engineering firm to be a consultant for review of materials submitted regarding the efficacy of granting or denying Doddridge County Floodplain Permit Application # 13-103.

Said floodplain permit application was prepared by said CEC for said MarkWest's Sherwood Gas Processing Plant 4 & 5 expansion request for a revised permit for additional temporary stockpiles as part of construction.

I would also ask that CEC provide another copy of the said floodplain application as required by the Doddridge County Floodplain Ordinance. Preferably on a pdf file to my e-mail address, [wellingsd8@gmail.com](mailto:wellingsd8@gmail.com)

Sincerely,

*Dan Wellings* 01/23/2014

**DAN WELLINGS, PS**  
**DODDRIDGE COUNTY FLOODPLAIN MNGR.**

IMPROVEMENT LOCATION PERMIT APPLICATION  
DODDRIDGE COUNTY, WEST VIRGINIA

DODDRIDGE COUNTY COMMISSION  
WEST UNION, WEST VIRGINIA 26456

PHONE: (304) 873-2631

A. COVERED ACTIVITIES

This application must be completed and submitted to the Doddridge County Commission if you intend to do one or more of the following activities in Doddridge County, outside of a municipality.

1. Erect or relocate a structure valued at more than \$1,000.00.
2. Alter a building or structure in a way which enlarges the exterior dimensions of the building or structure.
3. Engage in land-altering activities in a floodprone area.

B. IDENTIFICATION OF PROPERTY OWNER AND BUILDER

1. Property Owner(s)  
Name: MarkWest Liberty Midstream Phone: 724-416-0135  
Address: 601 Technology Drive, Suite 130 <sup>Resources</sup> Camonsburg, PA 15317
2. Builder or Contractor  
Name: Cast & Baker Corporation Phone: 724-745-6430

C. IDENTIFICATION OF PROPERTY

1. District: Grant District
2. Date/From Whom Property Purchased: Dennis H. Powell - 10/10/2011
3. Land Book Description: Sheet 19, Lot 32 + 31
4. Deed Book Reference: D.B.V. 200, Page 532
5. Tax Map Reference: \_\_\_\_\_
6. Existing Buildings/Uses of Property: Woodlands & Meadow Areas

D. IDENTIFICATION OF INTENDED CONSTRUCTION OR LAND USE

1. Briefly describe the intended construction or land use.
2. Sketch on a separate 8 1/2 x 11 sheet of paper the shape and location of the lot. Show the location of the intended construction or land use indicating building setbacks, size height. Identify existing buildings, structures or land uses on the property.

Sign and date sketch.

3. Estimated cost of building or structure: \$680,000

4. Estimated completion date: September 1, 2012

E. NOTES

1. The information on this application is true and accurate to the knowledge of the applicant.
2. The intended construction or land use identified on this application must be started no later than six (6) months from the date the application is approved.
3. In signing this application, it is understood that the Land Development Coordinator or his representative may inspect the property and/or activities identified on this application.
4. If the intended construction or land use identified on this application requires Health Department's approval, evidence of such approval from the County and/or State must be submitted to the Doddridge County Commission in order to complete this application.

PUBLIC SEWAGE ( ) YES (X) NO If NO, SEPTIC TANK PERMIT # \_\_\_\_\_

5. Duplicates of this application will be transmitted to:

Doddridge County Assessor's Office

6. The County Commission suggests all applicants call and advise local utility companies of your construction plans in order to avoid damage to underground utility lines.

7. Does your construction or renovation come within the floodplain area?

(X) YES ( ) NO

If your answer is yes, you will be required to have an elevation certificate with your application.

F. I (we), the owner(s) of the property on which the intended improvement is to be constructed, hereby insure that this construction and intended use complies with all restrictive covenants applying to the subject real estate. And, I (we) agree, understand and acknowledge that I (we) assume full responsibility for compliance with any such private land use covenants and that a violation thereof may result in legal sanctions by court injunction and damages irrespective of the issuance of this permit by the Doddridge County Commission.

SIGNED: \_\_\_\_\_

*J. Scott Lewis*  
Property Owner

\_\_\_\_\_  
Property Owner

LOCATION PERMIT FEES

Accessory Buildings and/or Structures..... (examples: garage, storage or farm buildings, carport)	\$ 5.00
Additions and/or Renovations to Single Family Residential or Manufactured Homes <u>UP TO</u> \$50,000.00.....	\$10.00
Additions and/or Renovations to Single Family Residential or Manufactured Homes <u>OVER</u> \$50,000.00.....	\$10.00
Single Family Residential <u>UP TO</u> \$50,000.00.....	\$10.00
Manufactured Homes - described as having permanent axle and frame.	None
Commercial/Industrial/Multi-Family ..... Residential and other buildings and structures, including additions and renovations to existing structures.	\$25.00

DO NOT WRITE BELOW THIS LINE - FOR OFFICIAL USE ONLY

Completed Application Received: <i>08/09/2012</i>	Subdivision Ordinance ( ) Complies ( ) Does Not Comply <input checked="" type="checkbox"/> Not Applicable	Floodplain Management Ordinance <input checked="" type="checkbox"/> Complies ( ) Does Not Comply ( ) Not Applicable
Flood-Prone Yes <input checked="" type="checkbox"/> No ( )	Aerial No.	Application Approved. Permit Issued:
FIRM Panel No. <i>0080B 3/12/1991</i>		<i>8/9/2012</i>
Permit No. #0469	Permit Expires: <i>2/9/2012</i>	Signature of Land Development Coordinator <i>Dan Wilkins</i>

*08/09/2012*



<b>Civil &amp; Environmental Consultants, Inc.</b>	
333 Baldwin Road	
Pittsburgh, Pennsylvania 15205	
(412) 429-2324 Toll Free (800) 365-2324	
Fax (412) 429-2114	
TO:	<b>Doddridge County Courthouse</b>
	<b>118 East Court Street</b>
	<b>West Union, WV 26456</b>

<b>LETTER OF TRANSMITTAL</b>			
DATE:	<b>1/2/14</b>	JOB NO.:	<b>110-811</b>
ATTENTION:	<b>Dan Wellings</b>		
RE:	<b>Sherwood Gas Processing Plant</b>		
	<b>Floodplain Permit Application</b>		

WE ARE SENDING YOU	<input checked="" type="checkbox"/>	ATTACHED	<input type="checkbox"/>	SEPARATE COVER	VIA	<b>FedEx - Priority</b>	THE FOLLOWING ITEMS:			
		SHOP DWGS	<input type="checkbox"/>	PRINTS	<input type="checkbox"/>	PLANS	<input type="checkbox"/>	SAMPLES	<input type="checkbox"/>	SPECIFICATIONS
		COPY OF LETTER	<input type="checkbox"/>	CHANGE ORDER	<input type="checkbox"/>					

COPIES	DATE	NUMBER	DESCRIPTION
1	12/30/14		Sherwood Floodplain Application Fee

WE ARE SENDING YOU	<input type="checkbox"/>	FOR APPROVAL	<input type="checkbox"/>	APPROVAL AS SUBMITTED	<input type="checkbox"/>	RESUBMIT ___ COPIES FOR APPROVAL
	<input checked="" type="checkbox"/>	FOR YOUR USE	<input type="checkbox"/>	APPROVED AS NOTED	<input type="checkbox"/>	SUBMIT ___ COPIES FOR DISTRIBUTION
	<input type="checkbox"/>	AS REQUESTED	<input type="checkbox"/>	RETURNED FOR CORRECTIONS	<input type="checkbox"/>	RETURN ___ PRINTS
	<input type="checkbox"/>	FOR REVIEW AND COMMENT	<input type="checkbox"/>			
	<input type="checkbox"/>	FOR BIDS DUE:				PRINTS RETURNED AFTER LOAN TO US

<b>REMARKS</b>
Mr. Wellings,
Please find the enclosed Sherwood Gas Project Floodplain additional fee. Please contact me if you have any questions.
Thank you,
Andy Gullone

2014 JAN -3 PM 1:02  
 BETH A. ROGERS  
 COUNTY CLERK  
 DODDRIDGE COUNTY WV

FILED

COPY TO: Green File

SIGNED:   
 Andrew R. Gullone, P.E., CPESC

Sherwood 4 and 5 - Doddridge County, WV  
 Opinion of Probable Construction Costs - Construction in the Floodplain  
 Project #: 110-811  
 December 2013

Item	Units	Quantity	Unit Cost	Total Cost
Earth Work	CY	58000	\$ 3.50	\$ 203,000.00
<b>Total</b>	-	-	-	\$ 203,000.00

Fee for first \$100,000 cost → \$ 1,000  
 Fee for next \$103,000 cost  
 \$5.00 X 103 → \$ 515

Correct fee → \$ 1,515.00

Amount submitted

12/06/2013

application

\$ 1,000.00

Need additional

\$ 515.00

Snell  
 AGullone@cecinc.com

12-18-13 @ 9:35am

Andy Gullone w/  
 Civil Environmental  
 Consultants

412-249-3179

Sherwood 4 & 5 Processing  
 Plants

"Cateee"



**Civil & Environmental Consultants, Inc.**

333 Baldwin Road

Pittsburgh, Pennsylvania 15205

(412) 429-2324 Toll Free (800) 365-2324

Fax (412) 429-2114

TO: **Doddridge County Courthouse**

**118 East Court Street**

**West Union, WV 26456**

**LETTER OF TRANSMITTAL**

DATE: **12/9/13** JOB NO.: **110-811**

ATTENTION: **Dan Wellings**

RE: **Sherwood Gas Processing Plant**

**Floodplain Permit Application**

WE ARE SENDING YOU	<input checked="" type="checkbox"/>	ATTACHED	<input type="checkbox"/>	SEPARATE COVER	VIA	<b>FedEx - Priority</b>	THE FOLLOWING ITEMS:			
	<input type="checkbox"/>	SHOP DWGS	<input type="checkbox"/>	PRINTS	<input type="checkbox"/>	PLANS	<input type="checkbox"/>	SAMPLES	<input type="checkbox"/>	SPECIFICATIONS
	<input type="checkbox"/>	COPY OF LETTER	<input type="checkbox"/>	CHANGE ORDER						

COPIES	DATE	NUMBER	DESCRIPTION
2	12/9/13		Sherwood Floodplain Application
1	12/9/13		\$1000 Floodplain Application Fee

WE ARE SENDING YOU	<input type="checkbox"/>	FOR APPROVAL	<input type="checkbox"/>	APPROVAL AS SUBMITTED	<input type="checkbox"/>	RESUBMIT ___ COPIES FOR APPROVAL
	<input checked="" type="checkbox"/>	FOR YOUR USE	<input type="checkbox"/>	APPROVED AS NOTED	<input type="checkbox"/>	SUBMIT ___ COPIES FOR DISTRIBUTION
	<input type="checkbox"/>	AS REQUESTED	<input type="checkbox"/>	RETURNED FOR CORRECTIONS	<input type="checkbox"/>	RETURN ___ PRINTS
	<input type="checkbox"/>	FOR REVIEW AND COMMENT	<input type="checkbox"/>			
	<input type="checkbox"/>	FOR BIDS DUE:	<input type="checkbox"/>	PRINTS RETURNED AFTER LOAN TO US		

**REMARKS**


Mr. Wellings,

Please find the enclosed Sherwood Gas Project Floodplain Application and fees. Please contact me if you have any questions.

Thank you,

Andy Gullone

COPY TO: Green File

SIGNED:   
Andrew R. Gullone, P.E., CPESC



---

**APPENDIX A**

**SITE LOCATION AND SOILS MAPS**









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# Sherwood Gas Processing Plant



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 11/20/2013

-  Location of the mouse click
-  Approximate Study (Zone A)
-  Detailed Study (Zone AE, AH, AO)
-  Floodway
-  Flood Water Depth (HEC-RAS)
-  Cross Section Line
-  Base Flood Elevation Line
-  DFIRM Panel (Map) Index

**User Notes:**

**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. To obtain more detailed information in areas where Base Flood Elevations have been determined, users are encouraged to consult the latest Flood Profile data contained in the official flood insurance study. These studies are available online at [www.msc.fema.gov](http://www.msc.fema.gov).

WY Flood Tool is supported by FEMA, WY NFIP Office, and WY GIS Technical Center (<http://www.MapWY.gov/flood>)

**Flood Hazard Area:** Selected site is **WITHIN** the FEMA 100-year floodplain.  
**Flood Zone:** AE  
**Advisory Flood Height:** N/A  
**Water Depth:** N/A  
**Elevation:** About 807 feet  
**Location (long, lat):** 80.686944 W, 39.277111 N  
**Location (UTM 17N):** (527002, 4347575)  
**FEMA Issued Flood Map:** 54017C0145C  
**Contacts:** Doddridge County  
**CRS Information:** No CRS information available  
**Flood Profile:** 54017\_003  
**HEC-RAS Model:** No Model  
**Parcel Number:**

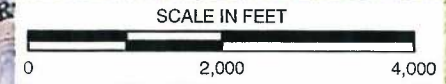


**LEGEND**

— LIMIT OF DISTURBANCE

**REFERENCE**

USGS TOPOGRAPHIC MAP/ ARCGIS MAP SERVICE:  
HTTP://GOTO.ARCGISONLINE.COM/MAPS/USA\_TOPO\_MAPS,  
ACCESSED 10/28/2013



**Civil & Environmental Consultants, Inc.**

333 Baldwin Road - Pittsburgh, PA 15205-9072  
412-429-2324 · 800-365-2324  
www.cecinc.com

MARKWEST LIBERTY MIDSTREAM & RESOURCES, LLC  
SHERWOOD GAS PROCESSING PLANTS 4 & 5  
DODDRIDGE COUNTY, WV

**SITE LOCATION MAP**

DRAWN BY:	MSM	CHECKED BY:	ARG	APPROVED BY:	FIGURE NO:
DATE:	10/28/2013	SCALE:	1" = 2,000'	PROJECT NO:	110-811.4004

1

P:\2011\10-811-4004\FIG1.LOC.mxd 10/28/2013 10:12 AM (mmsquire)



---

**APPENDIX B**

**FEMA FLOOD INFORMATION STUDY AND RATE MAP**

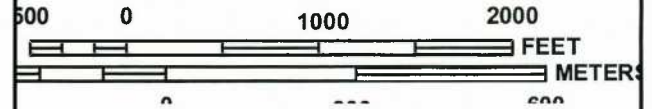
---



JOINS PANEL 0145



MAP SCALE 1" = 1000'



  
 NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0140C

## FIRM

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

PANEL 140 OF 325  
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	540024	0140	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.



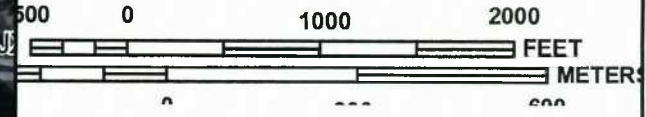
**MAP NUMBER**  
 54017C0140C  
**MAP REVISED**  
 OCTOBER 4, 2011

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)



MAP SCALE 1" = 1000'



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0145C

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

PANEL 145 OF 325  
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	540024	0145	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**  
 54017C0145C  
**MAP REVISED**  
 OCTOBER 4, 2011

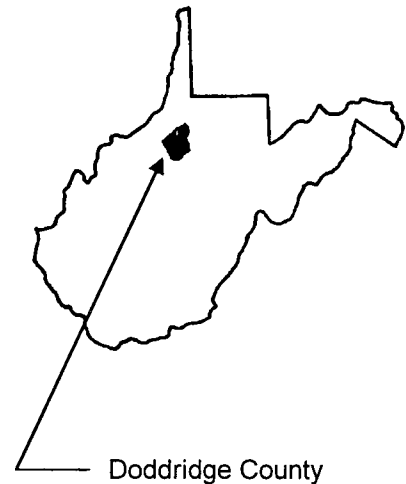
Federal Emergency Management Agency

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)

# FLOOD INSURANCE STUDY



## DODDRIDGE COUNTY, WEST VIRGINIA AND INCORPORATED AREAS



COMMUNITY NAME

WEST UNION, TOWN OF  
DODDRIDGE COUNTY (UNINCORPORATED  
AREAS)

COMMUNITY NUMBER

540025  
540024

Effective: October 4, 2011



Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER  
54017CV000A



**NOTICE TO  
FLOOD INSURANCE STUDY USERS**

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) report may not contain all data available within the Community Map Repository. Please contact the Community Map Repository for any additional data.

The Federal Emergency Management Agency (FEMA) may revise and republish part or all of this FIS report at any time. In addition, FEMA may revise part of this FIS report by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS report. Therefore, users should consult with community officials and check the Community Map Repository to obtain the most current FIS report components.

Initial Countywide FIS Effective Date: March 18, 1991

Flood Insurance Study Revised: October 4, 2011

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Exhibit 1 – Flood Profiles	
Big Isaac Creek	Panel 01P
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Exhibit 2 – Flood Insurance Rate Map Index  
    Flood Insurance Rate Map

**FLOOD INSURANCE STUDY  
DODDRIDGE COUNTY, WEST VIRGINIA  
AND INCORPORATED AREAS**

**1.0 INTRODUCTION**

**1.1 Purpose of Study**

This countywide format Flood Insurance Study investigates the existence and severity of flood hazards in the geographic area of Doddridge County, West Virginia, including the Town of West Union and the unincorporated areas of the county (hereinafter referred to collectively as Doddridge County); and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State or other jurisdictional agency will be able to explain them.

**1.2 Authority and Acknowledgments**

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses in this study were prepared by the U.S. Geological Survey (USGS) for the Federal Emergency Management Agency (FEMA) under Inter-Agency Agreement No. EMW-87-E- 2512. Within the Town of West Union, the work for this study was completed in May 1988; within the unincorporated areas of the county, the work for this study was completed in June 1988.

This digital conversion was prepared by the USACE, Huntington District, for FEMA, under Inter-Agency Agreement No. HSFE03-06-X-0023.

Base map information shown on the FIRM was provided by West Virginia Statewide Addressing and Mapping Board (SAMB). Imagery was captured at a scale of 1:24,000 in the Spring of 2003 for the purpose of producing natural color digital orthophotos at a two-foot pixel resolution.

The projection used in the preparation of this map is Universal Transverse Mercator (UTM) Zone 17, and the horizontal datum used is North American Datum of 1983 (NAD 83), GRS1980 spheroid. Corner coordinates shown on the FIRM are in latitude and longitude referenced to UTM, NAD 1983. Differences in the datum, spheroid, projection, or UTM zones used in the production of FIRMs for adjacent counties may

result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of the information shown on the FIRM.

### 1.3 Coordination

On January 17, 1985, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the county, and the USGS (the study contractor) to determine the streams to be studied by detailed methods. The Huntington District of the U. S. Army Corps of Engineers (USACE) and the Soil Conservation Service (SCS) were contacted for information pertinent to this study.

On April 18, 1990, a final CCO meeting was held with representatives of FEMA, the county, and the study contractor to review the results of the study. The final CCO meeting for the unincorporated areas of Doddridge County also served as the final CCO meeting for this countywide study, and was open to representatives from all communities within the county that were covered by this countywide study.

For this countywide FIS, the final CCO meeting was held on April 29, 2010, and attended by representatives of the Town of West Union and Doddridge County, West Virginia. All problems raised at that meeting have been addressed.

## 2.0 AREA STUDIED

### 2.1 Scope of Study

This FIS covers the geographic area of Doddridge County, West Virginia, including communities listed in Section 1.1.

Table 1, "Areas Studied by Detailed Methods" lists the streams studied by detailed methods.

**Table 1 – Areas Studied by Detailed Methods**

<u>Stream</u>	<u>Limits of Detailed Study</u>
Middle Island Creek	From the downstream county boundary to the confluence of Meathouse Fork and Buckeye Creek
Buckeye Creek	From the confluence with Middle Island Creek to a point approximately 240 feet upstream of the confluence of Long Run, and from the confluence of Greenbrier Creek to the confluence of Traugh Fork
Meathouse Fork	From the confluence with Middle Island Creek to County Highway 56, and from a point approximately 1,600 feet downstream of County Highway 25-13 to the confluence of Laurel Run and Big Isaac Creek
McElroy Creek	From the confluence of Flint Run to the confluence of Big Battle Run

**Table 1 – Areas Studied by Detailed Methods - continued**

<u>Stream</u>	<u>Limits of Detailed Study</u>
Wilhelm Run	From the confluence with Arnold Creek to a point approximately 1.2 miles upstream
Long Run	From the confluence with Buckeye Creek to a point approximately 2.4 miles upstream
Toms Fork	From the confluence with Meathouse Fork to the confluence of Little Toms Fork
Greenbrier Creek	From the confluence with Buckeye Creek to a point approximately 1.9 miles upstream
Big Isaac Creek	From the confluence with Meathouse Fork to the confluence of Little Isaac Creek
Laurel Run	From the confluence with Meathouse Fork to a point approximately 0.9 mile upstream of the confluence with Meathouse Fork

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through January 1990.

All or portions of the following streams were studied by approximate methods: Broad Run, Arnold Creek, Slaughter Run, Flint Run, Riggins Run, Robinson Fork, Big Battle Run, Skelton Run, Talkington Fork, Long Run, Bluestone Creek, Cove Creek, Indian Fork, Nutter Fork, Jockey Camp Run, Morgans Run, Buckeye Creek, Buffalo Calf Creek, Meathouse Fork, Little Toms Fork, Lick Run, Big Isaac Creek, Middle Fork, Dotson Run, Cabin Run, Leason Creek, Right Fork, Left Fork, Elk Lick Run, Pike Fork, Little Battle Run, Pigin Run, Brushy Fork, Rock Run, Wolfpen Run, Englands Run, Jockeycamp Run, Douglascamp Run, Traugh Fork, Bonnet Fork, the South Fork Hughes River, and Sycamore Fork. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and Doddridge County.

No Letters of Map Revision (LOMRs) were incorporated for the October 4, 2011, revision.

## 2.2 Community Description

Doddridge County is located in northern West Virginia. It is bordered by the unincorporated areas of Wetzel and Tyler Counties to the north; the unincorporated areas of Ritchie County to the west; the unincorporated areas of Harrison County to the east; and the unincorporated areas of Gilmer and Lewis Counties to the south. The total land

area contained within the county is approximately 321.6 square miles. In 2000, the population of the county was 7,491 (Reference 1).

The county seat is located in the Town of West Union. The total land area of the town is approximately 0.32 square miles, and the population was 806 in 2000 (Reference 1).

The climate of Doddridge County is temperate with a seasonal variation in temperature. The county is located in a region termed humid continental: humid because of the evenly spaced precipitation, and continental because of the yearly range in temperature. Mean annual precipitation of the county is approximately 45 inches. The average monthly temperatures in degrees Fahrenheit range from the mid-30's in winter to the low 70's in summer (Reference 2).

### 2.3 Principal Flood Problems

The principal flood problems of Doddridge County are the overflows of Middle Island Creek, Buckeye Creek, and Meathouse Fork. The history of flooding in the county indicates that flooding can occur at any time of the year. Large frontal storms or decaying tropical storms produce the worst flooding on the larger streams, while high intensity thunderstorms produce severe flooding on smaller drainage areas. Major floods have occurred in the county in 1875, 1950, 1963, and 1985.

The mountainous topography of the county is conducive to rapid rises on streams and also to fast runoff best described as flash flooding. This condition has been aggravated by human activities such as timbering in the county.

### 2.4 Flood Protection Measures

No major structural flood protection measures exist or are planned for the county.

## 3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 2-, 1-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 2-, 1-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent-annual-chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance (100-year) flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

### 3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the county.

Discharge-frequency curves were developed on a regional basis that applies to West Virginia (References 3 and 4). For the streams studied by detailed methods, 1-percent-annual-chance flood elevations were determined through discharge-frequency relations and the Manning equation. Within the Town of West Union, flood elevations were determined through streamflow-station data relationships and the Manning's equation.

Peak discharge-drainage area relationships for each stream studied by detailed methods are presented in Table 2, "Summary of Discharges".

**Table 2 – Summary of Discharges**

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (SQ. MILES)</u>	<u>PEAK DISCHARGE (CFS) 1-PERCENT-ANNUAL-CHANCE</u>
<b>MIDDLE ISLAND CREEK</b>		
Upstream of Doddridge-Tyler County boundary	134.78	15,200
Approximately 0.1 mile downstream of confluence of Piggan Run	120.06	13,080
<b>BUCKEYE CREEK</b>		
At confluence with Middle Island Creek	38.62	7,350
Downstream of confluence of Long Run	22.62	5,150
Upstream of confluence of Greenbrier Creek	9.41	3,050
Downstream of confluence of Traugh Fork	1.52	1,310
<b>MEATHOUSE FORK</b>		
At confluence with Middle Island Creek	66.84	9,600
Downstream of confluence of Toms Fork	50.47	8,200
Downstream of confluence of Brushy Fork	29.87	6,050
Downstream of confluence of Laurel Run and Big Isaac Creek	3.76	2,230
<b>MCELROY CREEK</b>		
Upstream of confluence of Flint Run	61.95	9,250
Upstream of confluence of Rigging Run	51.23	8,300
Downstream of confluence of Talkington Fork	39.18	7,100
Downstream of confluence of Robinson Fork and Big Battle Run	20.75	4,900



Table 2 – Summary of Discharges

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (SQ. MILES)</u>	<u>PEAK DISCHARGE (CFS) 1-PERCENT-ANNUAL- CHANCE</u>
<b>WILHELM RUN</b>		
At confluence with Arnold Creek	3.29	2,070
Approximately 1.2 miles upstream of confluence with Arnold Creek	2.07	1,570
<b>LONG RUN</b>		
At confluence with Buckeye Creek	4.44	2,460
Approximately 2.4 miles upstream of confluence with Buckeye Creek	1.85	1,470
<b>TOMS FORK</b>		
At confluence with Meathouse Fork	15.27	4,100
Downstream of confluence of Little Toms Fork	12.58	3,650
<b>GREENBRIER CREEK</b>		
At confluence with Buckeye Creek	2.80	1,880
Approximately 1.9 miles upstream of confluence with Buckeye Creek	1.09	1,080
<b>BIG ISAAC CREEK</b>		
At confluence with Meathouse Fork	1.79	1,450
<b>LAUREL RUN</b>		
At confluence with Meathouse Fork	1.97	1,530
Upstream of confluence of Big Isaac Creek	1.57	1,340

### 3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and the FIRM (Exhibit 2) where applicable.

Water-surface elevations of floods of the selected recurrence intervals were computed

using the USACE HEC-2 step-backwater computer program, and the results were published in a special flood hazard information report (References 5 and 6). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Channel roughness factors (Manning's "n") used in the hydraulic computations were assigned on the basis of field surveys of the stream and floodplain areas. For Middle Island Creek, channel "n" values range from 0.040 to 0.045 and overbank "n" values range from 0.050 to 0.070. For Buckeye Creek and Meathouse Fork, channel "n" values range from 0.055 to 0.080.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Qualifying benchmarks within a given jurisdiction that are catalogued by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical and have a vertical stability classification of A, B or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier.

Benchmarks catalogued by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

- Stability A: Monuments of the most reliable nature, expected to hold position/elevation (e.g. mounted in bedrock)
- Stability B: Monuments which generally hold their position/elevation (e.g. concrete bridge abutment)
- Stability C: Monuments which may be affected by surface ground movements (e.g. concrete monument below frost line)
- Stability D: Mark of questionable or unknown vertical stability (e.g. concrete monument above frost line, or steel witness post)

In addition to NSRS benchmarks, the FIRM may also show vertical control monuments established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for benchmarks shown on the FIRM for this jurisdiction, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their Web site at [www.ngs.noaa.gov](http://www.ngs.noaa.gov).

It is important to note that temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

### 3.3 Vertical Datum

All elevations used in the original Doddridge county FIS reports were referenced to the National Geodetic Vertical Datum of 1929 (NGVD29), formerly referred to as Sea Level Datum of 1929. All flood elevations shown in this FIS report and on the FIRM are referenced to North American Vertical Datum of 1988 (NAVD88). Structure and ground elevations in the community must, therefore, be referenced to NAVD88. Elevation factors used to convert the NGVD29 elevation data of the previous Braxton county FIS reports to NAVD88 are summarized below. Elevation reference marks used in this study are shown on the maps.

The data points used to determine the conversion are listed in Table 3, "Vertical Datum Conversion Values".

**Table 3 – Vertical Datum Conversion Values**

<u>USGS 7.5-Minute Quadrangle Name</u>	<u>Corner</u>	<u>Latitude (Decimal Degrees)</u>	<u>Longitude (Decimal Degrees)</u>	<u>Conversion from NGVD29 to NAVD88 (foot)</u>
Shirley	SE	39.375	80.750	-0.522
Center Point	SE	39.375	80.625	-0.515
Folsom	SE	39.375	80.500	-0.525
Pennsboro	SE	39.250	80.875	-0.554
West Union	SE	39.250	80.750	-0.515
Smithburg	SE	39.250	80.625	-0.502
Oxford	SE	39.125	80.750	-0.531
New Milton	SE	39.125	80.625	-0.522
<b>AVERAGE</b>				<b>-0.500 foot</b>

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. A conversion factor of -.500 feet was applied to the NGVD29 elevations in Doddridge County to convert to NAVD88. Structure and ground elevations in the county must, therefore, be referenced to NAVD88. It is important to note that adjacent communities and counties may be referenced to NGVD29. This may result in differences in Base Flood Elevations (BFEs) across the community and county boundaries.

For more information on NAVD88, see the FEMA publication entitled "Converting the National Flood Insurance Program to the North American Vertical Datum of 1988" (FEMA, June 1992), or contact the National Geodetic Survey Information Services, NOAA, N/NGS12, National Geodetic Survey, SSMC-3, #9202, 1315 East-West Highway, Silver Spring, MD 20910-3282 (Internet address <http://www.ngs.noaa.gov>).

### 4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent-annual-chance (100-year) flood elevations and

delineations of the 1- and 0.2-percent-annual-chance (500-year) floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles and Floodway Data Table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

#### 4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. For the streams studied in detail, the 1-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 20 feet (Reference 7).

For the streams studied by approximate methods, the boundaries of the 1-percent-annual-chance floodplain were delineated using the Flood Hazard Boundary Map (FHBM) for the Town of West Union and the FIS for the Unincorporated Areas of Doddridge County (References 8 and 9).

The 1-percent-annual-chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

#### 4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent-annual-chance flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1, "Floodway Schematic".

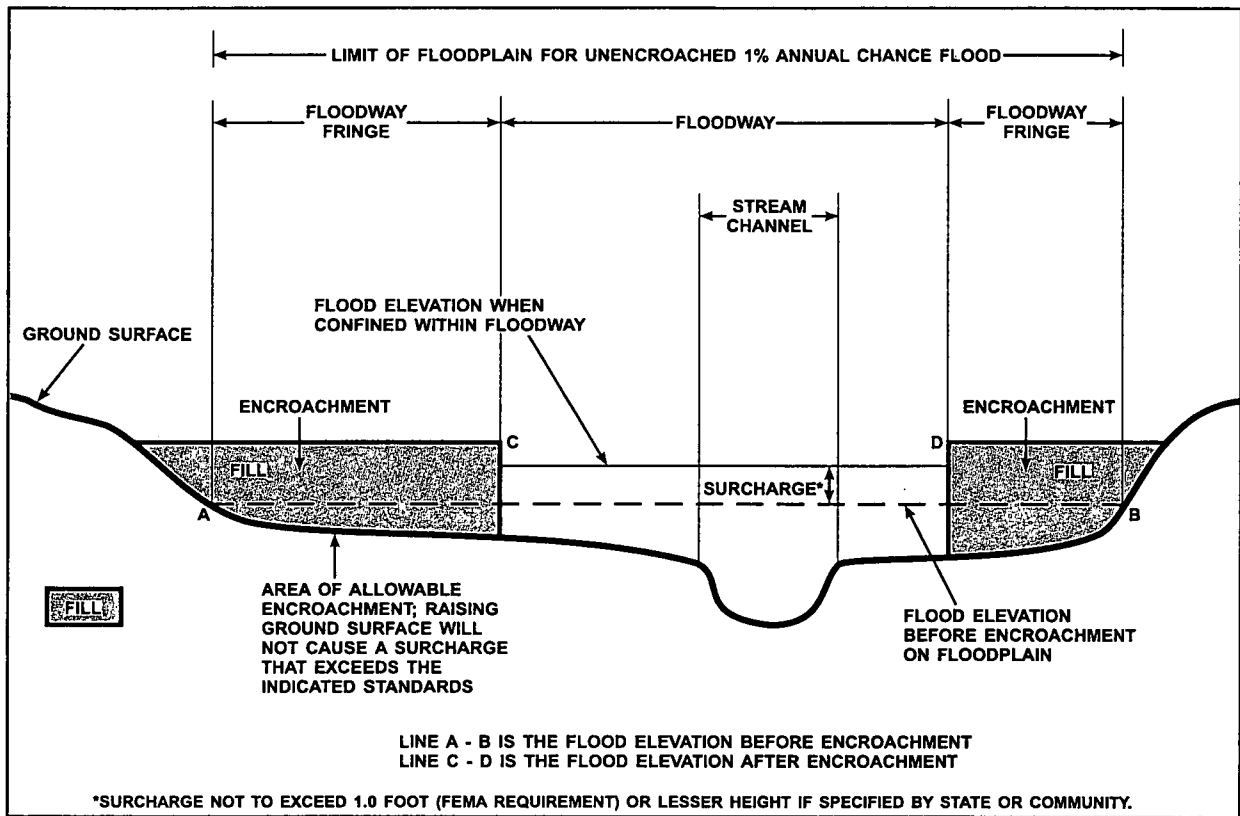


Figure 1 - Floodway Schematic

No floodways were calculated as part of this study.

## 5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

### Zone A

Zone A is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no (1-percent-annual-chance) BFEs or base flood depths are shown within this zone.

### Zone AE

Zone AE is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

### Zone AH

Zone AH is the flood insurance risk zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

### Zone AO

Zone AO is the flood insurance risk zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot base flood depths derived from the detailed hydraulic analyses are shown within this zone.

### Zone AR

Zone AR is the flood insurance risk zone that corresponds to an area of special flood hazard formerly protected from the 1-percent-annual-chance flood event by a flood-control system that was subsequently decertified. Zone AR indicates that the former flood-control system is being restored to provide protection from the 1-percent-annual-chance or greater flood event.

### Zone A99

Zone A99 is the flood insurance risk zone that corresponds to areas of the 1-percent-annual-chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No BFEs or depths are shown within this zone.

### Zone V

Zone V is the flood insurance risk zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no BFEs are shown within this zone.

## Zone VE

Zone VE is the flood insurance risk zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

## Zone X

Zone X is the flood insurance risk zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1-foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by levees. No BFEs or base flood depths are shown within this zone.

## Zone X (Future Base Flood)

Zone X (Future Base Flood) is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined based on future-conditions hydrology. No BFEs or base flood depths are shown within this zone.

## Zone D

Zone D is the flood insurance risk zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

## **6.0 FLOOD INSURANCE RATE MAP**

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplain. The locations of selected cross sections used in the hydraulic analyses are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of Doddridge County. Previously, separate FHBMs and/or FIRMs were prepared for each incorporated community with identified flood hazard areas and the unincorporated areas of the County. Historical map dates relating to pre-countywide maps prepared for each community are presented in Table 4, "Community Map History".

COMMUNITY NAME	INITIAL NFIP MAP DATE	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	INITIAL FIRM DATE	FIRM REVISIONS DATE
West Union, Town of	March 29, 1974	NONE	March 18, 1991	
Doddrige County (Unincorporated Areas)	November 8, 1974	June 3, 1977	March 18, 1991	

**TABLE 4**

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**DODDRIDGE COUNTY, WV  
AND INCORPORATED AREAS**

**COMMUNITY MAP HISTORY**



## 7.0 OTHER STUDIES

Flood Insurance Studies have been prepared for the unincorporated areas of Tyler, Ritchie and Harrison Counties, and for Lewis County and Incorporated Areas (References 10, 11, 12 and 13). The results of this study are in exact agreement with the results of those studies.

A FIS is currently being prepared for Gilmer County and Incorporated Areas (Reference 14). The results of that study will be in exact agreement with the results of this study.

Because it is based on more up-to-date analyses, this study supersedes the Flood Hazard Boundary Map for the Town of West Union and the FIS for the Unincorporated Areas of Doddridge County (References 8 and 9).

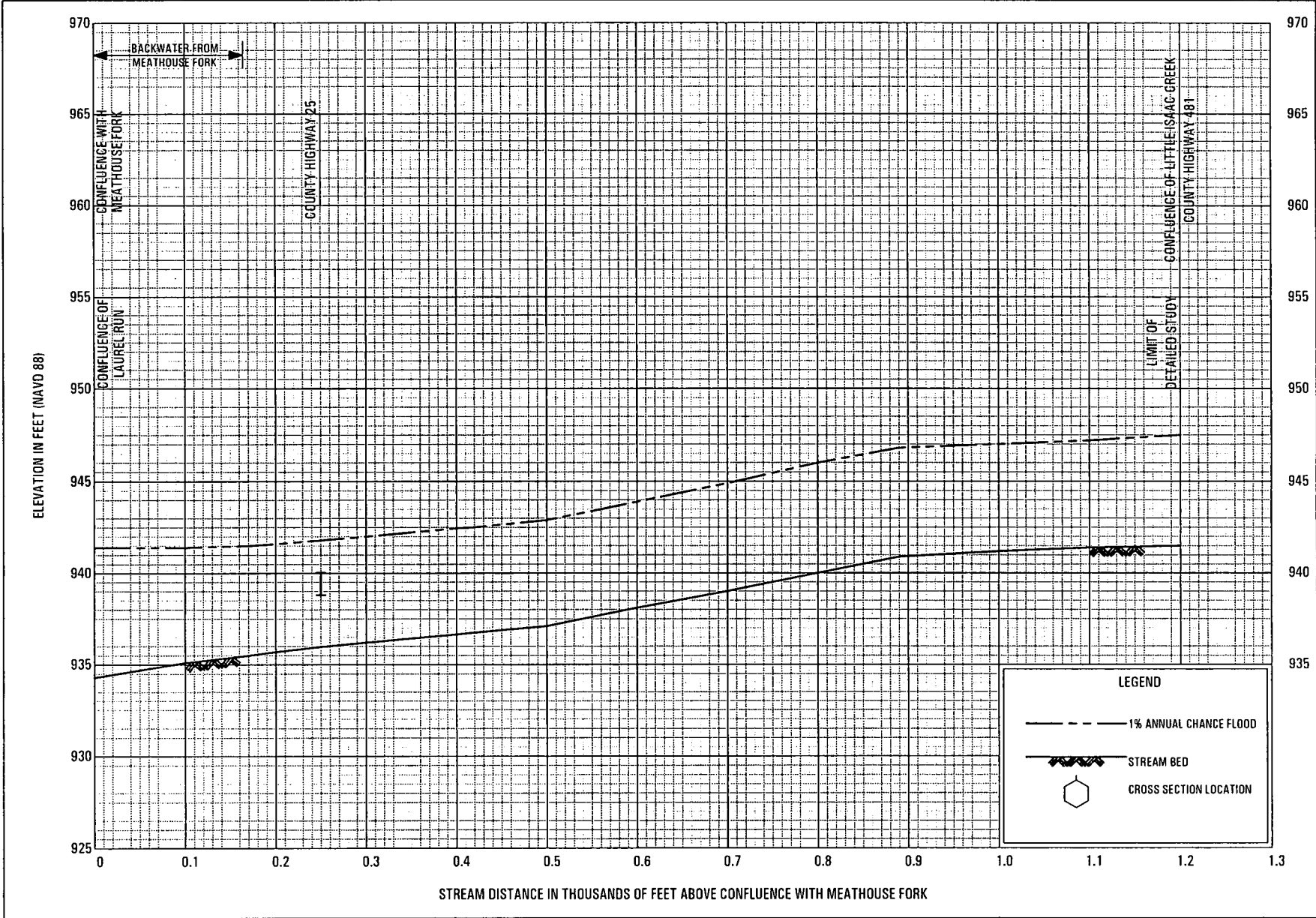
## 8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting Federal Insurance and Mitigation Division, FEMA Region III, One Independence Mall, Sixth Floor, 615 Chestnut Street, Philadelphia, PA 19106-4404.

## 9.0 BIBLIOGRAPHY AND REFERENCES

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11. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Harrison County, West Virginia, Washington, D. C., July 4, 1988.
12. Federal Emergency Management Agency, Flood Insurance Study, Lewis County and Incorporated Areas, West Virginia, Washington, D.C., July 1, 1987.
13. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Unincorporated Areas of Ritchie County, West Virginia, Washington, D.C., December 11, 1981.
14. Federal Emergency Management Agency, Flood Insurance Study, Gilmer County and Incorporated Areas, West Virginia (Unpublished).



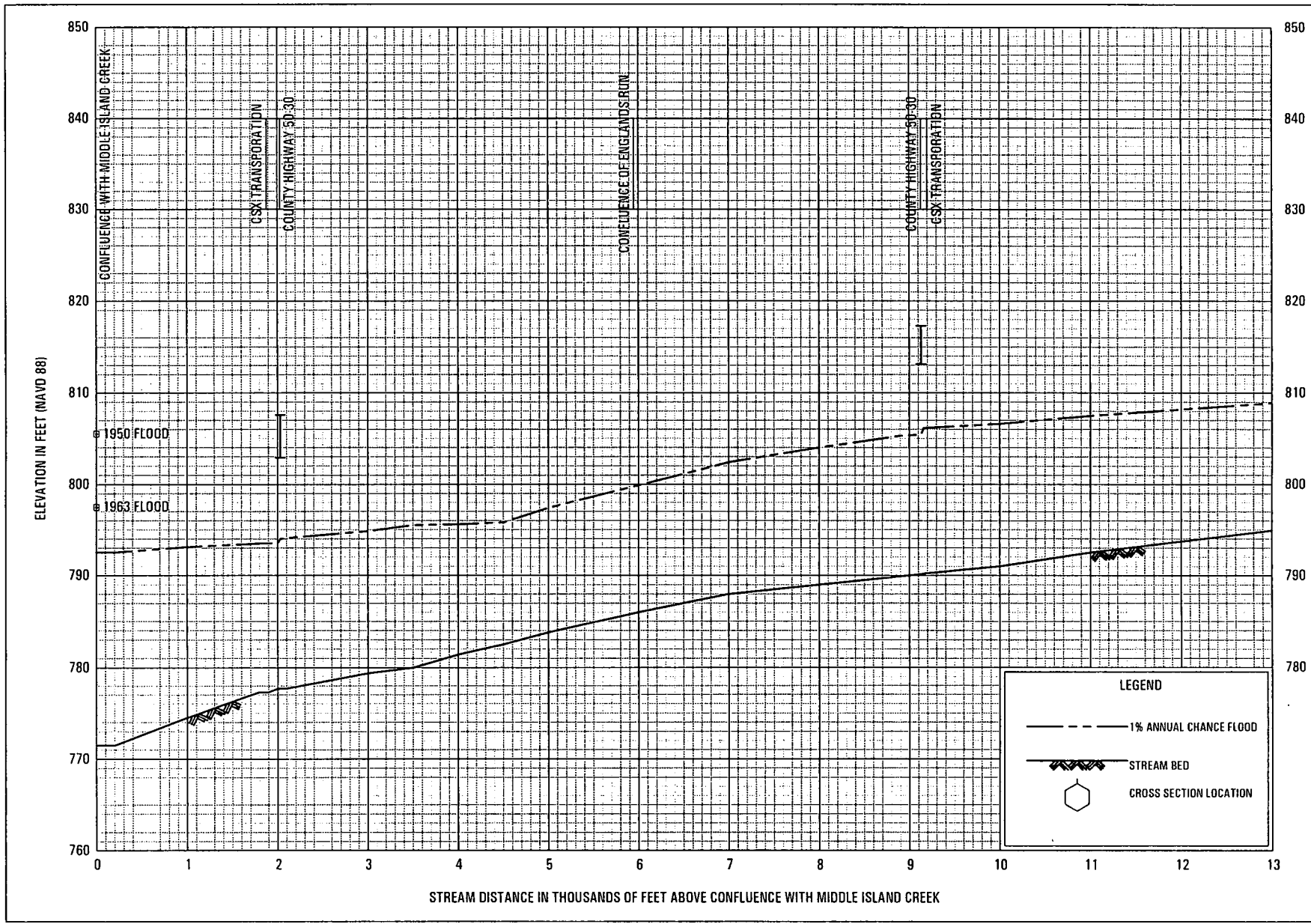
**FLOOD PROFILES**

BIG ISAAC CREEK

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FEDERAL EMERGENCY MANAGEMENT AGENCY  
DODDRIDGE COUNTY, WV  
AND INCORPORATED AREAS

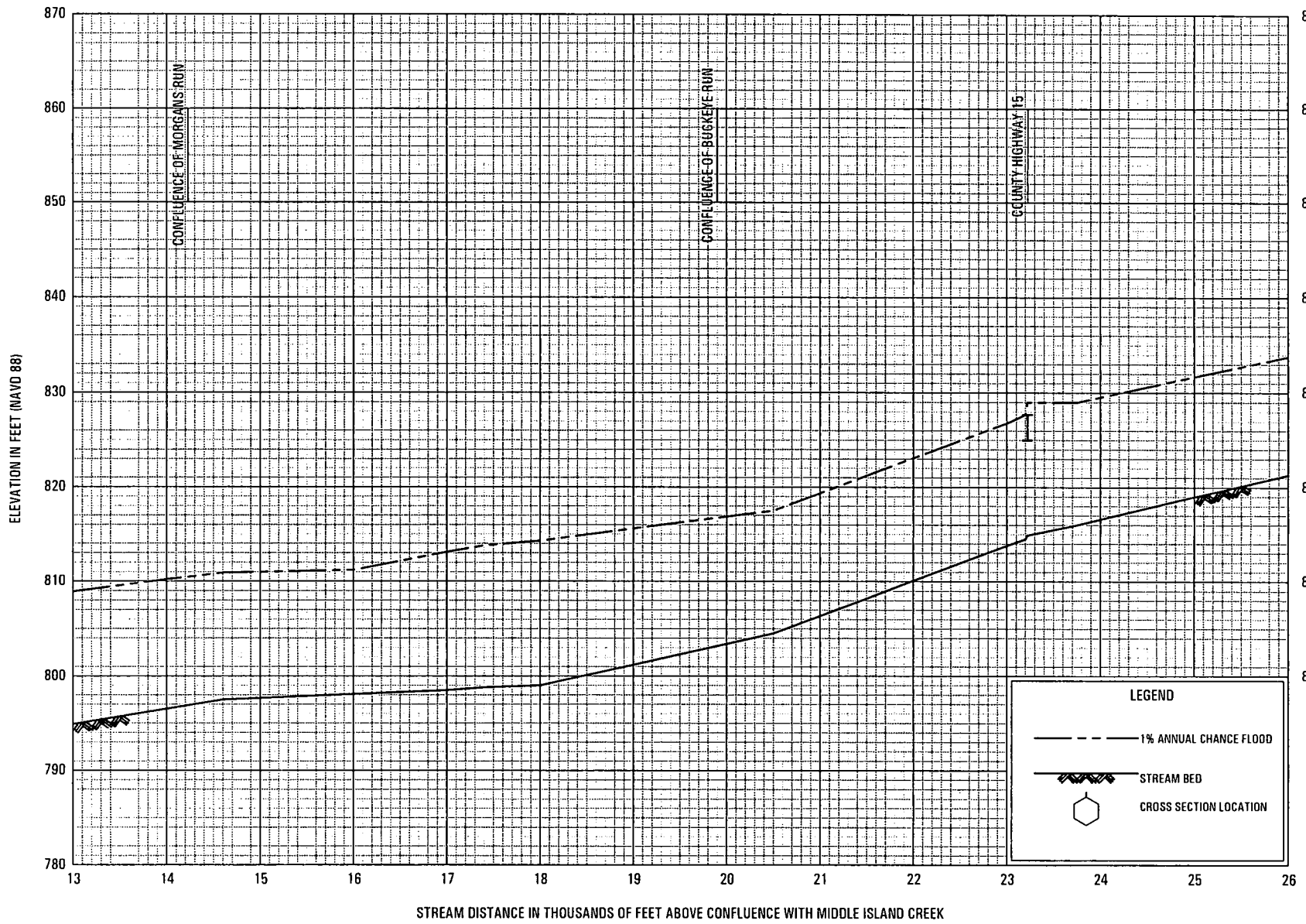
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FLOOD PROFILES

BUCKEYE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY  
 DODDRIDGE COUNTY, WV  
 AND INCORPORATED AREAS



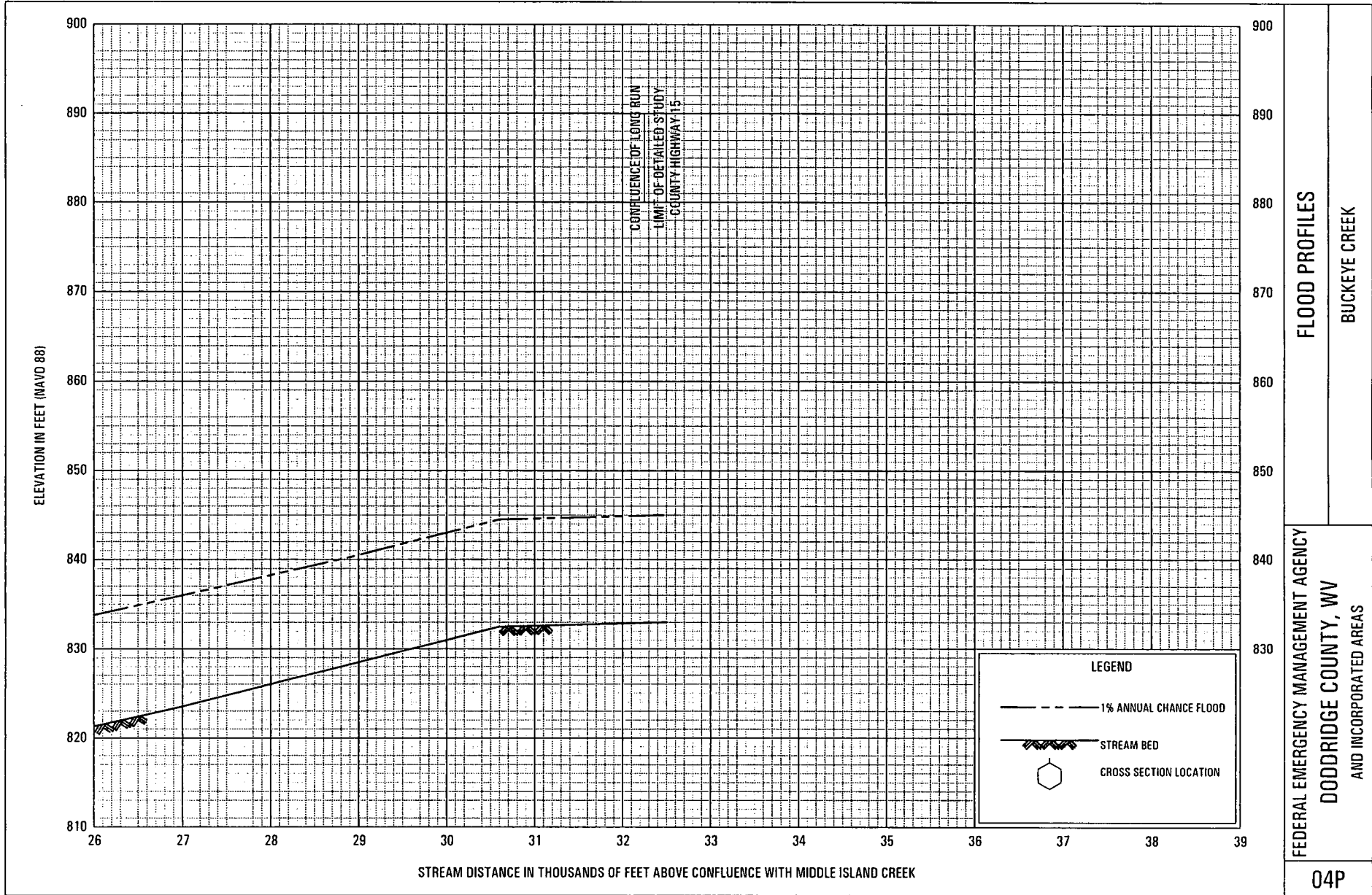
**FLOOD PROFILES**

**BUCKEYE CREEK**

FEDERAL EMERGENCY MANAGEMENT AGENCY

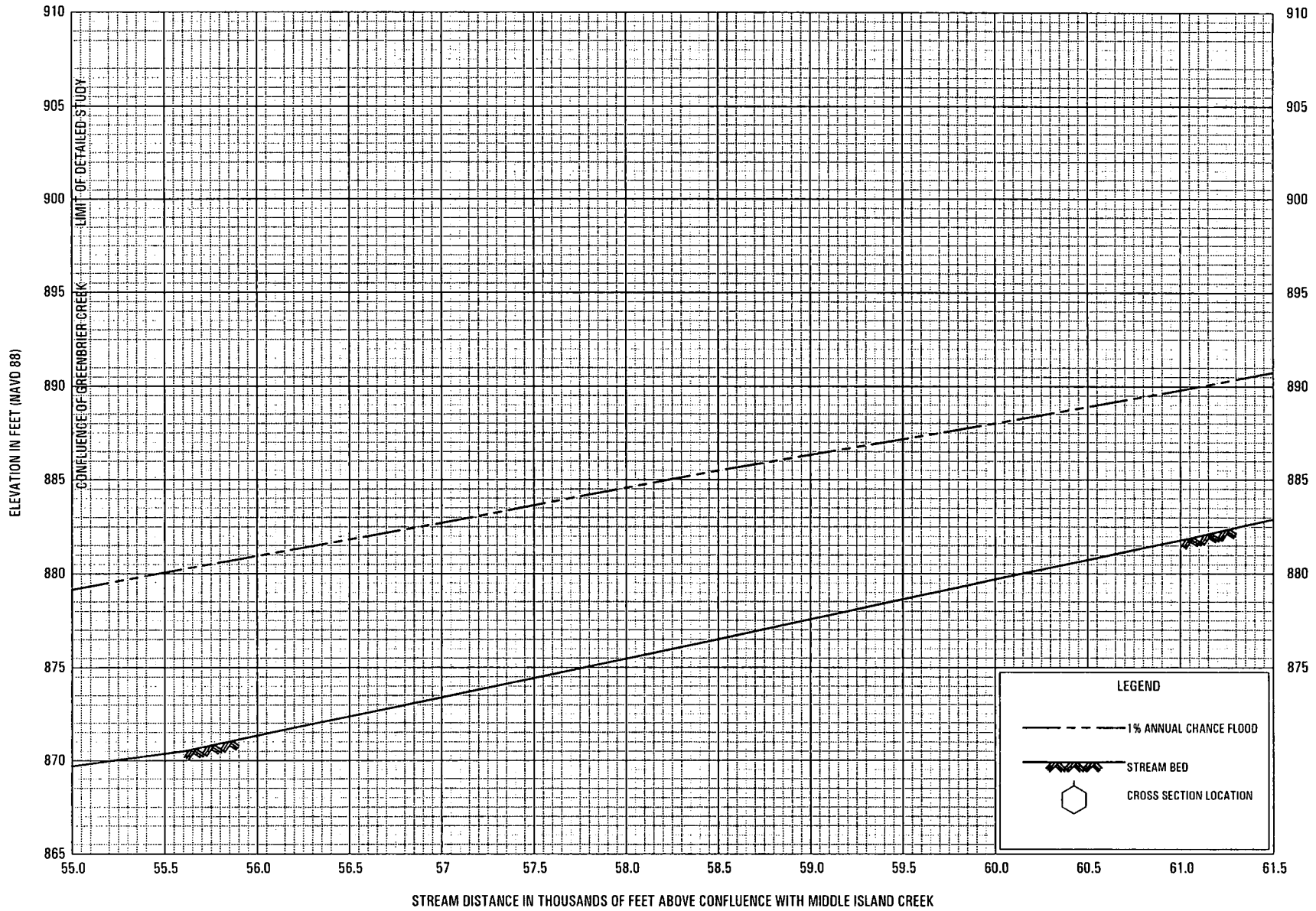
**DODDRIDGE COUNTY, WV**

AND INCORPORATED AREAS



FEDERAL EMERGENCY MANAGEMENT AGENCY  
DODDRIDGE COUNTY, WV  
AND INCORPORATED AREAS

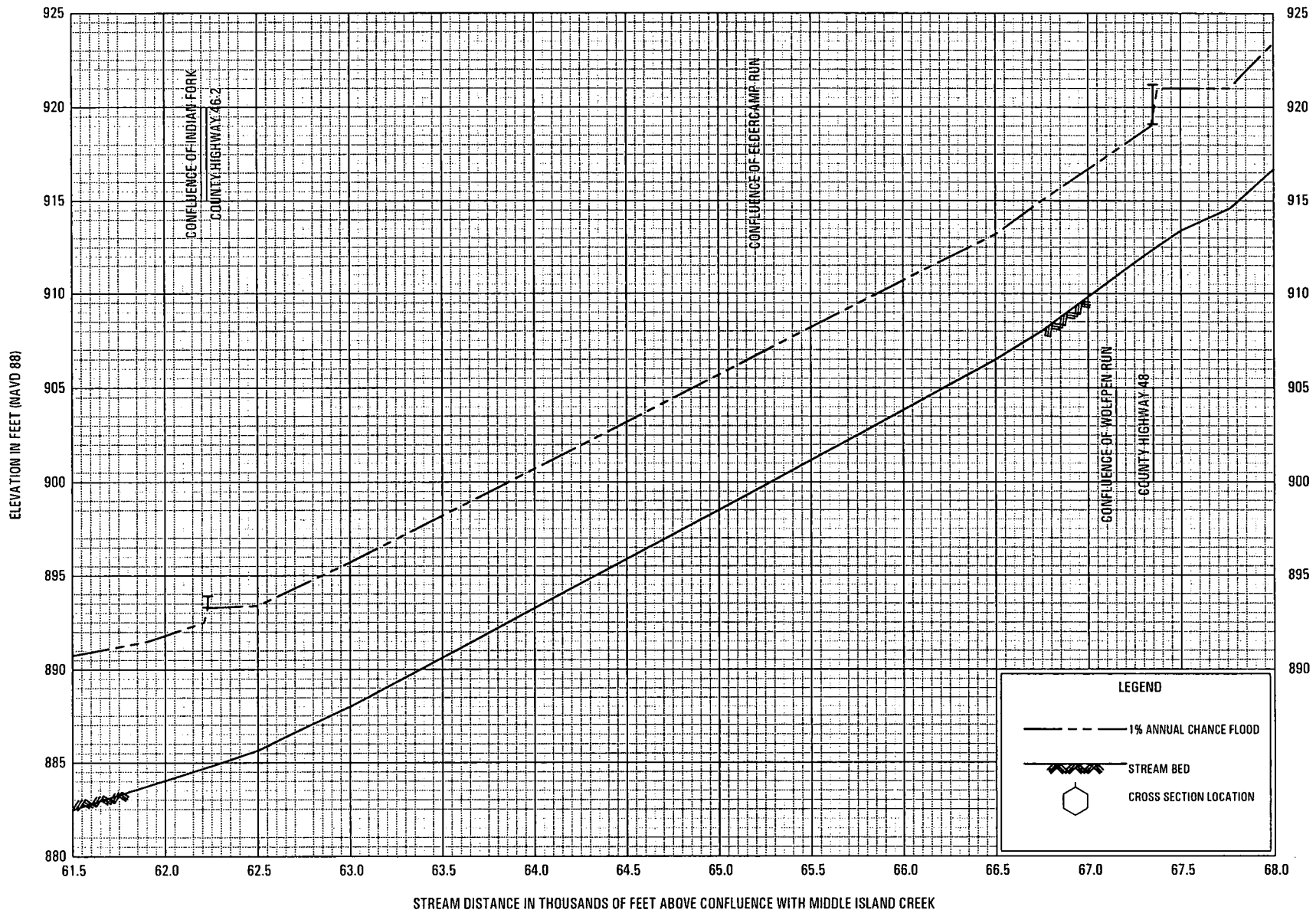
FLOOD PROFILES  
BUCKEYE CREEK



**FLOOD PROFILES**

**BUCKEYE CREEK**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
 DODDRIDGE COUNTY, WV  
 AND INCORPORATED AREAS



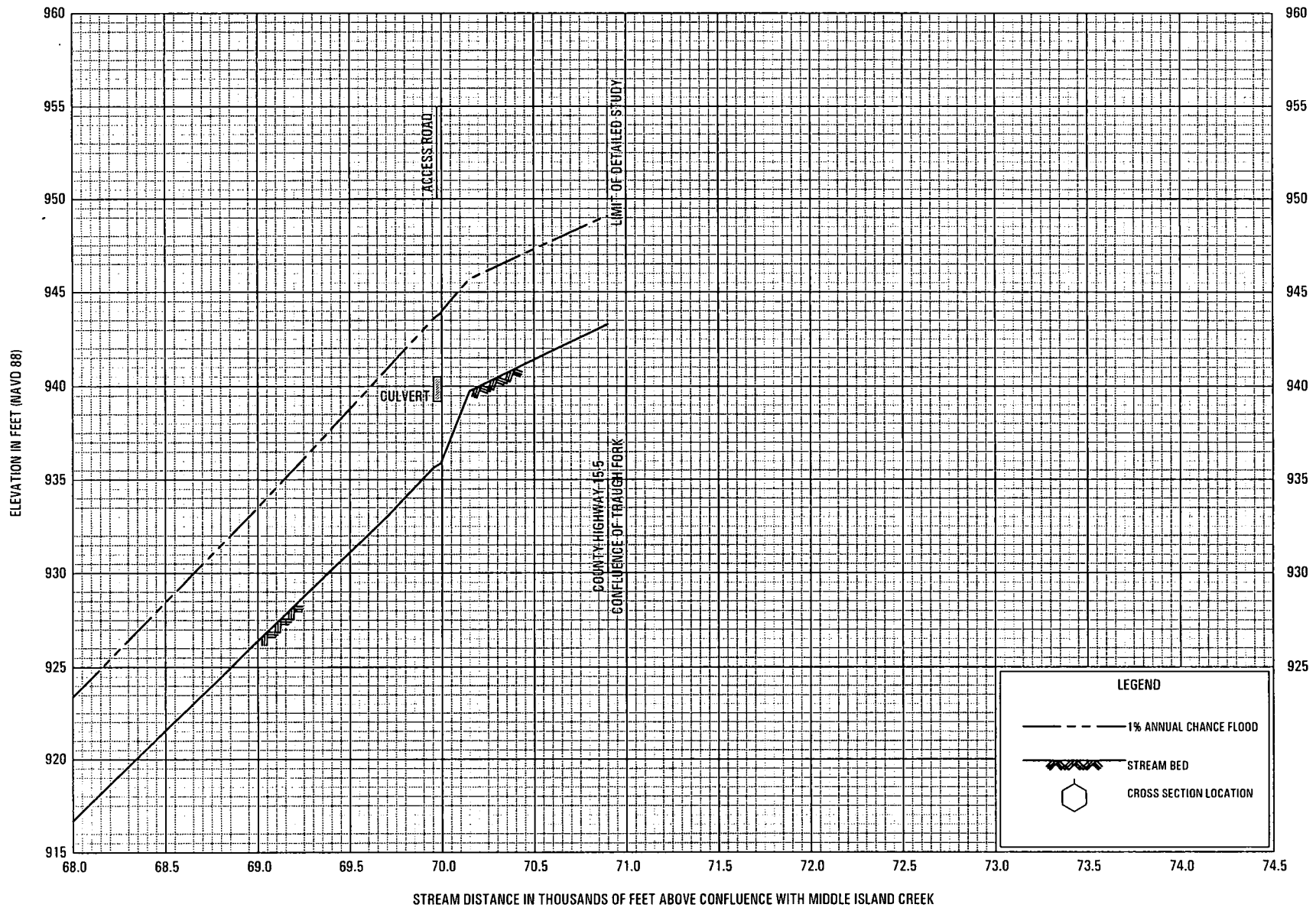
FLOOD PROFILES

BUCKEYE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY  
 DODDRIDGE COUNTY, WV  
 AND INCORPORATED AREAS

06P

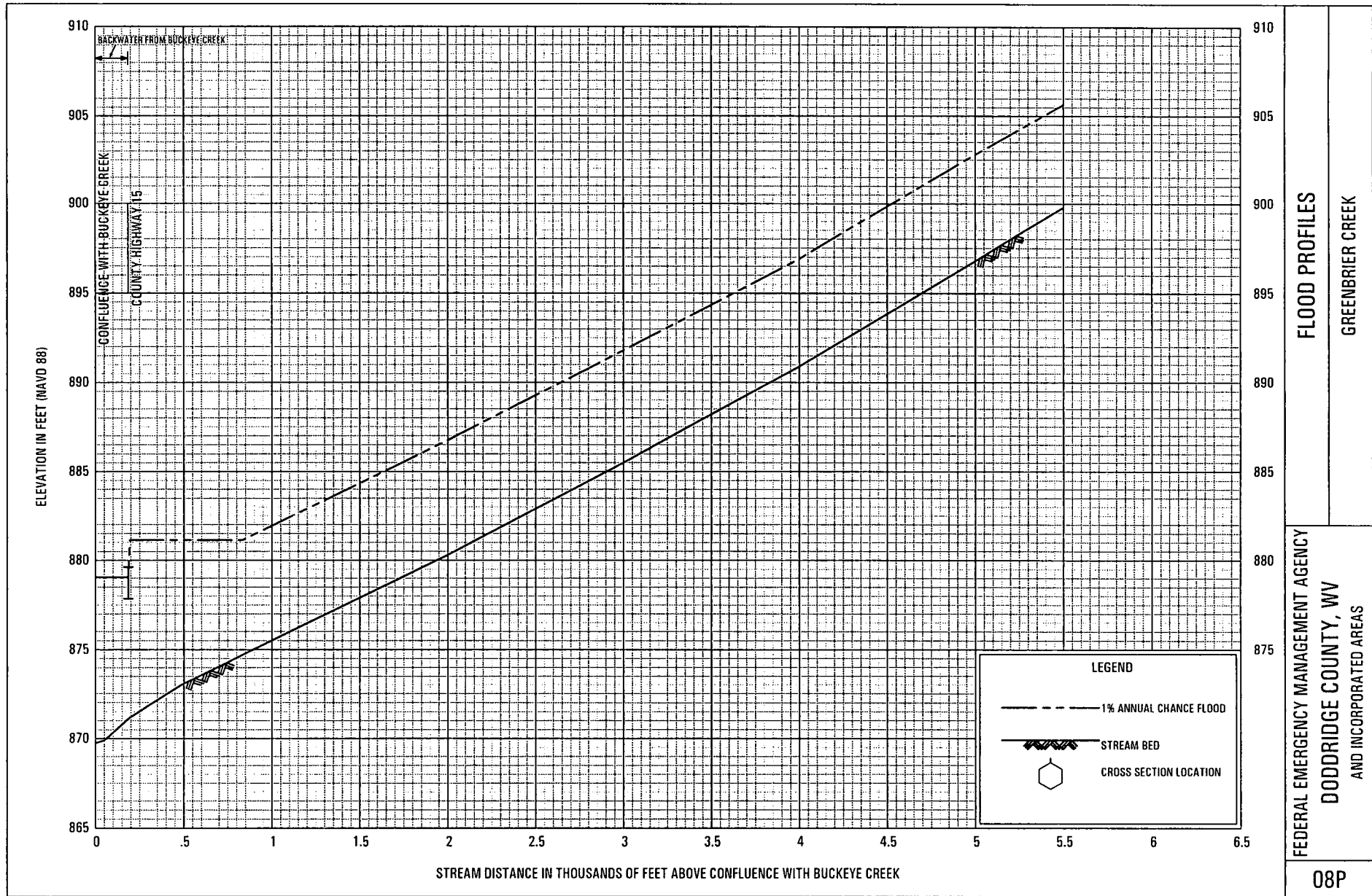




FLOOD PROFILES

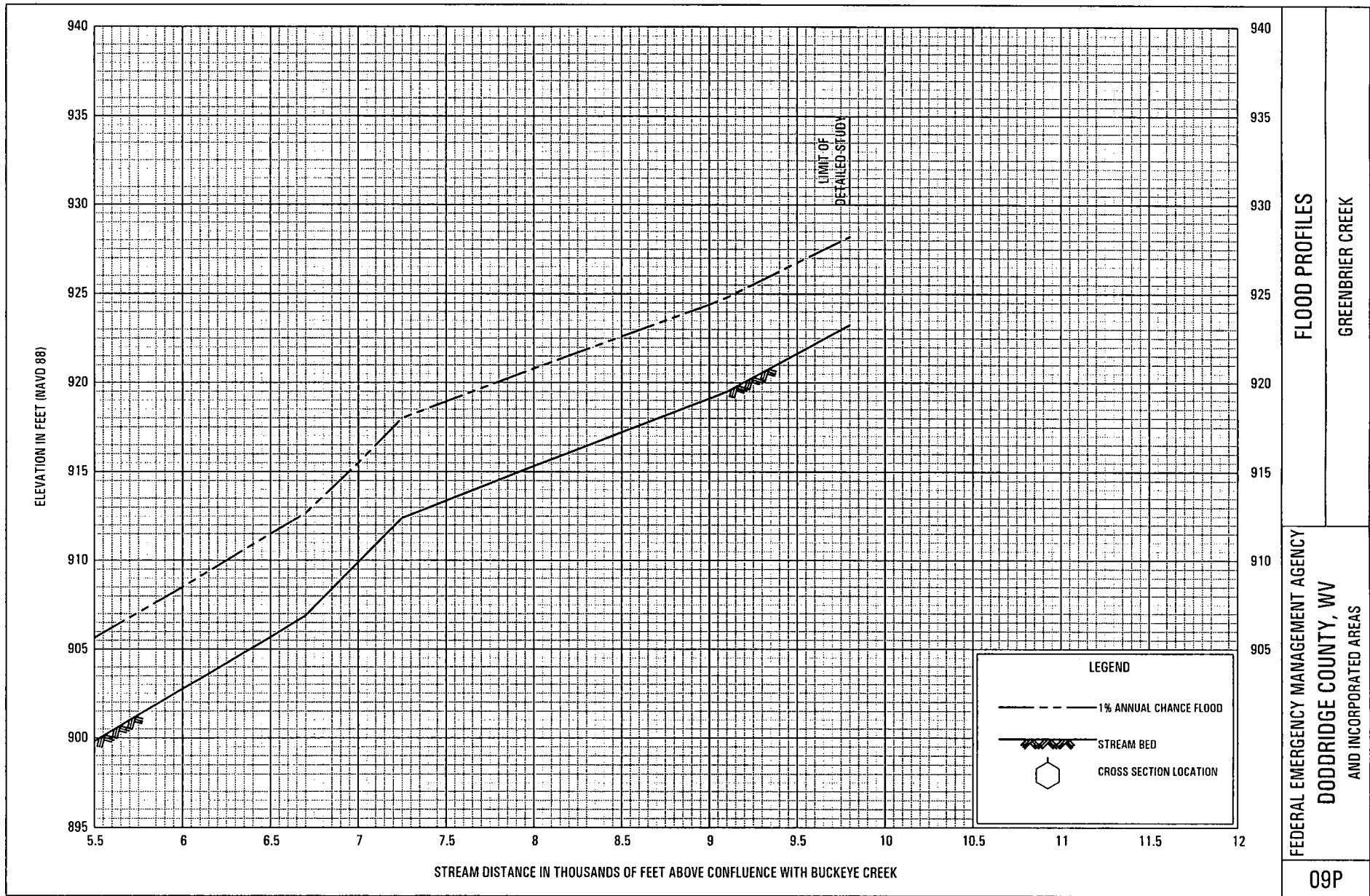
BUCKEYE CREEK

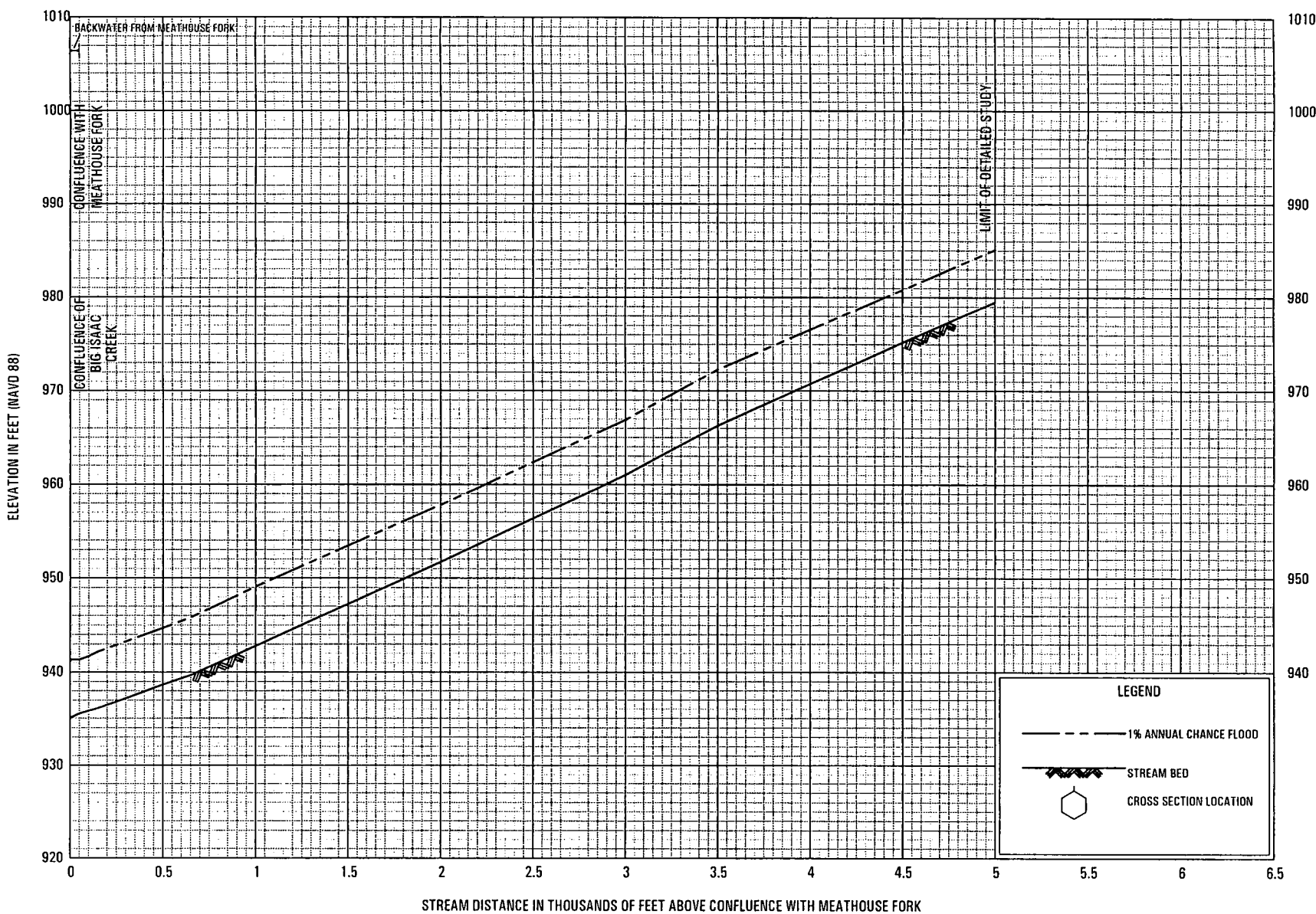
FEDERAL EMERGENCY MANAGEMENT AGENCY  
 DODDRIDGE COUNTY, WV  
 AND INCORPORATED AREAS



FLOOD PROFILES  
GREENBRIER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY  
DODDRIDGE COUNTY, WV  
AND INCORPORATED AREAS

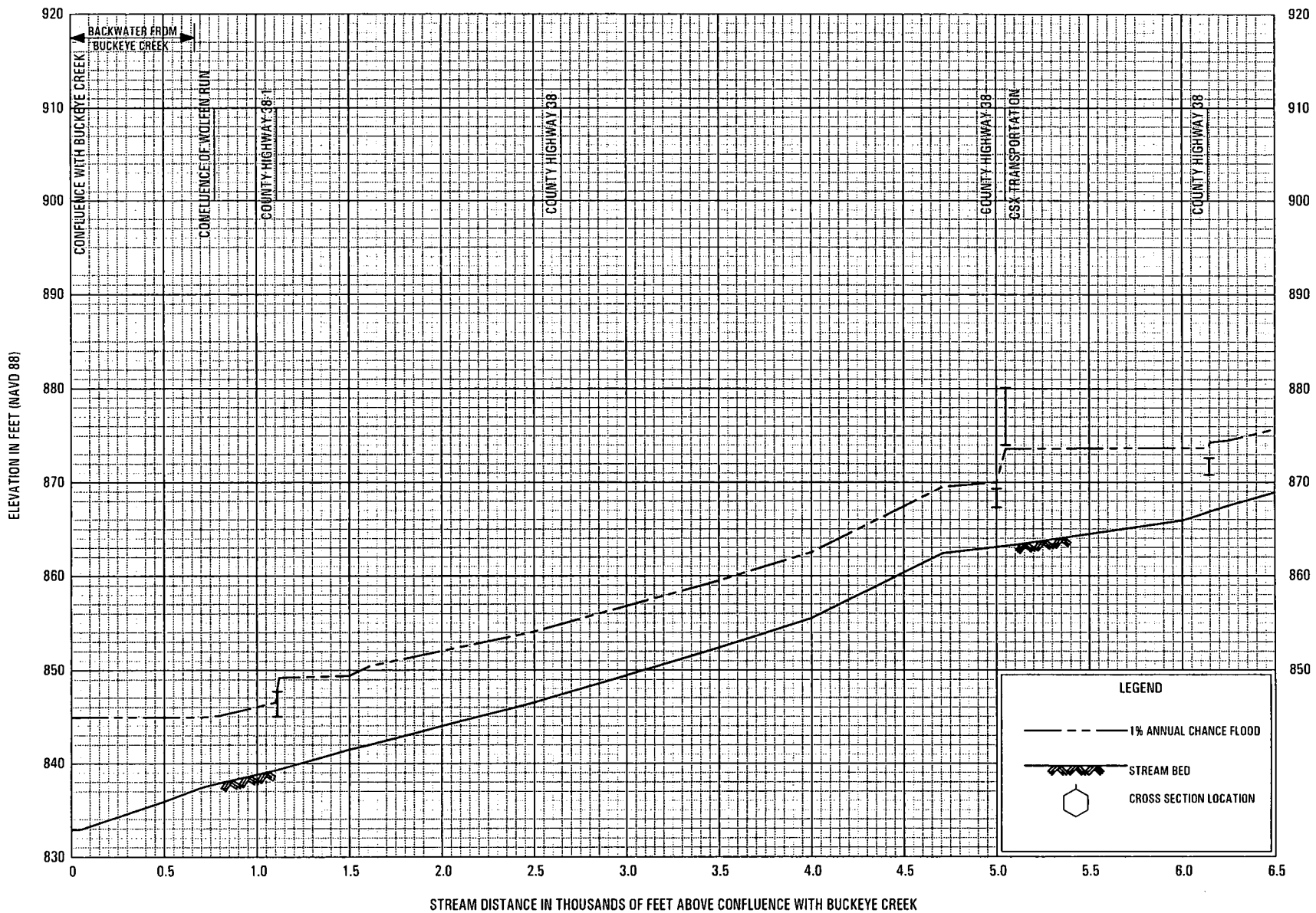




FLOOD PROFILES  
LAUREL RUN

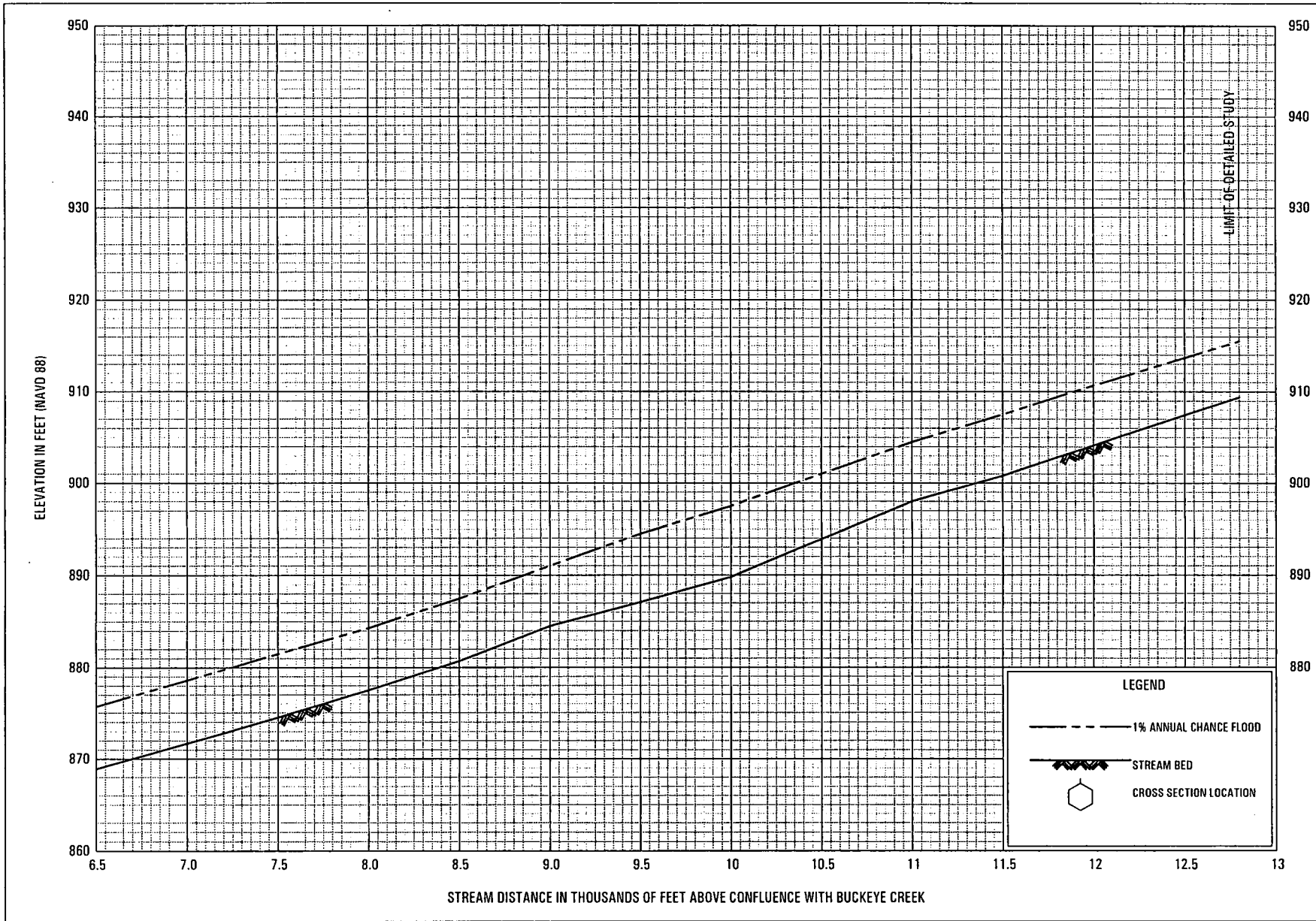
FEDERAL EMERGENCY MANAGEMENT AGENCY  
DODDRIDGE COUNTY, WV  
AND INCORPORATED AREAS

10P



FEDERAL EMERGENCY MANAGEMENT AGENCY  
 DODDRIDGE COUNTY, WV  
 AND INCORPORATED AREAS

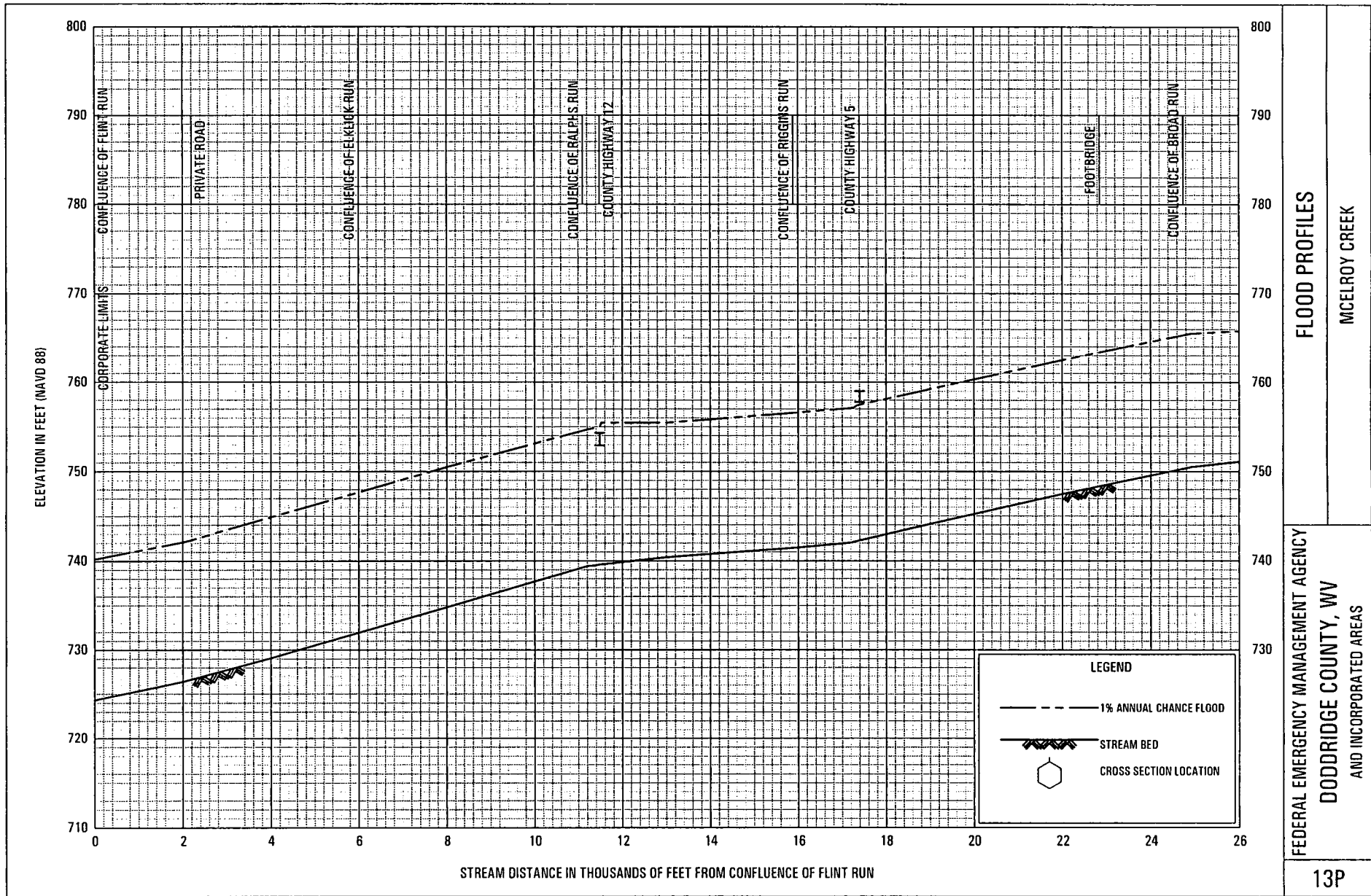
FLOOD PROFILES  
 LONG RUN

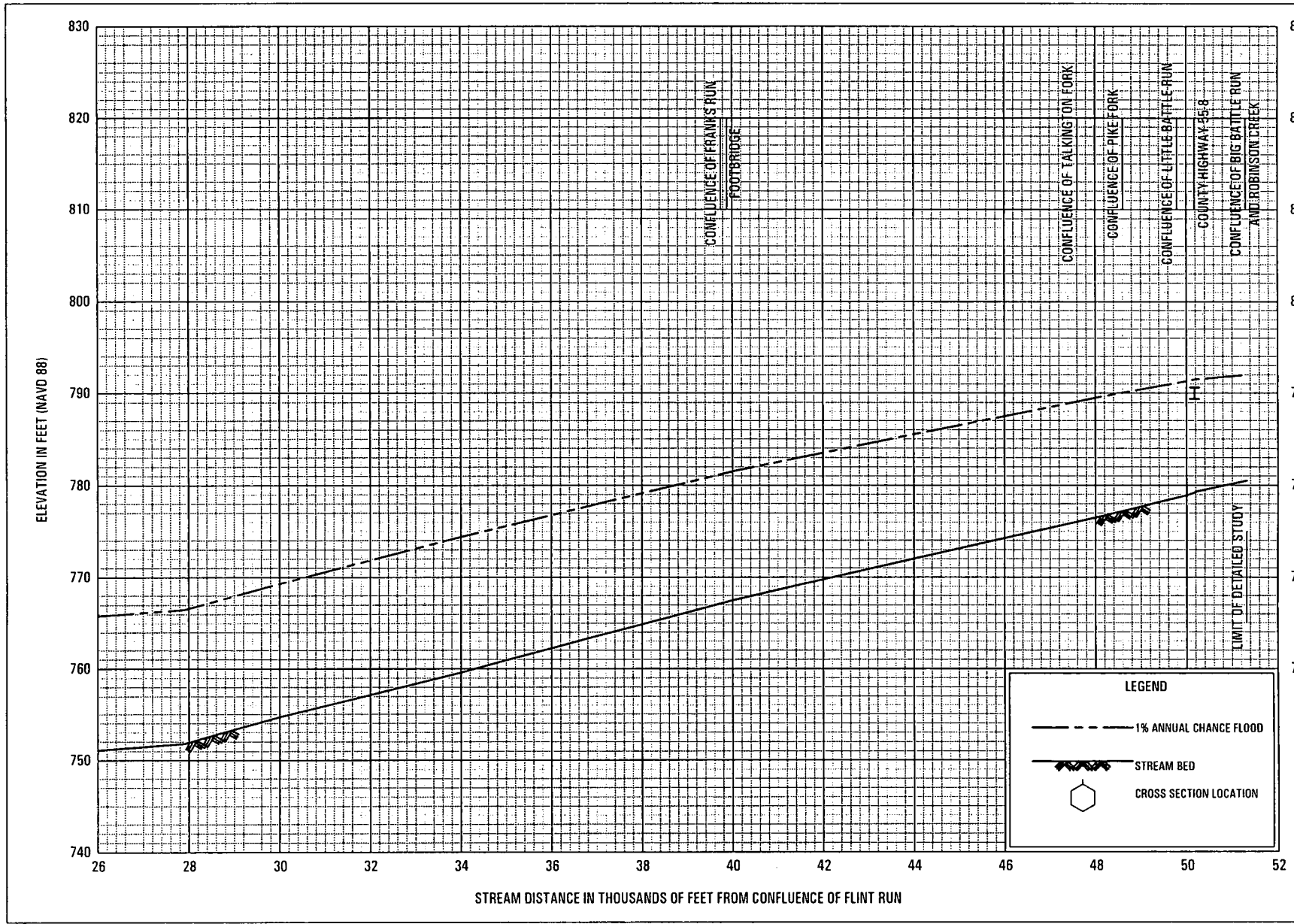


FLOOD PROFILES  
LONG RUN

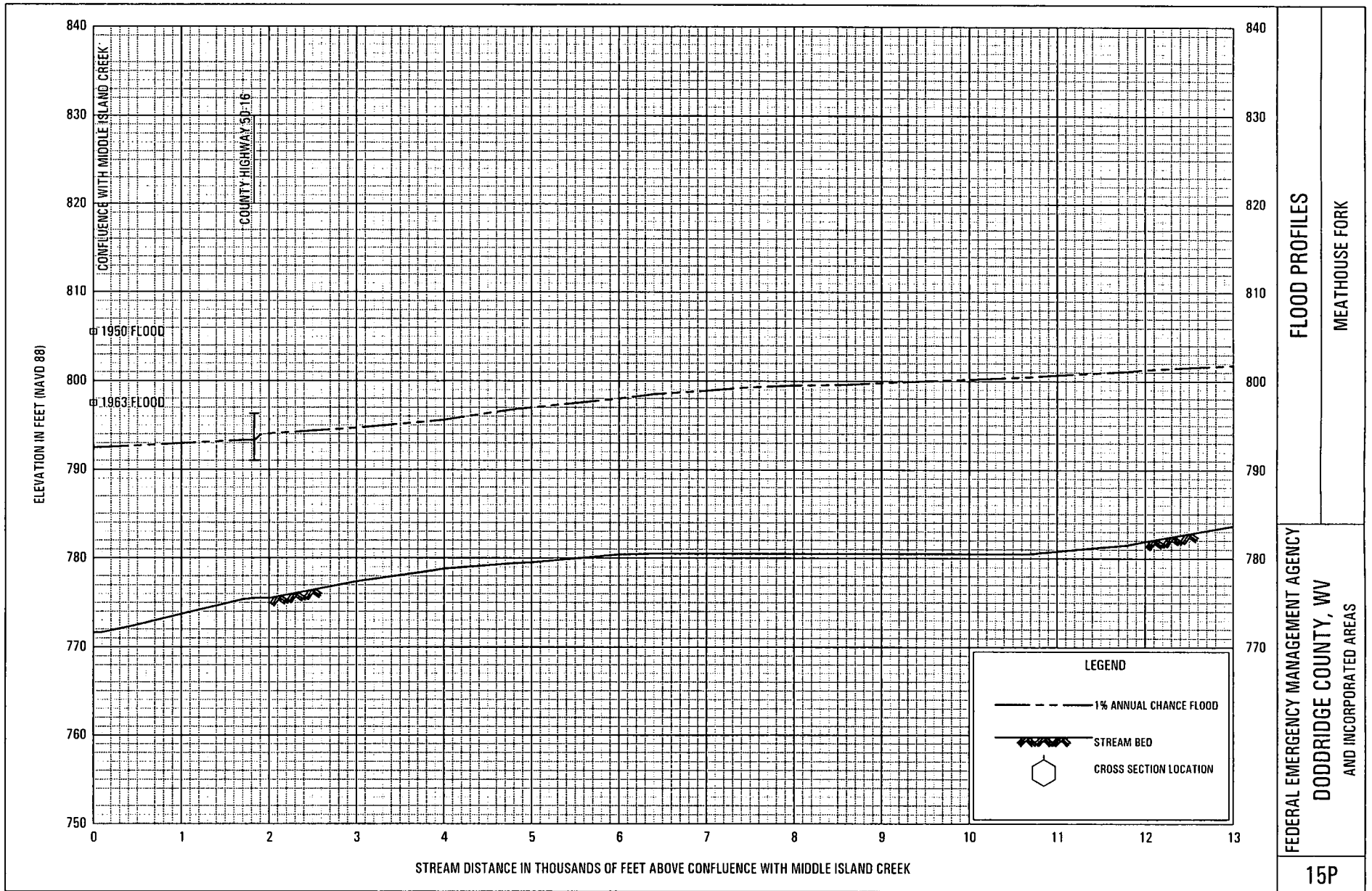
FEDERAL EMERGENCY MANAGEMENT AGENCY  
DODDRIDGE COUNTY, WV  
AND INCORPORATED AREAS

12P



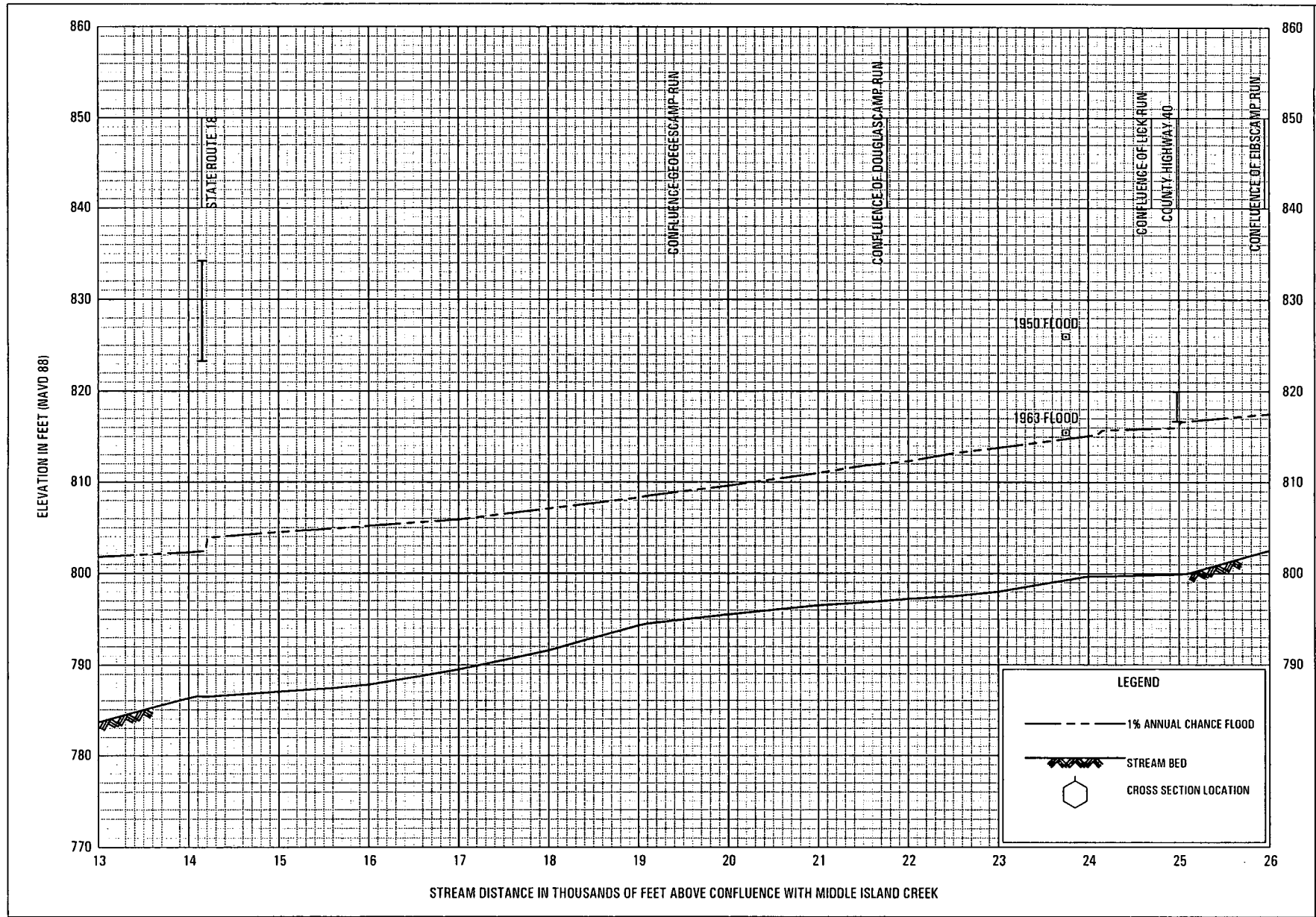






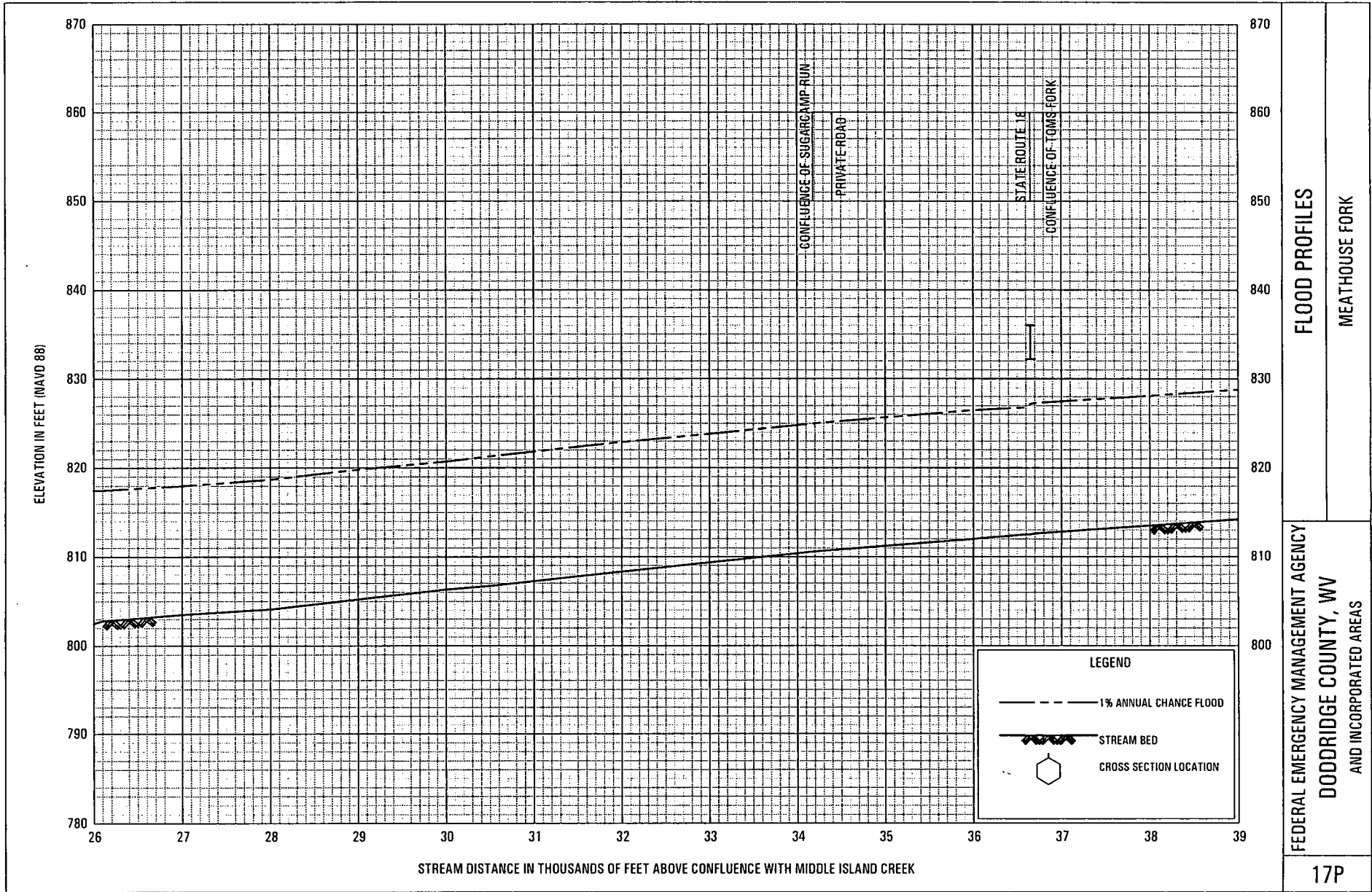
**FLOOD PROFILES**  
**MEATHOUSE FORK**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
DODDRIDGE COUNTY, WV  
AND INCORPORATED AREAS



FLOOD PROFILES  
MEATHOUSE FORK

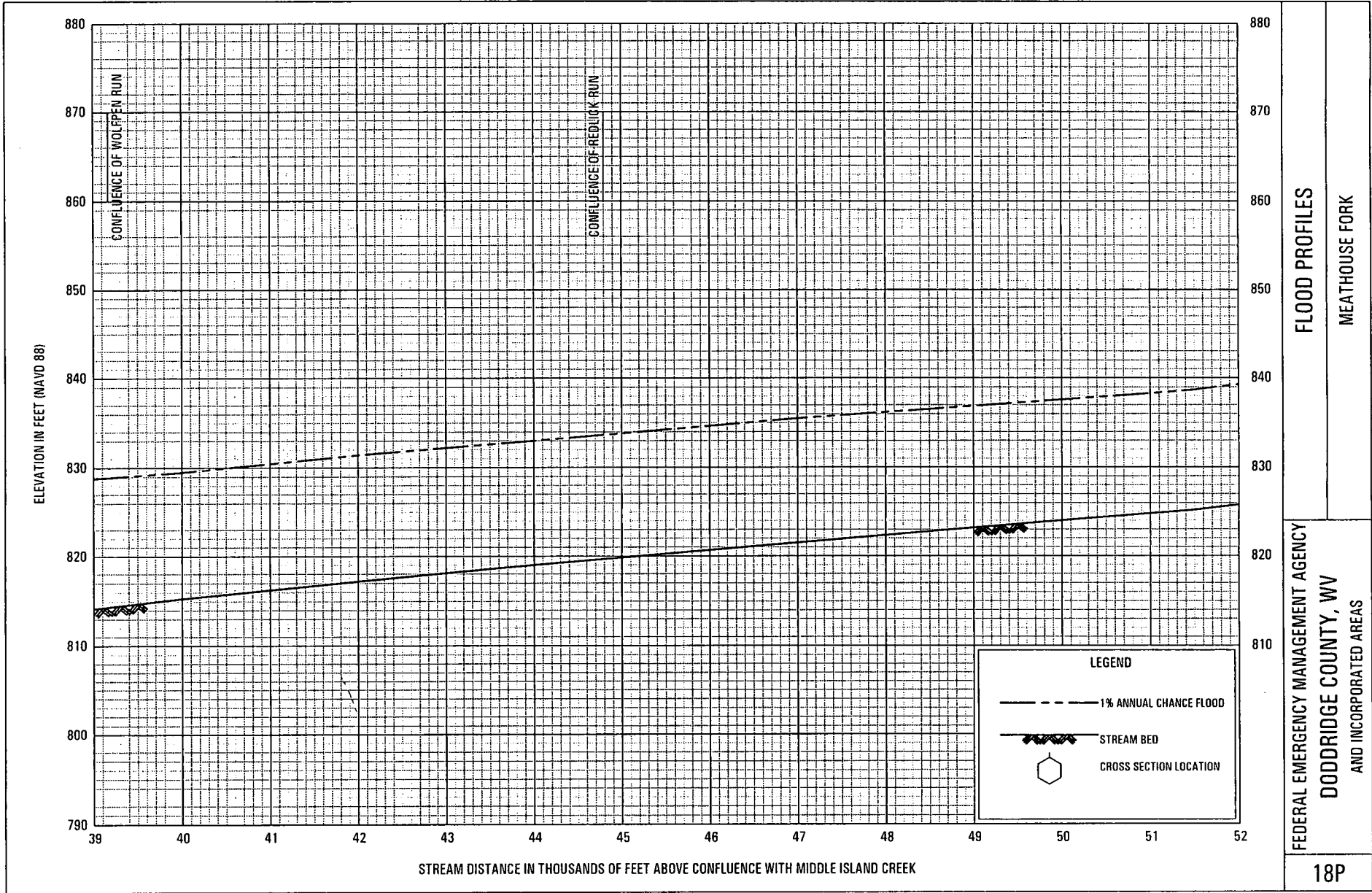
FEDERAL EMERGENCY MANAGEMENT AGENCY  
DODDRIDGE COUNTY, WV  
AND INCORPORATED AREAS

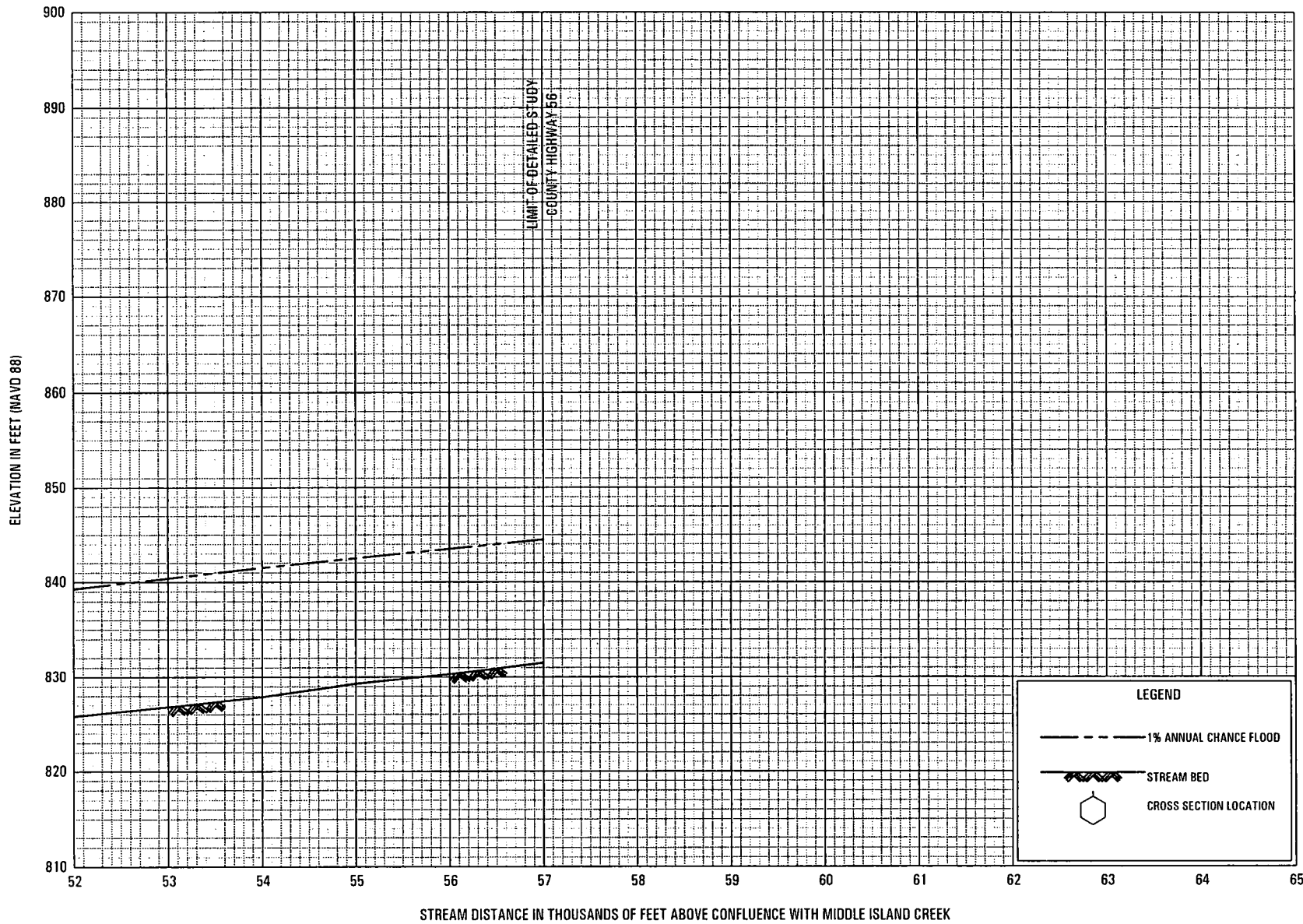


**FLOOD PROFILES**

**MEATHOUSE FORK**

**FEDERAL EMERGENCY MANAGEMENT AGENCY  
DODDRIDGE COUNTY, WV  
AND INCORPORATED AREAS**





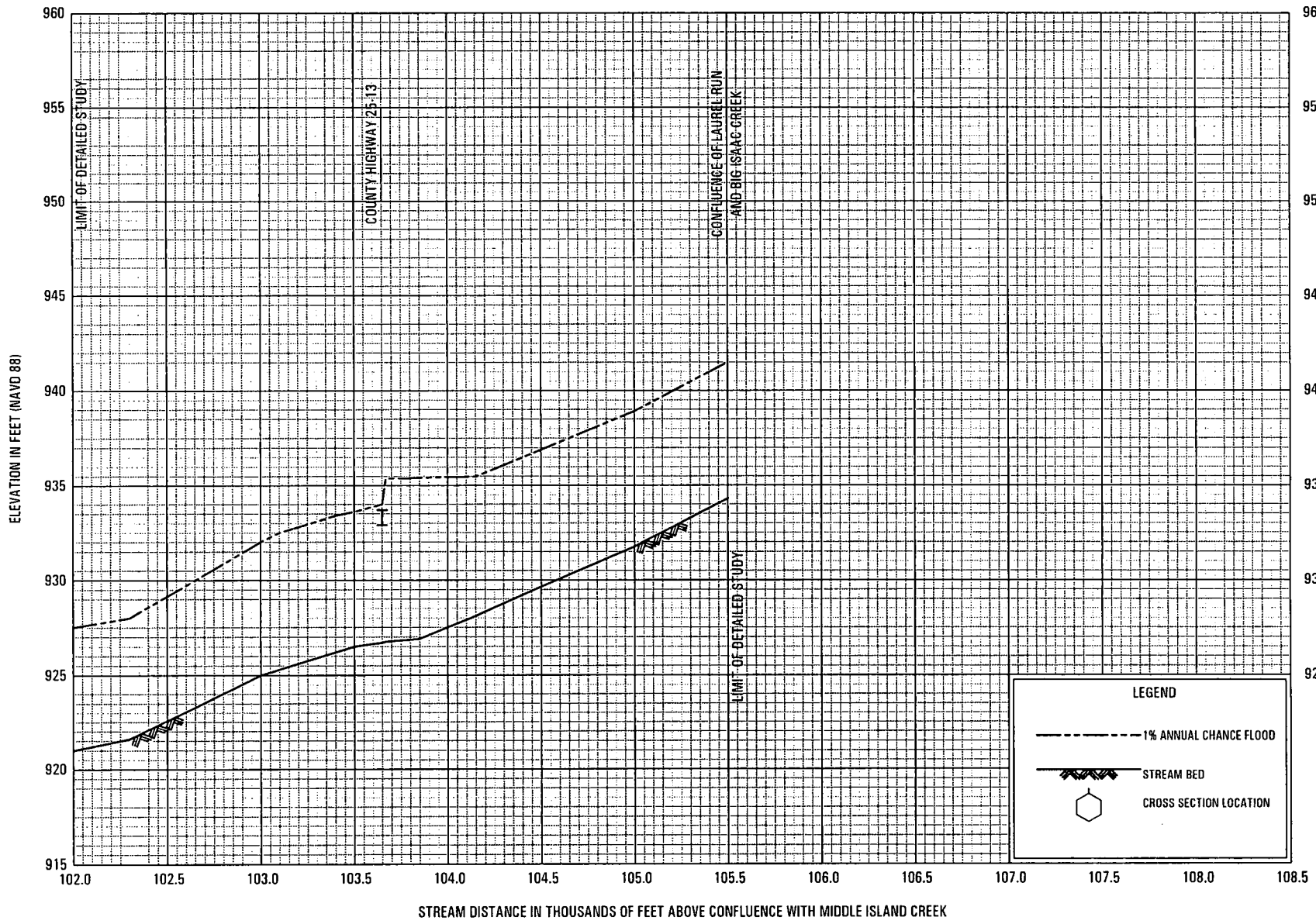
**FLOOD PROFILES**

MEATHOUSE FORK

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FEDERAL EMERGENCY MANAGEMENT AGENCY  
DODDRIDGE COUNTY, WV  
AND INCORPORATED AREAS

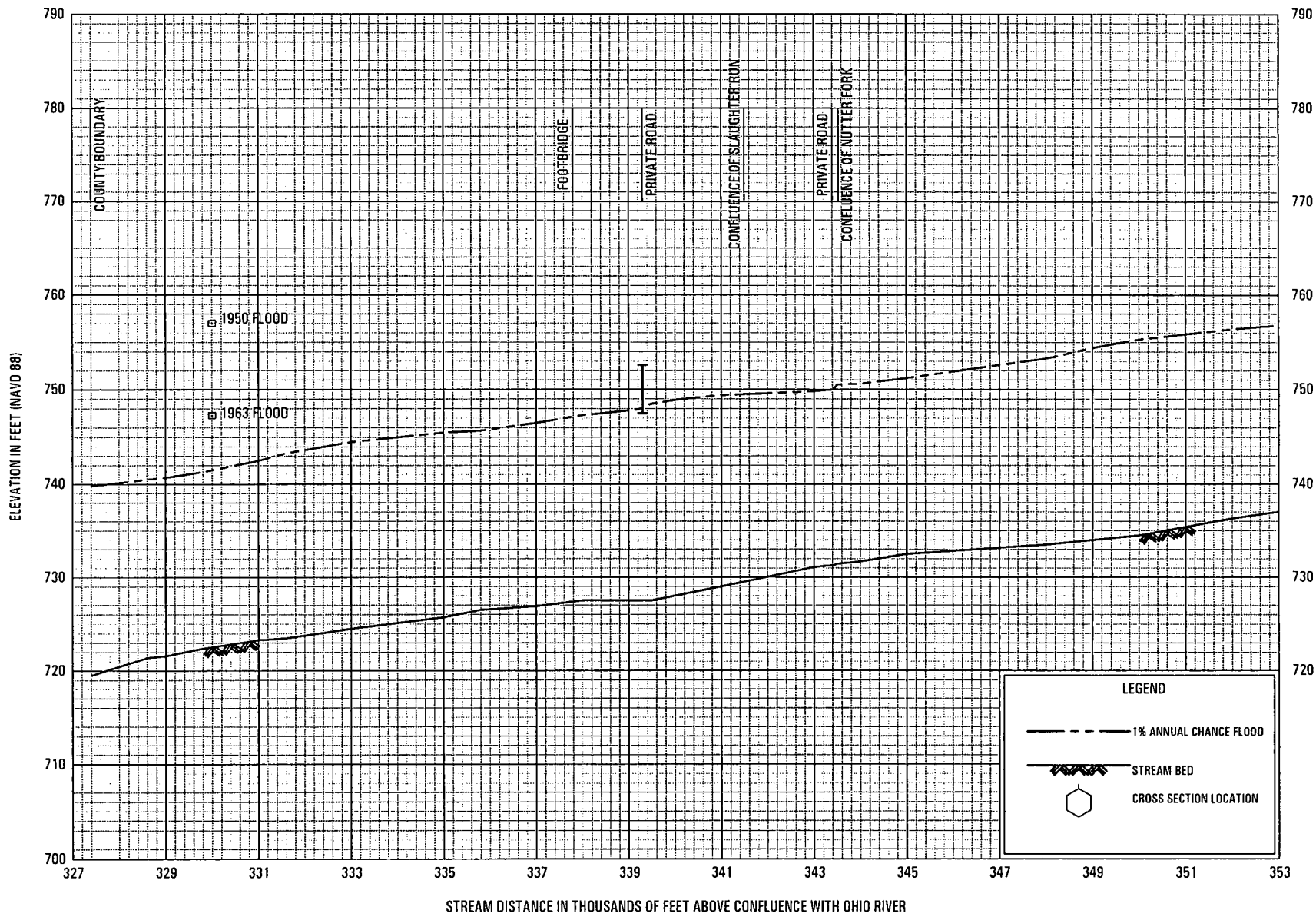
**19P**



FLOOD PROFILES

MEATHOUSE FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY  
 DODDRIDGE COUNTY, WV  
 AND INCORPORATED AREAS



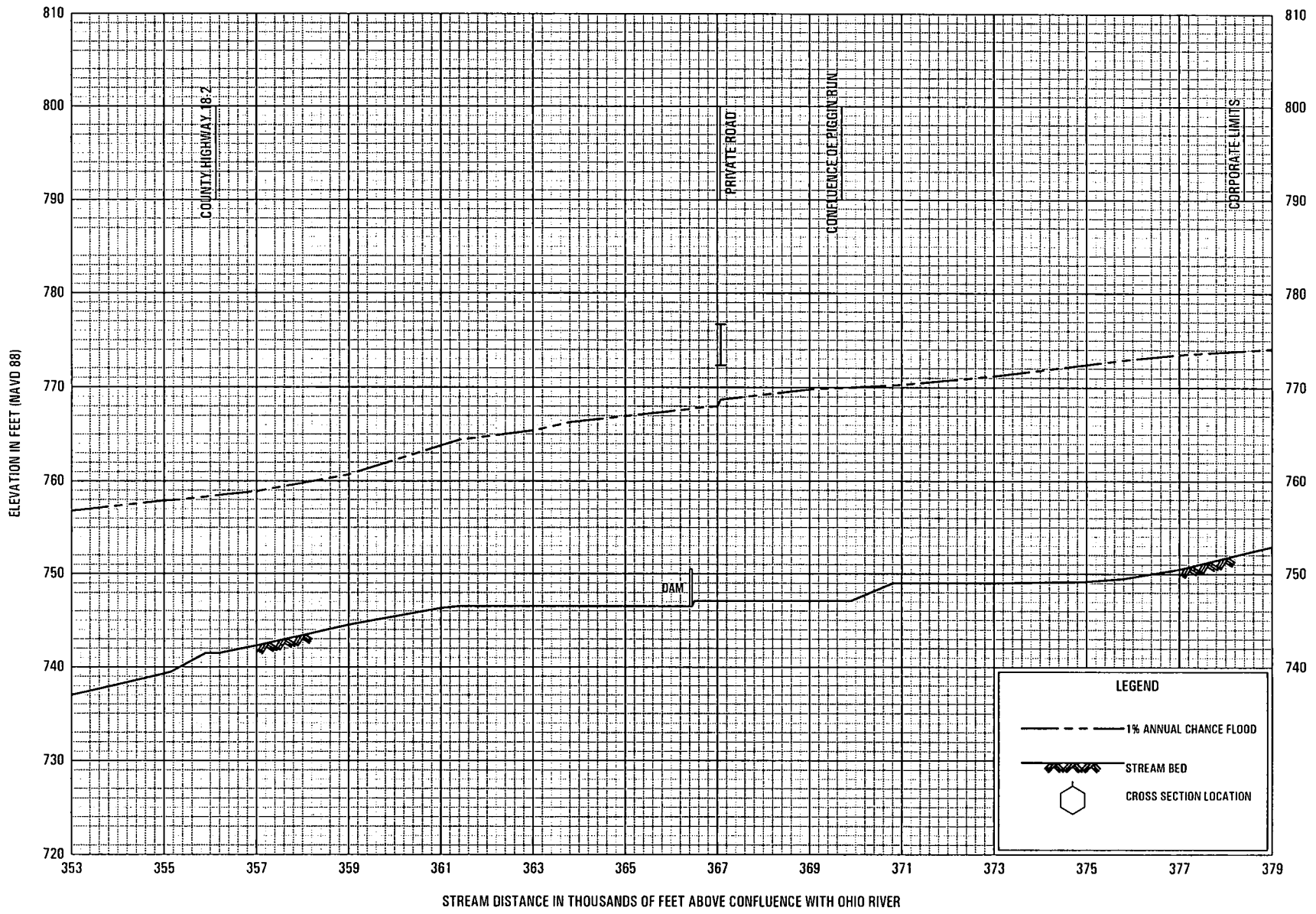
FLOOD PROFILES

MIDDLE ISLAND CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

DODDRIDGE COUNTY, WV

AND INCORPORATED AREAS

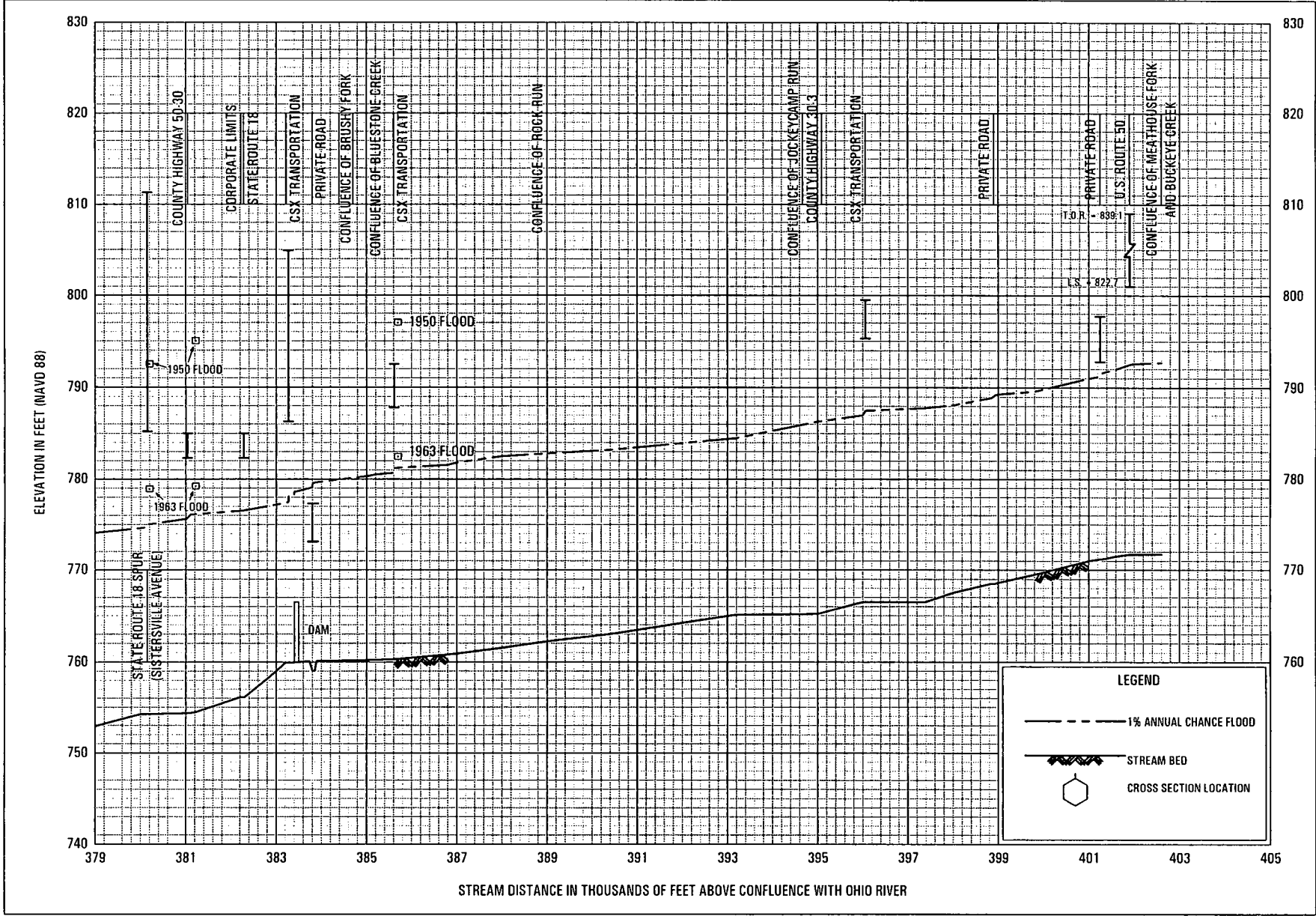


FEDERAL EMERGENCY MANAGEMENT AGENCY  
 DODDRIDGE COUNTY, WV  
 AND INCORPORATED AREAS

FLOOD PROFILES  
 MIDDLE ISLAND CREEK

22P





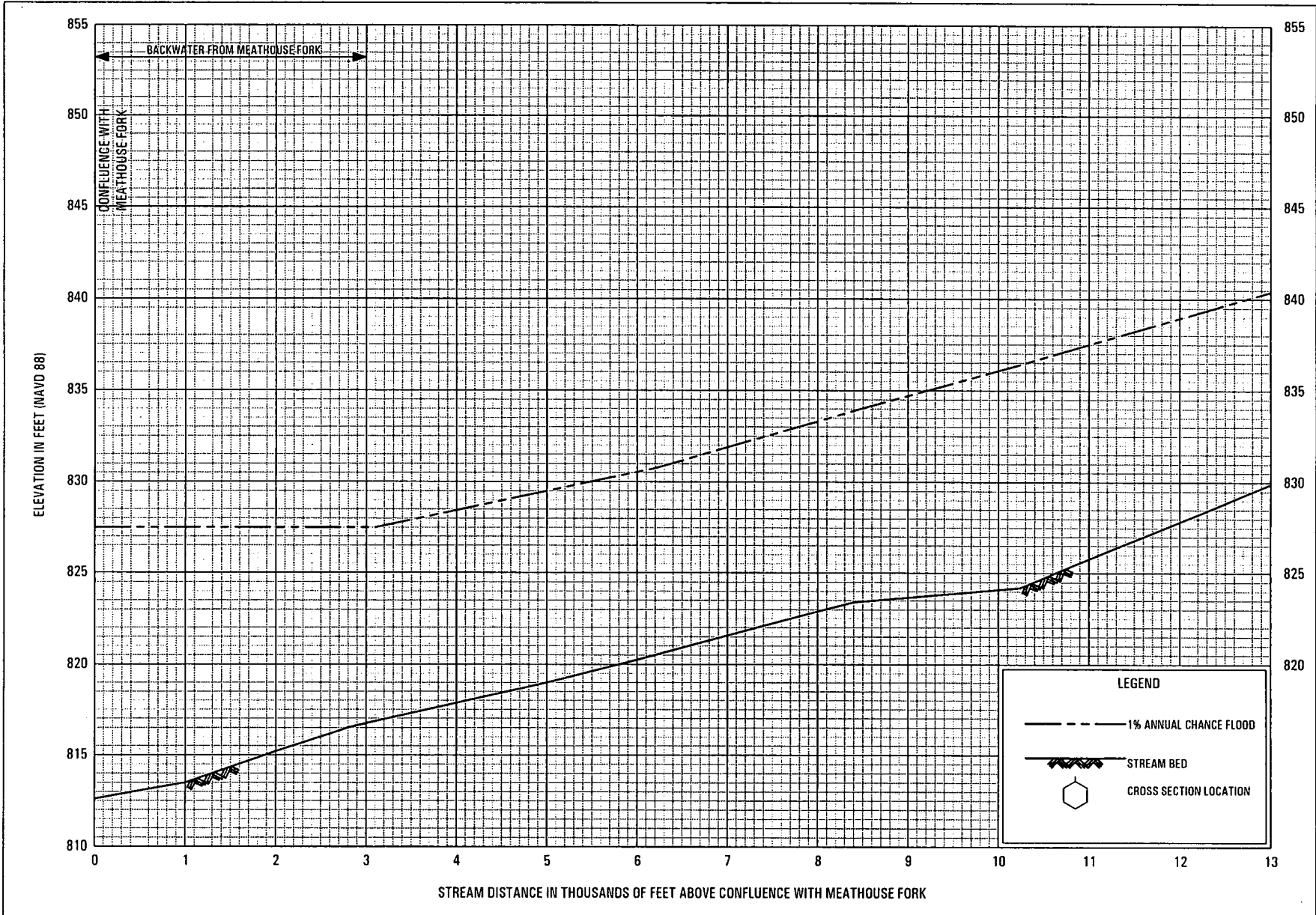
**FLOOD PROFILES**

MIDDLE ISLAND CREEK

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FEDERAL EMERGENCY MANAGEMENT AGENCY  
DODDRIDGE COUNTY, WV  
AND INCORPORATED AREAS

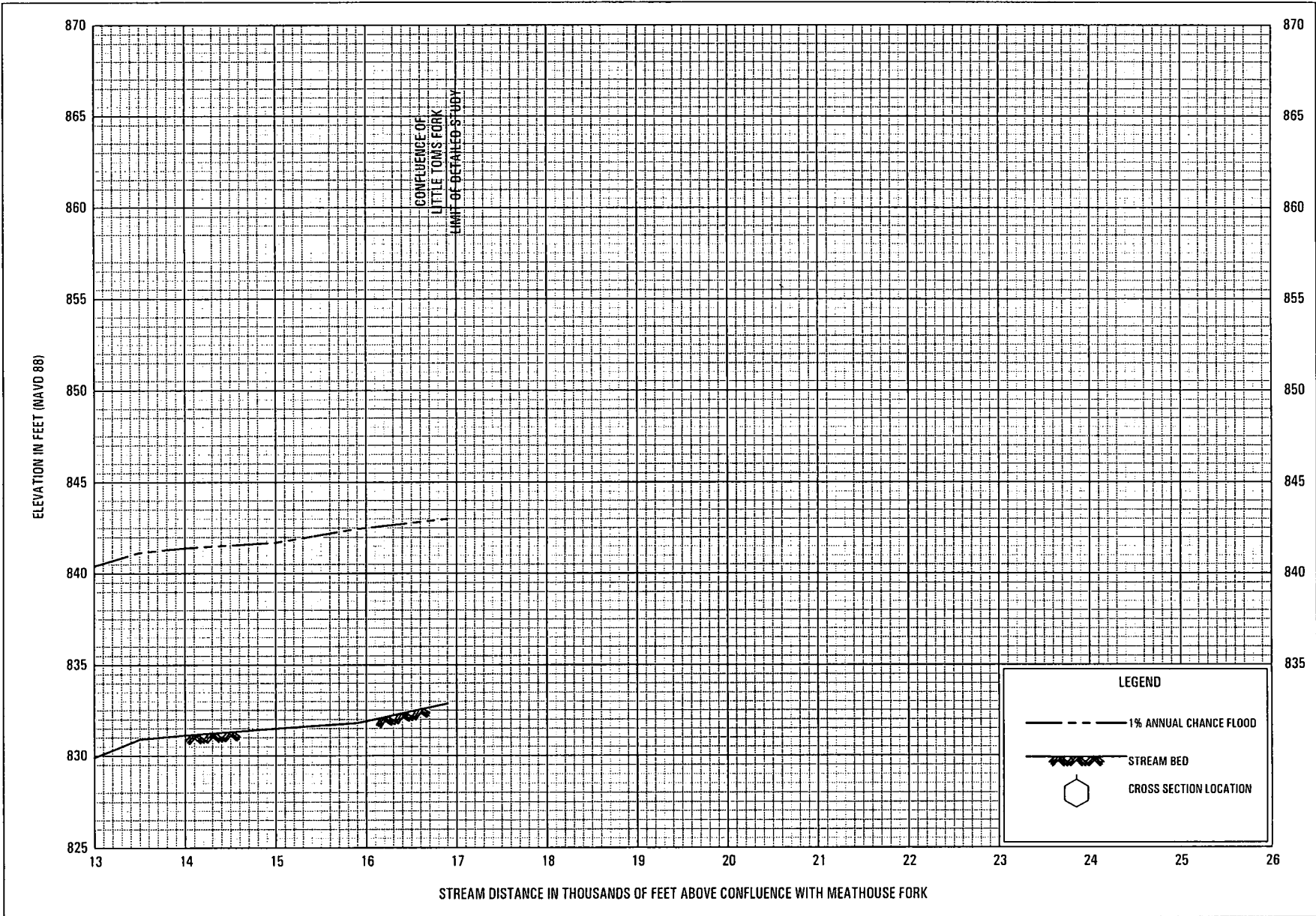
23P



**FLOOD PROFILES**

**TOMS FORK**

**FEDERAL EMERGENCY MANAGEMENT AGENCY  
DODDRIDGE COUNTY, WV  
AND INCORPORATED AREAS**

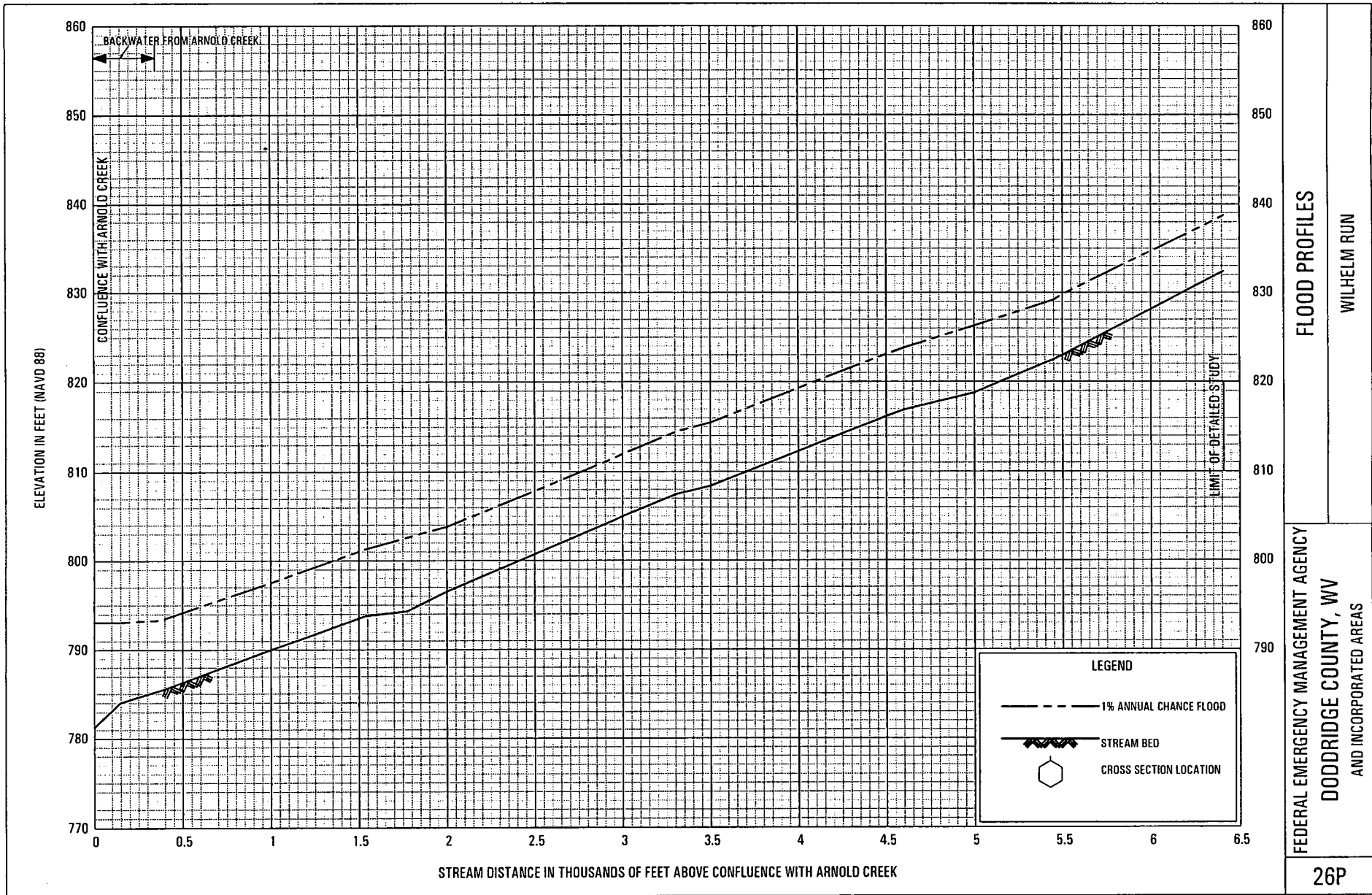


**FLOOD PROFILES**

**TOMS FORK**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
DODDRIDGE COUNTY, WV  
AND INCORPORATED AREAS

**25P**



FLOOD PROFILES

WILHELM RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY  
 DODDRIDGE COUNTY, WV  
 AND INCORPORATED AREAS

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**APPENDIX C**

**HYDRAULIC CALCULATIONS FOR EXISTING  
AND PROPOSED CONDITIONS**

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110-811\_Hydraulic Study.rep

PREPARED BY: TGS

11/20/13

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

CHECKED BY: ARG

02-Dec-2013

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

\*\*\*\*\*

PROJECT DATA

Project Title: 110-811\_Hydraulic Study  
Project File : 110-811\_Hydraulic Study.prj  
Run Date and Time: 11/20/2013 11:02:06 AM

Project in English units

Project Description:  
Markwest Liberty Midstream & Resources, LLC  
CEC #110-811  
4600 J. Barry Ct., Suite 500  
Canonsburg, PA 15317

November 2013

Sherwood Gas Processing Plant Flood  
Study  
Construction in a Floodway Study for Approval of temporary soil  
stockpiles.

FEMA Zones A, AE, and X from the Doddridge County Indiana FIS  
Study shown on FEMA FIRM Panel # 54017C0080 B, effective October 4,  
2011.

CEC Engineering Team:  
Principal: Rick Celender, C.E.T., CPESC,  
CPSWQ  
Project Manager: Andy Gullone, P.E., CPESC  
Hydraulic Modelers: Tim  
Johnston  
Reviewers: Andy Gullone, Rick Celender

Model Creation:  
Existing  
(Pre-project): CEC Created Model File, "110-811\_Hydraulic Study," Plan File,  
"110-811\_Existing 11-07-2013."  
Proposed (Post-project): CEC Created Model  
File, "110-811\_Hydraulic Study," Plan File, "110-811\_Proposed  
11-07-2013."  
Geometry file created in HEC-RAS.  
Steady flow file created  
from Doddridge County FIS, October 4, 2011.

110-811\_Hydraulic Study.rep

Data Sources:

Geometry -

Surface created from West Virginia Statewide Addressing and Mapping Board DEM blended with field topo survey of the bridge, existing access road from County Route 50/34, and various locations along the reach.

Flow - Total Buckeye Creek

100-year flow = 5,150 CFS.

Downstream Boundary - Known Water Surface Elevation

= 811. Approximate stream distance of 3,504 feet on profile.

\*\*\*\*\*

PLAN DATA

Plan Title: 110-811\_Existing 11-07-2013

Plan File : p:\2011\110-811\Calculations\H and H\20131107\_HEC-RAS\110-811\_Hydraulic Study.p02

Geometry Title: 110-811\_Existing 11-07-2013

Geometry File : p:\2011\110-811\Calculations\H and H\20131107\_HEC-RAS\110-811\_Hydraulic Study.g01

Flow Title : 110-811\_100Year

Flow File : p:\2011\110-811\Calculations\H and H\20131107\_HEC-RAS\110-811\_Hydraulic Study.f01

Plan Summary Information:

Number of:	Cross Sections = 40	Multiple Openings = 0
	Culverts = 0	Inline Structures = 0
	Bridges = 1	Lateral Structures = 0

Computational Information

Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options

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

\*\*\*\*\*

FLOW DATA

Flow Title: 110-811\_100Year

Flow File : p:\2011\110-811\Calculations\H and H\20131107\_HEC-RAS\110-811\_Hydraulic Study.f01

Flow Data (cfs)

```
*****
* River      Reach      RS      *      100-Year *
* Buckeye Creek  Buckeye Creek  3504.54 *      5150 *
*****
```

Boundary Conditions

\*\*\*\*\*

110-811\_Hydraulic Study.rep

```

*****
* River      Reach      Profile      *      Upstream
  Downstream *
*****
* Buckeye Creek  Buckeye Creek  100-Year      *
  Known WS = 811 *
*****

```

\*\*\*\*\*

GEOMETRY DATA

Geometry Title: 110-811\_Existing 11-07-2013  
 Geometry File : p:\2011\110-811\Calculations\H and  
 H\20131107\_HEC-RAS\110-811\_Hydraulic Study.g01

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek      RS: 3504.54

INPUT

Description: A

Station Elevation Data      num=      147

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100	838.81	-98.96	838.29	-98.75	838.18	-98.4	838	-96.95	837.26
-96.1	836.83	-95.4	836.48	-94.48	836	-93.69	835.59	-92.75	835.1
-91.68	834.54	-90.65	834	-89.58	833.44	-88.38	832.81	-87.57	832.38
-86.84	832	-85.95	831.54	-85.41	831.26	-84.5	830.79	-83.05	830.02
-83.01	830	-81.27	829.11	-79.1	828	-79.08	827.99	-79.07	827.99
-77.37	827.11	-75.99	826.41	-75.64	826.23	-75.18	826	-74.04	825.4
-73.22	824.97	-72.55	824.62	-71.39	824	-70.83	823.7	-70.35	823.45
-69.1	822.78	-67.62	822	-67.26	821.81	-67.01	821.68	-65.6	820.94
-64.29	820.25	-64.09	820.15	-63.81	820	-62.65	819.38	-61.84	818.95
-61.13	818.57	-60.06	818	-60.02	817.91	-59.96	817.79	-59.91	817.69
-59.87	817.59	-59.83	817.5	-59.8	817.43	-59.77	817.35	-59.73	817.28
-59.7	817.21	-59.67	817.15	-59.65	817.09	-59.62	817.04	-59.6	816.99
-59.58	816.94	-59.56	816.89	-59.54	816.85	-59.46	816.69	-59.15	815.06
-47.25	813.56	-46	813.25	-45.85	813.22	-44.79	812.96	-43.56	812.66
-42.3	812.35	-41.93	812.27	-41.36	808.97	-40.43	808	-40.31	808
-40.27	808	-40.22	808	-40.14	808	-38.54	807.48	-34.04	806
-33.41	805.89	-32.05	805.65	-25.82	804.54	-22.76	804.44	-19.68	804.44
-19.3	804.44	-14.73	804.44	-5.05	804.44	0	804.44	.9	804.44
5.75	804.44	15.3	804.44	16.43	804.44	19.72	804.44	21.76	804.67
25.81	806	28.84	806.95	32.2	808	35.74	808.98	39.4	810
43.29	811.02	47.05	812	49.55	812.68	54.41	814	56.85	814.55
63.18	816	63.21	816	63.24	816	63.62	816.01	63.71	816
63.73	816	63.9	816	64.26	816	66.98	816	71.15	816
79.48	816	89.67	816	95.77	816	97.03	816	99.05	816
101.29	816	101.88	816	102.53	816	103.1	816.19	110.92	818
112.97	819.63	113.44	820	115.04	821.27	116.39	822	119.11	823.46
119.51	824	120.78	825.71	121	826	121.65	826.89	122.64	828
123.43	828.89	124.41	830	125.72	831.48	126.18	832	126.52	832.39
127.95	834	129.37	835.19	130.09	835.93	132.25	835.95	133.34	836
134.36	836.19	136.69	836.42						

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



-100 .05 -41.93 110-811\_Hydraulic Study.rep  
 .035 49.55 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -41.93 49.55 50 50 50 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

```

*****
*****
* E.G. Elev (ft) * 814.77 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.79 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 813.98 * Reach Len. (ft) * 50.00 * 50.00 *
50.00 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 6.39 * 718.76 *
3.11 *
* E.G. slope (ft/ft) *0.001945 * Area (sq ft) * 6.39 * 718.76 *
3.11 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 6.74 * 5140.27 *
2.99 *
* Top width (ft) * 104.91 * Top width (ft) * 8.65 * 91.48 *
4.78 *
* Vel Total (ft/s) * 7.07 * Avg. vel. (ft/s) * 1.06 * 7.15 *
0.96 *
* Max Chl Dpth (ft) * 9.54 * Hydr. Depth (ft) * 0.74 * 7.86 *
0.65 *
* Conv. Total (cfs) *116782.8 * Conv. (cfs) * 152.9 *116562.2 *
67.7 *
* Length wtd. (ft) * 50.00 * wetted Per. (ft) * 8.83 * 96.27 *
4.96 *
* Min Ch El (ft) * 804.44 * Shear (lb/sq ft) * 0.09 * 0.91 *
0.08 *
* Alpha * 1.02 * Stream Power (lb/ft s) * 136.69 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.11 * Cum volume (acre-ft) * 123.59 * 53.87 *
65.65 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 37.01 * 5.05 *
14.34 *
*****
*****

```

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3454.54

INPUT

Description: B

Station Elevation Data num= 121

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-106.13	826.76	-105.83	826.61	-105.52	826.46	-104.57	826	-104.45	825.95
-104.42	825.93	-103.35	825.44	-102.97	825.27	-102.28	824.95	-101.55	824.59
-101.24	824.44	-100.37	824	-100.19	823.91	-99.27	823.46	-98.9	823.29
-98.27	822.98	-97.55	822.65	-97.23	822.49	-96.16	822	-96.15	821.99
-96.14	821.99	-94.96	821.48	-94.61	821.32	-93.85	820.99	-93.19	820.71
-92.79	820.53	-91.86	820.13	-91.79	820.1	-91.59	820	-90.51	819.47
-90.04	819.26	-89.22	818.86	-88.25	818.41	-87.98	818.28	-87.37	818
-87.36	818	-87.35	818	-87.19	817.14	-86.99	814.66	-83.41	814.33
-78.27	814.15	-64.45	812.92	-42.91	811.21	-42.79	809.16	-42.41	809.13
-42.01	809.09	-41.6	809.06	-41.18	809.02	-40.66	808.97	-40.11	808.93
-39.53	808.88	-37.2	808.63	-36.6	808.56	-35.97	808.48	-35.28	808.4

110-811\_Hydraulic Study.rep

-32.94	808.07	-32.49	808	-31.34	807.77	-31	807.7	-29.05	807.31
-28.01	807.09	-26.05	806.67	-25.06	806.46	-22.96	806	-22.17	805.82
-21.82	805.74	-19.4	805.19	-17.82	804.84	-16.67	804.58	-14.08	804.38
-13.68	804.38	-6.61	804.38	0	804.38	17.4	804.38	17.52	804.38
23.35	805.7	24.35	806	28.89	807.47	30.57	808	37.14	809.7
38.3	810	39.73	810.36	46.16	812	52.62	813.62	54.12	814
61.82	815.78	62.8	816	62.86	816	62.93	816	62.98	816
63.03	816	63.08	816	63.12	816	63.16	816	63.2	816
63.43	816	72.23	816	72.53	816	77.56	816	88.82	816
92.29	816	92.47	816	93.12	816	93.64	816	96.03	816
98.64	816	99.53	816	101.36	816	103.41	816	105.44	816
108.77	817.27	110.92	818	112.2	819.74	112.38	820	113.85	822
113.85	822.01	115.45	823.6	115.85	824	116.26	824.42	117.85	826
118.35	826.5								

Manning's n Values num= 3

Sta	n	Val	Sta	n	Val	Sta	n	Val
-106.13	.05		-42.79	.035		30.57	.05	

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-42.79	30.57		52	50		.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 814.63	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 1.09	* Wt. n-Val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 813.54	* Reach Len. (ft)	* 52.00	* 50.00
50.00				
* Crit w.s. (ft)	*	* Flow Area (sq ft)	* 34.40	* 575.46
59.85				
* E.G. Slope (ft/ft)	*0.002644	* Area (sq ft)	* 34.40	* 575.46
59.85				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 56.72	* 4917.36
175.92				
* Top width (ft)	* 123.75	* Top width (ft)	* 28.65	* 73.36
21.74				
* Vel Total (ft/s)	* 7.69	* Avg. vel. (ft/s)	* 1.65	* 8.55
2.94				
* Max Chl Dpth (ft)	* 9.16	* Hydr. Depth (ft)	* 1.20	* 7.84
2.75				
* Conv. Total (cfs)	*100154.9	* Conv. (cfs)	* 1103.2	* 95630.6
3421.1				
* Length Wtd. (ft)	* 50.02	* Wetted Per. (ft)	* 30.68	* 74.31
22.44				
* Min Ch El (ft)	* 804.38	* Shear (lb/sq ft)	* 0.19	* 1.28
0.44				
* Alpha	* 1.18	* Stream Power (lb/ft s)	* 118.35	* 0.00
0.00				
* Frctn Loss (ft)	* 0.15	* Cum Volume (acre-ft)	* 123.57	* 53.13
65.61				
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 36.99	* 4.96
14.32				

CROSS SECTION

RIVER: Buckeye Creek

REACH: Buckeye Creek

INPUT

Description: C

Station Elevation Data

num= 120		num= 120		num= 120		num= 120		num= 120	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-130.31	819.94	-130.16	819.85	-127.95	818.4	-127.34	818	-124.36	816.46
-123.5	816	-122.92	815.91	-122.44	815.86	-122.09	815.81	-121.89	815.78
-121.74	815.75	-121.45	815.71	-121.31	815.69	-121.19	815.68	-121.09	815.66
-121	815.65	-120.93	815.64	-120.86	815.64	-120.81	815.63	-120.78	815.51
-118.73	815.9	-118.62	815.92	-118.37	815.95	-117.79	815.59	-115.95	814.65
-112.35	813.89	-102.14	815.26	-94.41	813.55	-93.69	813.6	-93.3	813.59
-91.7	813.84	-89.86	814.09	-85.86	814.99	-84.7	814.77	-82.96	814.52
-77.51	814.54	-69.06	813.8	-67.38	813.67	-52.48	812.03	-42.72	810.75
-39.01	809.99	-38.2	809.83	-38.11	809.8	-37.46	809.6	-37.3	809.57
-37.12	809.53	-36.94	809.5	-36.74	809.46	-36.53	809.42	-35.73	809.24
-35.55	809.2	-35.23	809.14	-34.89	809.07	-34.51	809	-34.1	808.92
-33.65	808.83	-33.15	808.73	-32.59	808.62	-31.98	808.5	-31.02	808.31
-30.29	808.16	-29.54	808	-29.5	808	-28.02	807.66	-20.74	806
-15	804.51	-12.96	804.32	-3.54	804.32	0	804.32	4.45	804.32
15.59	804.32	24.88	805.99	24.9	806	29.51	807.42	31.4	808
35.16	808.93	39.43	810	41.01	810.41	47.1	812	50.37	812.89
54.45	814	59.19	815.18	62.48	816	62.51	816	62.55	816
62.56	816	63.15	816	63.19	816	63.22	816	63.23	816
63.24	816	63.25	816	63.26	816	63.27	816	63.28	816
73.18	816	75.76	816	76.08	816	82.98	816	89.81	816
92.74	816	96.15	815.99	98.06	815.99	99.09	815.99	104.95	816
110.42	817.6	111.76	818	112.3	818.75	113.18	820	113.8	820.86
114.59	822	115.75	823.64	116.01	824	117.38	825.93	117.43	826
117.52	826.13	118.81	828	119.32	828.72	120.21	830	120.39	830.24

Manning's n Values

num= 3		num= 3		num= 3	
Sta	n Val	Sta	n Val	Sta	n Val
-130.31	.05	-39.01	.035	31.4	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-39.01	31.4		55	50		.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 814.46	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 1.31	* Wt. n-Val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 813.15	* Reach Len. (ft)	* 55.00	* 50.00
50.00				
* Crit w.s. (ft)	*	* Flow Area (sq ft)	* 33.11	* 523.09
52.21				
* E.G. slope (ft/ft)	*0.003440	* Area (sq ft)	* 33.11	* 523.09
52.21				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 71.85	* 4908.79
169.36				
* Top width (ft)	* 113.94	* Top width (ft)	* 23.62	* 70.41
19.91				
* Vel Total (ft/s)	* 8.46	* Avg. vel. (ft/s)	* 2.17	* 9.38
3.24				
* Max Chl Dpth (ft)	* 8.83	* Hydr. Depth (ft)	* 1.40	* 7.43
2.62				
* Conv. Total (cfs)	* 87805.2	* Conv. (cfs)	* 1225.1	* 83692.7
2887.5				

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* Length wtd. (ft) * 50.21 * Wetted Per. (ft) * 23.84 * 71.50 *
20.57 *
* Min Ch El (ft) * 804.32 * Shear (lb/sq ft) * 0.30 * 1.57 *
0.55 *
* Alpha * 1.18 * Stream Power (lb/ft s) * 120.39 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.15 * Cum Volume (acre-ft) * 123.53 * 52.50 *
65.55 *
* C & E Loss (ft) * 0.09 * Cum SA (acres) * 36.96 * 4.88 *
14.30 *
*****
*****

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3354.54

INPUT

Description: D

Station Elevation Data num= 109

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-161.95	820.72	-159	819.1	-154.74	817.2	-151.93	815.9	-147.17	813.71
-145.77	813.06	-126.21	812.54	-124.87	812.51	-123.36	812.51	-123.07	812.53
-122.06	812.55	-122.03	812.53	-115.94	812.57	-115.14	812.59	-114.95	812.57
-103.12	812.35	-88.28	812.14	-82.76	812.08	-54.87	809.98	-52.64	809.81
-41.07	809.2	-39.11	809.06	-36.85	808.62	-36.78	808.61	-36.71	808.61
-36.64	808.6	-36.56	808.59	-36.14	808.54	-35.65	808.48	-35.49	808.45
-35.3	808.43	-35.09	808.4	-34.83	808.36	-34.53	808.32	-34.16	808.27
-33.7	808.2	-33.12	808.12	-32.28	808.01	-32.21	808	-31.45	807.84
-22.89	806	-21.17	805.62	-18.11	804.96	-15.26	804.34	-13.7	804.25
-13.63	804.25	-13.6	804.25	-13.5	804.25	-.57	804.25	0	804.25
4.84	804.25	8.21	804.25	16.71	804.25	17.49	804.25	26.48	806
31.46	807.35	33.9	808	38.76	809.37	40.95	810	46.89	811.73
47.8	812	48.18	812.11	54.65	814	57.78	814.8	62.56	816
62.6	816	62.66	816	62.67	816	62.73	816	62.74	816
62.91	816	63.02	816	63.12	816	63.22	816	63.3	816
63.38	816	63.45	816	63.52	816	63.58	816	63.63	816
63.69	816	63.74	816	63.78	816	63.83	816	64.54	816
66.78	816.01	67.1	816.01	67.7	816.01	68.02	816.01	68.26	816.01
71.84	816.01	73.95	816.01	74.22	816.01	85.96	816	89.03	815.99
91.01	815.98	96.63	815.95	100.33	815.97	106.93	816	112.68	817.78
113.29	818	113.56	818.18	115.15	820	116.54	821.58	116.9	822
118.58	823.91	118.65	824	118.98	824.38	119.3	824.8		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-161.95	.05	-36.56	.035	33.9	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -36.56 33.9 35 50 50 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

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*****
* E.G. Elev (ft) * 814.22 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 1.00 * Wt. n-Val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 813.21 * Reach Len. (ft) * 35.00 * 50.00 *

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50.00 *										
* Crit W.S. (ft)	*		* Flow Area (sq ft)	*	175.33	*	552.84	*		
47.41 *										
* E.G. Slope (ft/ft)	*	0.002567	* Area (sq ft)	*	175.33	*	552.84	*		
47.41 *										
* Q Total (cfs)	*	5150.00	* Flow (cfs)	*	360.75	*	4656.95	*		
132.31 *										
* Top width (ft)	*	198.05	* Top width (ft)	*	109.54	*	70.46	*		
18.05 *										
* Vel Total (ft/s)	*	6.64	* Avg. Vel. (ft/s)	*	2.06	*	8.42	*		
2.79 *										
* Max Chl Dpth (ft)	*	8.96	* Hydr. Depth (ft)	*	1.60	*	7.85	*		
2.63 *										
* Conv. Total (cfs)	*	101655.9	* Conv. (cfs)	*	7120.8	*	91923.5	*		
2611.6 *										
* Length wtd. (ft)	*	48.91	* Wetted Per. (ft)	*	109.74	*	71.33	*		
18.79 *										
* Min Ch El (ft)	*	804.25	* Shear (lb/sq ft)	*	0.26	*	1.24	*		
0.40 *										
* Alpha	*	1.47	* Stream Power (lb/ft s)	*	119.30	*	0.00	*		
0.00 *										
* Frctn Loss (ft)	*	0.13	* Cum Volume (acre-ft)	*	123.40	*	51.88	*		
65.49 *										
* C & E Loss (ft)	*	0.00	* Cum SA (acres)	*	36.88	*	4.79	*		
14.28 *										

\*\*\*\*\*  
\*\*\*\*\*

CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 3304.54

INPUT

Description: E

Station Elevation Data		num=		112							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-193.15	818.45	-183.47	814.34	-183.16	814.28	-176.73	813.26	-163.3	813.13		
-138.32	812.35	-120.78	812.28	-86.53	811.72	-71.47	811.24	-56.51	810.18		
-43	809.27	-36.76	808.75	-36.03	808.62	-36	808.61	-35.97	808.61		
-35.94	808.6	-35.9	808.6	-35.86	808.59	-35.82	808.58	-35.77	808.58		
-35.72	808.57	-35.67	808.56	-35.62	808.55	-35.57	808.54	-35.45	808.52		
-35.38	808.51	-35.31	808.49	-35.22	808.47	-35.13	808.45	-35.02	808.43		
-34.88	808.4	-34.73	808.37	-34.53	808.33	-34.3	808.28	-33.99	808.22		
-33.59	808.13	-33.11	808.03	-32.95	808	-29.62	807.39	-22.04	806		
-15.25	804.68	-11.71	804.25	-11.66	804.25	0	804.25	11.43	804.25		
12.59	804.25	14.93	804.25	22.78	805.33	26.75	806	35.39	807.94		
35.56	807.97	35.68	808	36.05	808.12	42.24	810	48.06	811.81		
48.44	811.93	48.47	811.94	48.67	812	48.97	812.09	55.11	814		
58.52	814.76	64.02	816	64.05	816	64.06	816	64.11	816		
64.12	816	64.16	816	64.18	816	64.21	816	64.23	816		
64.27	816	64.29	816	64.51	816	64.55	816	64.59	816		
64.63	816	64.66	816	64.7	816	64.72	816	64.98	816		
65.48	816	65.86	816	66.57	816	71.47	816.01	72.7	816.02		
72.75	816.02	73.29	816.02	74.51	816.02	75.35	816.02	84.84	816		
93.89	815.84	94	815.84	95.83	815.82	98.76	815.86	102.88	815.92		
106.57	816	109.76	817.28	111.63	818	113.65	818.64	117.46	820		
123.18	821.49	124.76	821.91	125.09	822	125.17	822	125.18	822		
125.45	822.01	125.65	822.02	126.04	822.04	126.82	822.08	127.57	822.09		
152.93	822.56	166.8	822.78								

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Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -193.15 .05 -36.76 .035 35.39 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -36.76 35.39 55 50 47 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \*\*\*\*\*  
 \* E.G. Elev (ft) \* 814.09 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 1.00 \* wt. n-val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 813.09 \* Reach Len. (ft) \* 55.00 \* 50.00 \*  
 47.00 \*  
 \* Crit W.S. (ft) \* \* Flow Area (sq ft) \* 189.89 \* 550.18 \*  
 43.57 \*  
 \* E.G. slope (ft/ft) \*0.002669 \* Area (sq ft) \* 189.89 \* 550.18 \*  
 43.57 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 384.80 \* 4642.55 \*  
 122.66 \*  
 \* Top width (ft) \* 214.04 \* Top width (ft) \* 125.11 \* 72.15 \*  
 16.78 \*  
 \* Vel Total (ft/s) \* 6.57 \* Avg. vel. (ft/s) \* 2.03 \* 8.44 \*  
 2.81 \*  
 \* Max Chl Dpth (ft) \* 8.84 \* Hydr. Depth (ft) \* 1.52 \* 7.63 \*  
 2.60 \*  
 \* Conv. Total (cfs) \* 99687.9 \* Conv. (cfs) \* 7448.5 \* 89865.2 \*  
 2374.2 \*  
 \* Length wtd. (ft) \* 50.48 \* Wetted Per. (ft) \* 125.22 \* 72.91 \*  
 17.55 \*  
 \* Min Ch El (ft) \* 804.25 \* Shear (lb/sq ft) \* 0.25 \* 1.26 \*  
 0.41 \*  
 \* Alpha \* 1.50 \* Stream Power (lb/ft s) \* 166.80 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.11 \* Cum Volume (acre-ft) \* 123.25 \* 51.24 \*  
 65.44 \*  
 \* C & E Loss (ft) \* 0.09 \* Cum SA (acres) \* 36.78 \* 4.71 \*  
 14.26 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3254.54

INPUT

Description: F

Station Elevation Data num= 117  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 \*\*\*\*\*  
 -240.13 819.89 -227.21 814.66 -216.19 812.98 -198.11 812.16 -175.25 811.94  
 -165.06 811.8 -160.59 811.79 -152.22 811.82 -122.44 811.41 -109.35 811.26  
 -104.94 811.11 -102.58 811.05 -67.55 810.05 -42.46 809.03 -36.68 808.81  
 -36.67 808.63 -36.63 808.62 -36.6 808.62 -36.56 808.61 -36.51 808.6  
 -36.47 808.59 -36.42 808.58 -36.36 808.57 -36.3 808.56 -36.24 808.55  
 -36.18 808.54 -36.1 808.52 -35.72 808.43 -35.62 808.41 -35.52 808.39  
 -35.41 808.37 -35.28 808.34 -35.14 808.31 -34.99 808.27 -34.82 808.23  
 -34.63 808.18 -34.4 808.13 -34.14 808.06 -33.88 808 -31.55 807.56

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-23.17	806	-20.88	805.53	-17.84	804.92	-15.28	804.39	-13.32	804.12
-7.98	804.12	-6.03	804.12	-.01	804.12	0	804.12	4.38	804.12
7.24	804.12	15.16	804.12	15.2	804.12	15.21	804.12	15.81	804.12
16.56	804.21	16.72	804.23	28.47	806	32.29	806.81	35.63	807.52
37.86	808	42.77	809.48	44.49	810	46.47	810.68	50.28	812
53.04	812.93	56.3	814	60.48	814.91	63.23	815.52	63.61	815.59
64.3	815.74	65.6	816	65.65	816	65.74	816	65.87	816
65.99	816	66.12	816	66.23	816	66.36	816	66.47	816
66.61	816	66.72	816	66.85	816	66.96	816	67.1	816
67.21	816	67.34	816	67.45	816	67.55	816	67.63	816
67.97	816	68.02	816	68.06	816	68.1	816	68.14	816
68.72	816	68.76	816	69.87	816.02	70.51	816.02	71.52	816.02
71.91	816.03	77.35	816	78.14	816	85.05	814.92	90.53	814.08
91.07	814	91.75	814	98.34	814	102.59	815.16	106.43	816
110.08	817.66	110.84	818	113.36	819.15	115.21	820	116.17	820.22
116.63	820.29	122.85	821.87						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-240.13	.05	-36.68	.035	37.86	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-36.68	37.86		43	50		.1	.3

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 813.89 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.71 * Wt. n-Val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 813.18 * Reach Len. (ft) * 43.00 * 50.00 *
52.00 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 359.83 * 584.88 *
42.35 *
* E.G. slope (ft/ft) *0.001955 * Area (sq ft) * 359.83 * 584.88 *
42.35 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 747.94 * 4298.79 *
103.28 *
* Top width (ft) * 271.26 * Top Width (ft) * 180.79 * 74.54 *
15.93 *
* Vel Total (ft/s) * 5.22 * Avg. Vel. (ft/s) * 2.08 * 7.35 *
2.44 *
* Max Chl Dpth (ft) * 9.06 * Hydr. Depth (ft) * 1.99 * 7.85 *
2.66 *
* Conv. Total (cfs) *116466.6 * Conv. (cfs) * 16914.5 * 97216.5 *
2335.6 *
* Length wtd. (ft) * 48.87 * Wetted Per. (ft) * 180.87 * 75.50 *
16.75 *
* Min Ch El (ft) * 804.12 * Shear (lb/sq ft) * 0.24 * 0.95 *
0.31 *
* Alpha * 1.68 * Stream Power (lb/ft s) * 122.85 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.09 * Cum Volume (acre-ft) * 122.90 * 50.59 *
65.39 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 36.59 * 4.63 *
14.24 *
*****
*****

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CROSS SECTION

110-811\_Hydraulic Study.rep

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3204.54

INPUT

Description: G

Station Elevation Data		num= 99		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-283.58	819.8	-266.29	814.14	-266.24	814.12	-266.23	814.12	-266.09	814.11		
-217.5	811.93	-217.38	811.93	-173.11	811.45	-163.78	811.46	-160.93	811.43		
-155.76	811.36	-150	811.26	-144.17	811.18	-124.33	810.91	-109.74	810.72		
-100.63	810.59	-93.13	810.46	-70.42	809.9	-50.46	809.14	-38.7	808.69		
-33.59	808.48	-31.92	807.96	-31.88	807.94	-31.83	807.93	-31.78	807.91		
-31.73	807.89	-31.68	807.88	-31.63	807.86	-31.57	807.84	-31.51	807.81		
-31.44	807.79	-31.37	807.77	-31.29	807.74	-31.2	807.71	-31.1	807.69		
-30.89	807.62	-30.78	807.58	-30.66	807.54	-30.52	807.5	-30.38	807.45		
-30.22	807.4	-29.76	807.22	-29.6	807.16	-29.42	807.08	-29.23	807		
-28.94	806.91	-28.61	806.8	-28.23	806.67	-27.79	806.53	-27.29	806.36		
-26.69	806.17	-26.19	806	-21.56	805.01	-18.47	804.35	-16.86	804.05		
-8.24	804.05	-2.99	804.05	0	804.05	3.37	804.05	15.21	804.05		
15.24	804.05	16.56	804.21	27.88	806	30.45	806.52	37.81	808		
39.9	808.63	44.4	810	47.91	811.09	50.79	812	54.71	813.27		
56.99	814	57.54	814.1	57.74	814.13	60.08	814.54	62.07	814.88		
63.39	815.06	64.64	815.27	69.51	816	69.65	816	69.72	816		
69.9	816	69.98	816	70.07	816	70.16	816	70.17	816		
70.18	816	70.19	816	70.2	816	71.28	816	71.34	816		
71.39	816	71.44	816	71.49	816	88.72	817.7	91.55	818		
96.32	818.82	102.84	820	107.71	820.7	116.72	821.98				

Manning's n Values		num= 3		Sta		n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-283.58	.05	-33.59	.035	37.81	.05		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-33.59	37.81		44	50	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 813.77	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.63	* wt. n-val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 813.14	* Reach Len. (ft)	* 44.00	* 50.00
51.00				
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 462.05	* 575.01
43.00				
* E.G. slope (ft/ft)	*0.001761	* Area (sq ft)	* 462.05	* 575.01
43.00				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 971.93	* 4079.60
98.47				
* Top Width (ft)	* 298.77	* Top width (ft)	* 210.87	* 71.40
16.50				
* Vel Total (ft/s)	* 4.77	* Avg. vel. (ft/s)	* 2.10	* 7.09
2.29				
* Max Chl Dpth (ft)	* 9.09	* Hydr. Depth (ft)	* 2.19	* 8.05
2.61				
* Conv. Total (cfs)	*122717.0	* Conv. (cfs)	* 23159.6	* 97211.0
2346.4				
* Length Wtd. (ft)	* 48.73	* Wetted Per. (ft)	* 210.94	* 72.36
17.28				



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110-811_Hydraulic Study.rep
* Min Ch El (ft) * 804.05 * Shear (lb/sq ft) * 0.24 * 0.87 *
  0.27 *
* Alpha * 1.79 * Stream Power (lb/ft s) * 116.72 * 0.00 *
  0.00 *
* Frctn Loss (ft) * 0.08 * Cum volume (acre-ft) * 122.50 * 49.93 *
  65.34 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 36.39 * 4.54 *
  14.22 *
*****
*****

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3154.54

INPUT

Description: H

Station Elevation Data num= 114

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-344.06	820.17	-341.76	819.33	-335.3	817.11	-317.4	813.56	-307.81	813.2
-291.22	811.81	-276.12	811.8	-258.35	811.75	-229.19	811.76	-224.11	811.69
-215.03	811.6	-171.68	811.14	-151.63	811.01	-147.14	810.92	-145.09	810.87
-117.3	810.47	-103.72	810.29	-98.64	810.21	-79.31	809.67	-63.22	809.32
-54.02	808.86	-34.08	808.02	-31.16	807.11	-31.09	807.09	-31.01	807.06
-30.93	807.04	-30.84	807.02	-30.75	806.99	-30.65	806.96	-30.55	806.93
-30.44	806.9	-30.32	806.86	-30.2	806.83	-30.06	806.79	-29.91	806.74
-29.75	806.7	-29.57	806.66	-29.38	806.61	-28.95	806.49	-28.71	806.42
-28.43	806.33	-28.13	806.24	-27.79	806.14	-27.4	806.02	-27.33	806
-25.54	805.56	-19.16	804	-17.81	803.9	-14.84	803.9	-12.95	803.9
-11.52	803.9	-10.4	803.9	-9.49	803.9	-8.03	803.9	-7.43	803.9
-6.92	803.9	-6.49	803.9	-6.11	803.9	-5.77	803.9	-5.54	803.9
-5.32	803.9	0	803.9	3.09	803.9	3.31	803.9	3.55	803.9
3.82	803.9	4.15	803.9	4.52	803.9	4.96	803.9	5.47	803.9
6.08	803.9	6.81	803.9	7.72	803.9	8.87	803.9	10.64	803.9
13.16	803.9	14.82	804	20.71	805.01	26.47	806	34.72	807.69
36.26	808	41.95	809.75	42.76	810	43.86	810.36	48.82	812
51.4	812.8	55.27	814	56.44	814.25	58.83	814.76	62.79	815.6
64.71	816	64.81	816	65.06	816	65.18	816	65.22	816
65.34	816	66.33	816	66.69	816	71	816	71.46	816
71.82	816	76.48	816.77	77.53	816.86	80.56	817.14	83.2	817.46
87.71	817.86	89.18	817.99	89.27	818	89.46	818.03	100.7	820
108.63	821.17	115.16	822	115.51	822	115.58	822		

Manning's n values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-344.06	.05	-34.08	.035	34.72	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -34.08 34.72 48 50 52 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 813.66 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.53 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 813.13 * Reach Len. (ft) * 48.00 * 50.00 *
52.00 *

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* Crit W.S. (ft) * 50.00 * Flow Area (sq ft) * 618.80 * 568.05 *
* E.G. Slope (ft/ft) * 0.001516 * Area (sq ft) * 618.80 * 568.05 *
* Q Total (cfs) * 111.95 * Flow (cfs) * 1235.28 * 3802.78 *
* Top width (ft) * 17.75 * Top width (ft) * 272.92 * 68.80 *
* Vel Total (ft/s) * 2.24 * Avg. Vel. (ft/s) * 2.00 * 6.69 *
* Max Chl Dpth (ft) * 2.82 * Hydr. Depth (ft) * 2.27 * 8.26 *
* Conv. Total (cfs) * 2875.5 * Conv. (cfs) * 31729.7 * 97679.2 *
* Length wtd. (ft) * 18.58 * Wetted Per. (ft) * 273.03 * 69.69 *
* Min Ch El (ft) * 0.25 * Shear (lb/sq ft) * 0.21 * 0.77 *
* Alpha * 0.00 * Stream Power (lb/ft s) * 115.58 * 0.00 *
* Frctn Loss (ft) * 65.29 * Cum volume (acre-ft) * 121.95 * 49.27 *
* C & E Loss (ft) * 14.20 * Cum SA (acres) * 36.15 * 4.46 *

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\*\*\*\*\*

CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 3104.54

INPUT

Description: I

Station Elevation Data

num= 109

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-383.34	816.88	-380.41	816.27	-361.18	811.96	-358.34	811.62	-338.46	811.1
-330.45	811.09	-301.63	811.16	-297.15	811.2	-278.53	811.33	-275.53	811.33
-225.16	811.18	-203.03	811.34	-171.74	811.16	-165.14	811.09	-154.69	810.93
-154.09	810.93	-138.76	810.85	-128.69	810.69	-108.79	810.52	-62.36	809.45
-61.73	809.43	-61.33	809.43	-61.1	809.42	-34.68	808.63	-32.1	807.88
-32.06	807.85	-32.01	807.83	-31.95	807.8	-31.9	807.77	-31.84	807.74
-31.78	807.71	-31.72	807.68	-31.65	807.64	-31.58	807.61	-31.5	807.57
-31.37	807.53	-31.23	807.48	-30.68	807.28	-30.54	807.22	-30.4	807.16
-30.24	807.1	-30.08	807.03	-29.9	806.95	-29.7	806.87	-29.49	806.78
-29.26	806.69	-29.02	806.58	-28.7	806.46	-28.35	806.33	-27.96	806.18
-27.52	806.01	-27.48	806	-22.31	804.38	-21.08	804	-11.63	803.47
-11.58	803.47	-11.54	803.47	-11.44	803.47	-7.05	803.47	-4.63	803.47
-2.3	803.47	-.93	803.47	0	803.47	2.92	803.47	3.66	803.47
3.67	803.47	8.94	803.47	13.25	803.47	15.58	804	23.04	805.4
26.21	806	31.87	807.14	36.15	808	38.74	808.76	43	810
46.9	811.41	48.53	812	53.61	813.61	54.83	814	54.97	814.03
55.06	814.05	64.07	816	64.37	816	64.47	816	64.78	816
64.82	816	64.83	816	64.85	816	64.86	816	64.88	816
68.81	816	71.72	816	73.12	816	74.23	816	84.17	817.64
87	818	87.13	818	91.93	818.78	99.35	820	104.37	820.67
104.41	820.68	115.25	822	115.59	822	115.69	822	124.72	822.11
135.24	822.23	144.49	822.33	144.6	822.33	151.56	822.39		

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

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\*\*\*\*\*  
 -383.34 .05 -34.68 .035 36.15 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -34.68 36.15 22 50 48 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \*\*\*\*\*  
 \* E.G. Elev (ft) \* 813.57 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.44 \* Wt. n-Val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 813.13 \* Reach Len. (ft) \* 22.00 \* 50.00 \*  
 48.00 \*  
 \* Crit W.S. (ft) \* \* Flow Area (sq ft) \* 763.82 \* 591.74 \*  
 42.07 \*  
 \* E.G. slope (ft/ft) \*0.001277 \* Area (sq ft) \* 763.82 \* 591.74 \*  
 42.07 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 1413.92 \* 3653.55 \*  
 82.54 \*  
 \* Top width (ft) \* 418.50 \* Top width (ft) \* 331.72 \* 70.83 \*  
 15.95 \*  
 \* Vel Total (ft/s) \* 3.68 \* Avg. vel. (ft/s) \* 1.85 \* 6.17 \*  
 1.96 \*  
 \* Max Chl Dpth (ft) \* 9.66 \* Hydr. Depth (ft) \* 2.30 \* 8.35 \*  
 2.64 \*  
 \* Conv. Total (cfs) \*144116.5 \* Conv. (cfs) \* 39566.8 \*102240.1 \*  
 2309.6 \*  
 \* Length wtd. (ft) \* 42.12 \* Wetted Per. (ft) \* 331.91 \* 72.08 \*  
 16.76 \*  
 \* Min Ch El (ft) \* 803.47 \* Shear (lb/sq ft) \* 0.18 \* 0.65 \*  
 0.20 \*  
 \* Alpha \* 2.07 \* Stream Power (lb/ft s) \* 151.56 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.05 \* Cum Volume (acre-ft) \* 121.19 \* 48.61 \*  
 65.23 \*  
 \* C & E Loss (ft) \* 0.02 \* Cum SA (acres) \* 35.82 \* 4.38 \*  
 14.18 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3054.54

INPUT

Description: J

Station Elevation Data		num=		97							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-429.24	820.02	-421.03	817.24	-412.97	815.16	-397.1	811.6	-374.14	811.01		
-367.57	810.72	-352.22	810.82	-334.91	810.87	-315.95	811.01	-280.2	811.02		
-262.38	810.97	-222.98	811.25	-208.79	811.28	-204.94	811.31	-200.98	811.37		
-183.88	811.19	-166.39	810.98	-163.8	810.96	-152.84	810.92	-122.32	810.87		
-114.52	810.84	-84.08	809.91	-75.91	809.69	-67.79	809.61	-35.1	809.26		
-35.07	808.53	-34.81	808.37	-34.74	808.35	-34.67	808.33	-34.6	808.31		
-34.52	808.29	-34.44	808.26	-34.36	808.24	-34.27	808.21	-34.17	808.18		
-33.73	808	-33.7	808	-33.64	808	-33.6	808	-33.59	808		
-33.58	808	-33.56	808	-33.54	808	-31.01	807.15	-27.53	806		
-23.61	804.75	-21.27	804	-16.03	803.04	-12.18	803.04	-12.13	803.04		

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-12.11	803.04	-11.95	803.04	-11.89	803.04	-4.65	803.04	-2.06	803.04
0	803.04	1.54	803.04	2.63	803.04	6.59	803.04	7.86	803.04
9.9	803.04	14.57	803.48	17.29	804	21.31	804.85	26.85	806
28.59	806.34	33.57	807.34	35.91	807.81	36.86	808	38.61	808.46
44.41	810	49.01	811.58	50.23	812	51.33	812.33	57.04	814
66.81	815.06	75.8	816	75.82	816	75.86	816	75.89	816
75.91	816	75.93	816	75.94	816	75.95	816	75.96	816
77.14	816	78.3	816.19	78.68	816.24	79.1	816.3	79.86	816.42
81.74	816.76	83.22	816.97	89.82	818	93.81	818.77	99.8	820
105.59	821.09	110.84	821.97						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -429.24 .05 -35.1 .035 38.61 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -35.1 38.61 23 50 53 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \* E.G. Elev (ft) \* 813.50 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.38 \* Wt. n-Val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 813.12 \* Reach Len. (ft) \* 23.00 \* 50.00 \*  
 53.00 \*  
 \* Crit W.S. (ft) \* \* Flow Area (sq ft) \* 853.67 \* 626.16 \*  
 37.07 \*  
 \* E.G. slope (ft/ft) \*0.001105 \* Area (sq ft) \* 853.67 \* 626.16 \*  
 37.07 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 1474.96 \* 3611.28 \*  
 63.76 \*  
 \* Top width (ft) \* 457.93 \* Top width (ft) \* 368.79 \* 73.71 \*  
 15.43 \*  
 \* Vel Total (ft/s) \* 3.40 \* Avg. Vel. (ft/s) \* 1.73 \* 5.77 \*  
 1.72 \*  
 \* Max Chl Dpth (ft) \* 10.08 \* Hydr. Depth (ft) \* 2.31 \* 8.49 \*  
 2.40 \*  
 \* Conv. Total (cfs) \*154949.3 \* Conv. (cfs) \* 44377.5 \*108653.4 \*  
 1918.4 \*  
 \* Length wtd. (ft) \* 41.79 \* Wetted Per. (ft) \* 369.00 \* 75.78 \*  
 16.13 \*  
 \* Min Ch El (ft) \* 803.04 \* Shear (lb/sq ft) \* 0.16 \* 0.57 \*  
 0.16 \*  
 \* Alpha \* 2.10 \* Stream Power (lb/ft s) \* 110.84 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.04 \* Cum Volume (acre-ft) \* 120.78 \* 47.91 \*  
 65.19 \*  
 \* C & E Loss (ft) \* 0.02 \* Cum SA (acres) \* 35.64 \* 4.30 \*  
 14.16 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3004.54

INPUT  
 Description: K

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Station Elevation Data

num= 102

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-469.9	819.55	-464.82	817.83	-445.16	812.74	-439.76	811.53	-432.36	811.33
-408.99	810.29	-370.93	810.49	-362.09	810.6	-358.19	810.65	-356.83	810.66
-304.24	810.68	-285.06	810.58	-250.46	810.66	-226.31	810.87	-201.92	811.25
-180.38	811.02	-178.06	811.01	-142.44	810.98	-125	810.7	-123.4	810.68
-103.48	810.53	-85.36	810	-63.3	809.72	-38.45	809.01	-35.94	808.19
-35.5	808.15	-35.41	808.15	-35.32	808.14	-35.23	808.13	-35.07	808.12
-34.91	808.11	-34.74	808.1	-34.56	808.09	-34.37	808.07	-34.17	808.06
-33.97	808.05	-33.76	808.03	-33.54	808.02	-33.31	808.01	-33.23	808
-33.22	808	-29.25	806.47	-28.04	806	-24.92	804.84	-22.64	804
-21.26	803.52	-19.32	802.84	-16.91	802.19	-16.85	802.19	-16.82	802.19
-16.69	802.19	-5.82	802.19	-3.39	802.19	-1.15	802.19	.55	802.19
5.22	802.19	7.83	802.19	15.01	804	17.99	804.66	24.08	806
28.83	806.92	34.36	808	39.34	809.23	42.42	810	43.7	810.36
46.48	811.12	48.67	811.73	49.66	812	51.94	812.56	53.3	812.86
55.11	813.29	58.2	813.97	58.24	813.98	58.31	814	58.32	814
58.46	814	58.5	814	58.52	814	58.54	814	58.56	814
58.91	814.04	59.21	814.08	59.5	814.11	59.78	814.15	60.05	814.18
60.31	814.21	60.56	814.25	60.8	814.28	65.04	814.69	65.28	814.71
67.85	814.94	69.06	815.07	71.32	815.3	73.81	815.51	77.92	815.88
78.98	816	81.68	816.58	88.8	818	91.98	818.82	96.72	820
100.95	821.02	104.2	821.84						

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-469.9	.05	-38.45	.035	34.36	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-38.45	34.36		36	50		.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 813.44	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.30	* wt. n-Val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 813.13	* Reach Len. (ft)	* 36.00	* 50.00
48.00				
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 1021.66	* 638.29
51.45				
* E.G. slope (ft/ft)	*0.000895	* Area (sq ft)	* 1021.66	* 638.29
51.45				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 1674.02	* 3392.13
83.85				
* Top width (ft)	* 501.13	* Top width (ft)	* 408.23	* 72.81
20.09				
* Vel Total (ft/s)	* 3.01	* Avg. vel. (ft/s)	* 1.64	* 5.31
1.63				
* Max Chl Dpth (ft)	* 10.94	* Hydr. Depth (ft)	* 2.50	* 8.77
2.56				
* Conv. Total (cfs)	*172110.5	* Conv. (cfs)	* 55945.0	*113363.4
2802.2				
* Length wtd. (ft)	* 44.76	* Wetted Per. (ft)	* 408.47	* 74.60
20.74				
* Min Ch El (ft)	* 802.19	* Shear (lb/sq ft)	* 0.14	* 0.48
0.14				
* Alpha	* 2.16	* Stream Power (lb/ft s)	* 104.20	* 0.00
0.00				
* Frctn Loss (ft)	* 0.04	* Cum Volume (acre-ft)	* 120.29	* 47.18

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65.13 \*  
 \* C & E Loss (ft) \* 0.03 \* Cum SA (acres) \* 35.43 \* 4.22 \*  
 14.14 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2954.54

INPUT

Description: L

Station Elevation Data num= 103

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-509.9	819.95	-504.94	818.22	-502.96	817.64	-479.97	811.59	-461.37	810.54
-447.19	809.9	-436.37	809.96	-403.73	810.08	-396.99	810.15	-359.14	810.32
-344.07	810.32	-312.63	810.14	-291.29	810.11	-285.49	810.1	-260.08	810.18
-242.17	810.32	-187.74	811.09	-186.83	811.08	-186.73	811.08	-185.37	811.08
-160.81	810.67	-133.05	810.2	-130.8	810.14	-120.98	809.94	-119.28	809.94
-113.78	809.93	-103.13	809.97	-93.69	809.92	-69.28	809.54	-67.94	809.52
-52.45	809.04	-45.11	808.85	-35.47	808.67	-31.5	808.25	-31.42	808.24
-31.35	808.22	-31.26	808.21	-31.16	808.19	-31.04	808.18	-30.92	808.16
-30.8	808.15	-30.67	808.13	-30.53	808.11	-29.89	808	-29.86	808
-29.83	808	-29.8	808	-29.75	808	-29.74	808	-29.73	808
-29.72	808	-29.7	808	-29.05	807.78	-23.67	806	-21.63	805.31
-17.79	804	-10.69	802.19	-10.66	802.19	-10.4	802.19	0	802.19
9.16	802.19	11.62	802.51	18.63	804	24.79	805.33	27.88	806
35.22	807.49	37.75	808	46.11	809.77	47.2	810	53.42	811.42
56	812	58.23	812.39	59.06	812.53	61.48	812.94	62.86	813.17
63.48	813.27	64.67	813.47	67.71	813.95	68.01	814	68.09	814
68.17	814	74.52	814.69	76.39	814.89	77.77	815.04	78.82	815.15
86.29	816	88.24	816.57	94.41	818	97.98	819.07	101.06	820
106.62	821.6	108.05	822	110.66	822.46	119.91	823.94	120.29	824
120.3	824	125.67	824.01	128.68	824.01	130.18	824.02	131.37	824.02
132.17	824.03	141.52	824.19	144.3	824.23				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-509.9	.05	-31.5	.035	35.22	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -31.5 35.22 36 50 48 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \*\*\*\*\*  
 \* E.G. Elev (ft) \* 813.38 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.22 \* wt. n-val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 813.16 \* Reach Len. (ft) \* 36.00 \* 50.00 \*  
 48.00 \*  
 \* Crit W.S. (ft) \* \* Flow Area (sq ft) \* 1335.70 \* 601.92 \*  
 75.85 \*  
 \* E.G. slope (ft/ft) \* 0.000698 \* Area (sq ft) \* 1335.70 \* 601.92 \*  
 75.85 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 2150.66 \* 2884.04 \*  
 115.30 \*  
 \* Top Width (ft) \* 548.72 \* Top width (ft) \* 454.43 \* 66.72 \*

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27.57 *
* Vel Total (ft/s) * 2.56 * Avg. vel. (ft/s) * 1.61 * 4.79 *
  1.52 *
* Max Chl Dpth (ft) * 10.97 * Hydr. Depth (ft) * 2.94 * 9.02 *
  2.75 *
* Conv. Total (cfs) *194956.4 * Conv. (cfs) * 81414.7 *109177.0 *
4364.7 *
* Length wtd. (ft) * 43.93 * Wetted Per. (ft) * 454.73 * 68.16 *
  28.15 *
* Min Ch El (ft) * 802.19 * Shear (lb/sq ft) * 0.13 * 0.38 *
  0.12 *
* Alpha * 2.14 * Stream Power (lb/ft s) * 144.30 * 0.00 *
  0.00 *
* Frctn Loss (ft) * 0.03 * Cum Volume (acre-ft) * 119.31 * 46.47 *
  65.06 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 35.08 * 4.14 *
  14.12 *

```

\*\*\*\*\*  
 \*\*\*\*\*

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2904.54

INPUT

Description: M

Station Elevation Data		num= 136	
Sta	Elev	Sta	Elev
-555.08	818.17	-551.53	817.23
-465.28	809.62	-444.08	809.58
-348.18	810.06	-339.93	810.08
-287.65	810.03	-244.02	810.11
-185.09	810.59	-179.54	810.57
-131.45	809.67	-109.41	809.57
-65.8	808.97	-57.78	808.78
-32.25	807.93	-29.14	806.3
-20.73	803.97	-20.58	803.93
-19.87	803.78	-19.67	803.73
-18.75	803.53	-18.49	803.47
-16.25	802	-8.17	802
10.99	802	11.25	802
18.97	803.35	22.4	804
31.62	806.15	34.08	806.73
37.56	807.54	37.59	807.55
37.7	807.57	37.94	807.62
38.4	807.72	38.42	807.72
39.41	807.93	39.44	807.93
41.15	808.28	41.79	808.41
44.9	809.07	45.41	809.17
47.83	809.65	49.22	809.95
59.36	812.09	59.65	812.13
72.37	813.72	73.02	813.8
86.03	815.5	89.61	816
100.75	819.42	102.44	820
116.74	824	116.77	824
117.07	824.01		

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

-555.08 .05 -36.42

.035 41.79 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -36.42 41.79 42 49.96 51 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 813.33 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.15 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 813.18 * Reach Len. (ft) * 42.00 * 49.96 *
51.00 *
* Crit w.s. (ft) * * Flow Area (sq ft) * 1615.57 * 707.63 *
56.07 *
* E.G. Slope (ft/ft) *0.000477 * Area (sq ft) * 1615.57 * 707.63 *
56.07 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 2288.75 * 2801.51 *
59.74 *
* Top width (ft) * 605.56 * Top width (ft) * 501.12 * 78.21 *
26.23 *
* Vel Total (ft/s) * 2.16 * Avg. Vel. (ft/s) * 1.42 * 3.96 *
1.07 *
* Max Chl Dpth (ft) * 11.18 * Hydr. Depth (ft) * 3.22 * 9.05 *
2.14 *
* Conv. Total (cfs) *235685.9 * Conv. (cfs) *104743.1 *128209.0 *
2733.8 *
* Length wtd. (ft) * 46.33 * Wetted Per. (ft) * 501.38 * 80.26 *
26.68 *
* Min Ch El (ft) * 802.00 * Shear (lb/sq ft) * 0.10 * 0.26 *
0.06 *
* Alpha * 2.01 * Stream Power (lb/ft s) * 117.07 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.02 * Cum Volume (acre-ft) * 118.09 * 45.72 *
64.99 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 34.68 * 4.05 *
14.09 *
*****
*****
    
```

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2854.58

INPUT

Description: N

Station Elevation Data num= 136

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-604.74	818.03	-587.39	813.47	-585.09	812.8	-577.61	812.3	-543.57	809.78
-498.5	809.63	-494.24	809.57	-493.32	809.62	-490.35	809.6	-464.42	809.7
-449.62	809.77	-442.77	809.62	-433.61	809.82	-392.69	810.06	-389.49	810.07
-346.11	809.57	-337.27	809.58	-300.9	809.69	-284.47	809.73	-253.74	809.76
-239.62	809.94	-231.28	810.08	-222.63	810.03	-219.09	810.11	-207.99	810.26
-195.77	810.2	-192.67	809.81	-189.75	809.76	-188.94	809.79	-181.12	809.87
-161.13	809.86	-154.94	809.75	-148.17	809.64	-131.76	809.27	-129.32	809.24
-116.92	809.12	-99.47	808.99	-99.27	808.99	-99.21	808.99	-87.45	808.85
-82.36	808.91	-76.54	808.84	-69.24	808.81	-62.26	808.9	-35.56	808.9
-34.29	808.35	-33.72	808.09	-31.28	806.16	-31.27	806.16	-31.24	806.14
-27.8	804.33	-27.74	804.32	-27.67	804.3	-27.61	804.29	-27.54	804.27



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-27.46	804.25	-27.39	804.23	-27.3	804.21	-27.21	804.19	-27.11	804.17
-27.01	804.14	-26.89	804.12	-26.77	804.09	-26.64	804.06	-26.49	804.02
-26.4	804	-24.06	802.5	-23.28	802	-4.28	802	0	802
14.53	802	19.83	802.93	25.91	804	26.55	804.15	26.9	804.23
26.94	804.25	26.96	804.25	27.08	804.29	27.12	804.3	27.23	804.33
27.28	804.35	27.38	804.38	27.43	804.4	27.53	804.43	27.59	804.45
28.53	804.72	28.64	804.74	28.75	804.77	28.87	804.79	29	804.82
29.39	804.91	29.49	804.94	29.6	804.97	29.75	805	29.91	805.04
30.09	805.09	30.28	805.13	30.48	805.18	30.7	805.24	30.95	805.3
31.21	805.36	31.5	805.43	31.85	805.52	32.24	805.61	32.68	805.72
33.18	805.84	34.31	806.12	34.94	806.28	35.68	806.46	36.54	806.68
37.56	806.94	38.78	807.25	40.46	807.67	42.6	808.2	45.44	808.91
49.4	809.9	49.81	810	57.71	811.96	57.86	812	66.98	813.82
67.88	814	67.97	814	68.01	814	68.24	814	87.56	815.69
88.39	815.76	90.98	816	94.53	817.23	96.75	818	100.5	819.34
102.36	820	103.49	820.39	108.11	822	109.79	822.45	115.56	824
115.88	824.04								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-604.74	.05	-35.56	.035	45.44	.05

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	-35.56	45.44		40	50.04	52		.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 813.30	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.11	* Wt. n-Val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 813.19	* Reach Len. (ft)	* 40.00	* 50.04
52.00				
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 1883.78	* 765.53
37.44				
* E.G. slope (ft/ft)	*0.000361	* Area (sq ft)	* 1883.78	* 765.53
37.44				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 2414.86	* 2701.74
33.41				
* Top width (ft)	* 650.22	* Top Width (ft)	* 550.86	* 81.00
18.37				
* Vel Total (ft/s)	* 1.92	* Avg. Vel. (ft/s)	* 1.28	* 3.53
0.89				
* Max Chl Dpth (ft)	* 11.19	* Hydr. Depth (ft)	* 3.42	* 9.45
2.04				
* Conv. Total (cfs)	*270927.9	* Conv. (cfs)	*127039.4	*142131.2
1757.4				
* Length wtd. (ft)	* 44.99	* Wetted Per. (ft)	* 551.07	* 83.71
18.86				
* Min Ch El (ft)	* 802.00	* Shear (lb/sq ft)	* 0.08	* 0.21
0.04				
* Alpha	* 1.99	* Stream Power (lb/ft s)	* 115.88	* 0.00
0.00				
* Frctn Loss (ft)	* 0.01	* Cum Volume (acre-ft)	* 116.41	* 44.87
64.94				
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 34.18	* 3.96
14.06				

CROSS SECTION

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RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2804.54

INPUT

Description: 0

Station Elevation Data

num= 224

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-636.99	817.78	-620.56	813.37	-593.74	811.22	-573.43	809.84	-567.39	809.75
-532.59	809.32	-523.1	809.82	-493.13	809.57	-486.12	809.6	-483.76	809.54
-473.25	809.31	-455.93	809.7	-446.03	809.76	-418.52	809.68	-391.12	809.35
-371.75	809.21	-353.59	809.07	-320.57	809.32	-310.49	809.4	-285.69	809.54
-264.41	809.57	-260.62	809.62	-252.37	809.53	-243.1	809.46	-235.49	809.62
-210.66	809.92	-203.19	809.88	-197.84	809.23	-197.64	809.22	-194.22	809.36
-191.11	809.39	-177.26	809.36	-170.33	809.28	-164.3	809.01	-153.82	808.7
-139.84	808.71	-132.13	808.6	-123.32	808.22	-121.92	808.15	-120.95	808.13
-107.12	808.07	-104.82	808.04	-97.1	807.93	-90.23	807.96	-83.62	808.09
-65.83	808.29	-65.47	808.31	-61.61	808.39	-41.95	809.2	-35.53	809.4
-35.51	809.4	-34.23	808.97	-33.63	808.75	-31.2	806.83	-31.19	806.83
-29.7	805.77	-29.59	805.69	-29.57	805.68	-25.99	803.68	-25.99	803.67
-25.98	803.66	-25.97	803.64	-25.95	803.62	-25.94	803.61	-25.92	803.59
-25.91	803.57	-25.89	803.55	-25.87	803.53	-25.85	803.5	-25.84	803.48
-25.82	803.46	-25.8	803.43	-25.78	803.4	-25.75	803.38	-25.73	803.35
-25.71	803.32	-25.68	803.29	-25.67	803.27	-23.62	802	-12.29	802
-8.16	802	-.98	802	0	802	18.54	802	18.64	802.02
18.75	802.05	18.76	802.05	18.87	802.08	18.97	802.1	19.06	802.12
19.15	802.15	19.24	802.17	19.32	802.19	19.35	802.19	19.44	802.21
19.51	802.23	19.59	802.25	19.66	802.27	19.73	802.28	19.8	802.3
19.86	802.31	19.92	802.33	19.98	802.34	20.04	802.36	20.09	802.37
20.15	802.38	20.21	802.4	20.26	802.41	20.31	802.42	20.36	802.43
20.41	802.45	20.46	802.46	20.5	802.47	20.55	802.48	20.59	802.49
20.63	802.5	20.67	802.51	20.71	802.52	20.75	802.53	20.78	802.53
20.82	802.54	20.85	802.55	20.88	802.56	20.92	802.57	20.95	802.57
20.98	802.58	21.08	802.61	21.11	802.61	21.14	802.62	21.17	802.63
21.2	802.64	21.23	802.64	21.26	802.65	21.29	802.66	21.31	802.66
21.34	802.67	21.36	802.67	21.39	802.68	21.41	802.69	21.44	802.69
21.46	802.7	21.48	802.7	21.5	802.71	21.53	802.71	21.55	802.72
21.57	802.72	21.59	802.73	21.61	802.73	21.63	802.74	21.65	802.74
21.66	802.75	21.68	802.75	21.7	802.75	21.72	802.76	21.74	802.76
21.75	802.77	21.89	802.8	21.91	802.8	23.53	803.12	23.69	803.16
23.71	803.17	23.81	803.19	24.81	805.05	24.86	805.07	25.04	805.13
25.21	805.2	25.38	805.26	25.55	805.32	25.64	805.35	26.14	805.53
37.03	807.89	42.61	809.52	47.89	809.79	48.09	809.82	48.29	809.86
49.56	810.15	49.78	810.2	50.02	810.26	50.26	810.32	50.54	810.38
50.84	810.45	51.15	810.51	51.47	810.58	51.81	810.66	52.17	810.74
52.9	810.9	53.26	810.98	53.64	811.07	54.04	811.17	54.47	811.27
55.97	811.53	56.29	811.59	56.63	811.67	57.01	811.75	57.43	811.84
57.9	811.94	58.18	812	66	813.35	69.49	813.96	69.71	814
75.94	814.59	80	814.97	82.33	815.19	83.84	815.33	85.64	815.5
87.9	815.68	88.33	815.71	90.91	815.91	91.03	815.92	92.13	816
93.67	816.33	94.43	816.53	96.39	816.99	98.88	817.68	99.33	817.79
100.04	818	105.58	819.9	105.87	820	106.47	820.21	111.67	822
117.68	823.92	117.92	824	118.6	824.19	124.8	825.92		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-636.99	.05	-35.53	.035	42.61	.05

Bank	Sta: Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-35.53	42.61		50	60		.1	.3



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-84.59	807.47	-83.07	807.51	-83.03	807.51	-82.25	807.53	-68.99	807.62
-59.02	807.76	-50.91	807.97	-37.84	808.52	-37.49	808.63	-35.61	808.13
-29.14	805.37	-23.52	803.77	-22.8	802.87	-22.74	802.78	-22.67	802.68
-22.58	802.55	-22.48	802.41	-22.35	802.23	-22.33	802.2	-22.28	802.17
-22.01	802	-18.39	802	-17.92	802	-13.41	802	-12.3	802
-8.44	802	-6.69	802	-3.47	802	-1.09	802	0	802
2.18	802	7.06	802	9.46	802	15.81	802	16.72	802
21.18	802	21.2	802	21.25	802.02	21.31	802.03	21.36	802.04
21.41	802.05	21.46	802.07	21.51	802.08	21.55	802.09	21.6	802.1
21.65	802.11	21.69	802.12	21.73	802.13	21.78	802.14	21.82	802.15
21.86	802.16	21.89	802.17	21.93	802.18	25.86	802.95	25.9	802.96
25.91	802.96	25.93	802.96	28.32	807.37	28.33	807.37	28.38	807.39
28.42	807.41	28.47	807.42	28.51	807.44	28.53	807.45	28.66	807.49
31.44	808.11	45.69	812.31	49.98	813.62	59.57	813.62	60.31	813.64
61.18	813.66	62.21	813.69	63.5	813.72	65.11	813.76	67.15	813.81
69.83	813.88	73.34	813.96	74.76	814	74.91	814	91.42	815.35
99.32	816	102.78	816.84	107.54	818	111.72	819.44	113.34	820
114.82	820.51	119.14	822	124.37	823.8	124.94	824	126.17	824.38
131.32	826	136.21	827.34	138.39	827.91				

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -699.01 .05 -37.49 .035 28.66 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -37.49 28.66 51 50 58 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 813.26 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.09 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 813.17 * Reach Len. (ft) * 51.00 * 50.00 *
58.00 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 2252.96 * 668.48 *
58.25 *
* E.G. Slope (ft/ft) *0.000323 * Area (sq ft) * 2252.96 * 668.48 *
58.25 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 2806.04 * 2281.87 *
62.10 *
* Top Width (ft) * 716.87 * Top width (ft) * 630.88 * 66.15 *
19.83 *
* Vel Total (ft/s) * 1.73 * Avg. vel. (ft/s) * 1.25 * 3.41 *
1.07 *
* Max Chl Dpth (ft) * 11.17 * Hydr. Depth (ft) * 3.57 * 10.11 *
2.94 *
* Conv. Total (cfs) *286703.3 * Conv. (cfs) *156213.6 *127032.7 *
3457.1 *
* Length Wtd. (ft) * 50.57 * wetted Per. (ft) * 632.18 * 70.59 *
20.64 *
* Min Ch El (ft) * 802.00 * Shear (lb/sq ft) * 0.07 * 0.19 *
0.06 *
* Alpha * 2.02 * Stream Power (lb/ft s) * 138.39 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.02 * Cum volume (acre-ft) * 111.98 * 43.21 *
64.81 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 32.96 * 3.79 *
14.01 *
*****
*****

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2704.54

INPUT

Description: Q

Station Elevation Data		num= 154		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-748.45	816.02	-700.4	811.68	-692.77	810.93	-683.87	809.81	-680.17	809.65		
-677.45	809.68	-674.56	810.19	-673.33	810.49	-666	811.13	-662.97	811.41		
-637.33	811.61	-634.04	811.63	-631.87	811.61	-583.36	810.81	-582.01	810.82		
-577.31	810.68	-571.55	811.45	-562.03	811.58	-551.48	811.55	-539	811.63		
-517.08	811.43	-503.81	811.42	-480.94	811.33	-472.87	811.32	-443.55	811.19		
-439.45	811.22	-390.14	811.6	-383.12	811.66	-350.21	812.11	-346.85	812.08		
-333.68	812.1	-333.26	812.1	-319.39	812.02	-296.26	811.96	-289.76	811.86		
-274.92	811.73	-266.98	811.52	-260.88	811.65	-254.36	811.35	-248.44	811.18		
-234.05	810.76	-220.2	810.35	-189.97	809.52	-189.63	809.44	-185.63	809.13		
-184.53	808.98	-176.48	808.66	-164.04	808.06	-132.48	807.88	-131.43	807.87		
-131.03	807.87	-128.5	807.82	-127.59	807.8	-97.03	807.18	-93.87	807.15		
-65.52	808.11	-59.38	808.03	-40.14	808.49	-33.94	808.23	-32.14	808.15		
-31.27	808.03	-31.03	807.98	-30.36	807.89	-29.98	807.71	-28.02	805.88		
-27.8	805.81	-27.78	805.8	-27.75	805.79	-27.72	805.78	-27.69	805.77		
-27.6	805.74	-27.39	805.67	-27.27	805.61	-27.07	805.53	-26.7	805.38		
-25.82	805.02	-20.72	802.94	-18.43	802	-17.88	802	-17.79	802		
-12.4	802	-11.38	802	-6.9	802	-6.87	802	-4.92	802		
-1.38	802	0	802	1.76	802	4.54	802	5.55	802		
9.02	802	10.62	802	16.34	802	16.72	802	18.59	802		
19.75	802.24	20.4	802.37	21.76	802.65	22.53	802.8	23.02	802.9		
23.36	802.97	23.61	803.02	23.8	803.06	23.95	803.09	24.07	803.12		
24.17	803.14	24.26	803.16	24.33	803.17	24.39	803.19	24.45	803.2		
24.5	803.21	24.54	803.22	24.58	803.22	24.61	803.23	24.64	803.24		
24.67	803.24	24.7	803.25	24.72	803.25	24.74	803.26	24.76	803.26		
24.78	803.26	24.8	803.27	24.81	803.27	24.83	803.27	24.84	803.28		
24.85	803.28	24.86	803.28	24.88	803.28	25.13	803.34	30	808.07		
30.08	808.22	30.78	808.43	49.1	815.09	102.85	815.17	114.4	816		
114.46	816	114.54	816	114.59	816	114.7	816	115.25	816.16		
116.5	816.52	121.57	818	127.43	819.88	127.81	820	128.27	820.15		
133.84	822	139.7	823.91	139.98	824	140.39	824.13	146.22	826		
150.1	827.24	152.47	828	157.76	829.1	161.88	829.95				

Manning's n Values		num= 3		Sta		n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-748.45	.05	-33.94	.035	30	.05		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-33.94	30		51 43.25	43	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 813.23	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.20	* wt. n-val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 813.03	* Reach Len. (ft)	* 51.00	* 43.25
43.00				
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 1669.43	* 630.60
32.79				

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* E.G. Slope (ft/ft) *0.000598 * Area (sq ft) * 1669.43 * 630.60 *
32.79 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 2204.73 * 2903.94 *
41.33 *
* Top Width (ft) * 758.78 * Top width (ft) * 681.41 * 63.94 *
13.43 *
* Vel Total (ft/s) * 2.21 * Avg. Vel. (ft/s) * 1.32 * 4.61 *
1.26 *
* Max Chl Dpth (ft) * 11.03 * Hydr. Depth (ft) * 2.45 * 9.86 *
2.44 *
* Conv. Total (cfs) *210513.5 * Conv. (cfs) * 90121.4 *118702.7 *
1689.4 *
* Length Wtd. (ft) * 46.37 * Wetted Per. (ft) * 681.90 * 67.54 *
14.37 *
* Min Ch El (ft) * 802.00 * Shear (lb/sq ft) * 0.09 * 0.35 *
0.09 *
* Alpha * 2.61 * Stream Power (lb/ft s) * 161.88 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.03 * Cum volume (acre-ft) * 109.68 * 42.47 *
64.75 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 32.19 * 3.71 *
13.99 *
*****
*****

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2661.29

INPUT

Description: R

Station Elevation Data num= 146

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-783.32	816.92	-733.81	811.97	-729.95	811.66	-716.71	810.33	-715.94	810.19
-714.02	810.18	-707.96	809.91	-707.14	810.05	-704.49	810.53	-699.47	810.98
-692.88	811.53	-667.52	811.89	-662.99	811.93	-644.31	811.73	-617.72	811.48
-613.76	811.45	-611.42	811.47	-607.17	810.96	-602.21	811.53	-589.62	811.81
-582.69	811.99	-577.88	811.93	-553	811.55	-533.67	811.35	-517	811.32
-503.59	811.16	-484.32	811.15	-482.21	811.18	-460.37	811.51	-433.39	811.71
-408.66	811.94	-400	812.03	-396.5	812.04	-378.35	811.9	-366.17	811.81
-356.25	811.79	-352.92	811.8	-325.51	811.94	-315.59	811.84	-300.04	811.69
-296.75	811.66	-295.78	811.65	-293.27	811.68	-283.04	811.61	-275.48	811.56
-272.25	811.41	-270.84	811.41	-260.52	811.18	-255.37	811.1	-251.05	811.01
-243.46	810.92	-229.93	810.51	-225.49	810.37	-218.08	810.2	-193.64	809.53
-159.48	808.73	-159.26	808.71	-158.2	808.66	-149.61	808.37	-138.25	808.02
-108.81	808.05	-104.98	807.98	-98.95	808.1	-76.28	808.02	-66.27	807.74
-50.69	807.61	-35.72	807.37	-30.35	806.7	-28.35	806.46	-21.76	804.95
-15.72	804.22	-15.2	803.46	-14.95	803.31	-14.93	803.28	-14.91	803.25
-14.89	803.21	-14.86	803.17	-14.83	803.13	-14.8	803.08	-14.77	803.02
-14.73	802.96	-14.69	802.89	-14.63	802.8	-14.58	802.71	-14.51	802.6
-14.43	802.47	-14.33	802.31	-14.21	802.11	-14.14	802	-10.62	802
-9.76	802	-3.66	802	-1.11	802	0	802	3.28	802
7.57	802	10.21	802	16.23	802	17.12	802	20.6	802
20.72	802.01	20.95	802.03	21.16	802.04	21.36	802.06	21.55	802.07
21.72	802.09	27.88	802.57	31.67	806.67	33.46	808.35	46.36	812.63
47.42	812.95	50.63	813.48	56.04	813.65	57.86	813.75	101.72	813.93
102.64	813.94	103.63	813.96	104.68	813.97	105.74	813.98	106.86	813.99
107.53	814	107.58	814	109.13	814.12	109.42	814.15	113.04	814.43
114.04	814.51	115.48	814.62	117.7	814.79	121.05	815.06	124.84	815.34
126.67	815.49	132.02	815.89	132.34	815.91	133.53	816	136.37	816.61

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137.94 816.96 139.77 817.36 142.54 818 143.12 818.18 144.56 818.64  
 147.7 819.64 148.85 820 152.27 821.08 155.2 822 157.11 822.61  
 158.68 823.11

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -783.32 .05 -28.35 .035 31.67 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -28.35 31.67 134 57.86 63 .1 .3  
 Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 -783.32 -500 813 F

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \*\*\*\*\*  
 \* E.G. Elev (ft) \* 813.19 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.27 \* wt. n-val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 812.92 \* Reach Len. (ft) \* 134.00 \* 57.86 \*  
 63.00 \*  
 \* Crit w.s. (ft) \* 809.61 \* Flow Area (sq ft) \* 1247.76 \* 601.26 \*  
 41.10 \*  
 \* E.G. Slope (ft/ft) \*0.000753 \* Area (sq ft) \* 1592.60 \* 601.26 \*  
 41.10 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 1945.87 \* 3143.85 \*  
 60.28 \*  
 \* Top width (ft) \* 790.57 \* Top width (ft) \* 714.91 \* 60.02 \*  
 15.63 \*  
 \* Vel Total (ft/s) \* 2.72 \* Avg. vel. (ft/s) \* 1.56 \* 5.23 \*  
 1.47 \*  
 \* Max Chl Dpth (ft) \* 10.92 \* Hydr. Depth (ft) \* 2.65 \* 10.02 \*  
 2.63 \*  
 \* Conv. Total (cfs) \*187692.8 \* Conv. (cfs) \* 70917.6 \*114578.2 \*  
 2196.9 \*  
 \* Length wtd. (ft) \* 86.10 \* Wetted Per. (ft) \* 471.77 \* 63.22 \*  
 17.03 \*  
 \* Min Ch El (ft) \* 802.00 \* Shear (lb/sq ft) \* 0.12 \* 0.45 \*  
 0.11 \*  
 \* Alpha \* 2.38 \* Stream Power (lb/ft s) \* 158.68 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.06 \* Cum volume (acre-ft) \* 107.77 \* 41.85 \*  
 64.72 \*  
 \* C & E Loss (ft) \* 0.02 \* Cum SA (acres) \* 31.37 \* 3.65 \*  
 13.97 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

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

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2603.43

INPUT  
 Description: S  
 Station Elevation Data num= 168

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Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-894.09	816.87	-876.52	814.4	-831.94	811.38	-830.85	811.3	-830.72	811.29
-823.48	810.55	-823.34	810.52	-820.05	810.19	-818.82	810.68	-818.75	810.7
-818.67	810.71	-815.87	811.16	-809.43	811	-784.07	810.46	-778.22	810.36
-745.9	810.51	-718.61	810.5	-715.28	810.48	-707.53	810.45	-704.06	810.44
-703.62	810.45	-664.69	810.04	-638.25	809.64	-625.96	809.74	-618.61	809.75
-599.23	809.86	-584.82	810.13	-569.62	810.31	-551.66	810.8	-528.92	811.45
-528.79	811.47	-527.09	811.55	-522.26	811.71	-510.94	811.18	-500.7	811.56
-476.48	811.6	-467.12	811.53	-464.76	811.52	-461.95	811.56	-432.04	811.7
-423.95	811.73	-418.48	811.69	-391.41	811.38	-372.01	811.72	-371.95	811.67
-370.07	811.7	-368.61	811.83	-363.43	811.89	-350.22	811.76	-349.4	811.76
-345.61	811.67	-321.9	811.34	-318.71	811.36	-304.07	810.9	-302.05	810.88
-294.79	810.9	-289.51	810.85	-280.21	810.76	-274.05	810.67	-272.54	810.58
-247.3	810.31	-242.95	810.26	-226.04	809.86	-208.97	809.51	-201.01	809.47
-196.58	809.5	-179.02	809.17	-163.54	808.91	-155.16	808.84	-147.64	808.66
-138.16	808.75	-136.69	808.74	-128.47	808.6	-126.5	808.4	-112.75	808.41
-101.83	808.22	-87.87	808.42	-79.46	808.57	-70.73	808.12	-56.58	807.63
-41.5	806.76	-36.54	806.63	-31.16	806.57	-28.47	806.55	-26.43	806.53
-26.25	806.42	-25.52	805.98	-22.05	802.88	-21.93	802.8	-21.2	802.12
-21.19	802.1	-21.17	802.09	-21.15	802.08	-21.12	802.07	-21.1	802.06
-21.08	802.04	-21.06	802.03	-21.03	802.02	-21.01	802	-3.33	802
0	802	8.49	802	12.86	802	19.91	802	21.64	802.22
23.61	802.46	24.81	802.61	25.62	802.71	26.21	802.79	26.65	802.84
27	802.88	27.27	802.92	27.5	802.95	27.69	802.97	27.71	802.97
27.85	802.99	27.99	803.01	28.11	803.02	28.22	803.04	28.31	803.05
28.39	803.06	28.47	803.07	28.54	803.08	28.6	803.08	28.65	803.09
28.7	803.1	28.75	803.1	28.79	803.11	28.83	803.11	28.87	803.12
28.9	803.12	28.93	803.12	28.96	803.13	28.99	803.13	29.01	803.14
29.04	803.14	29.06	803.14	29.08	803.14	29.1	803.15	29.12	803.15
29.14	803.15	29.16	803.15	29.37	803.21	29.76	803.33	29.88	803.36
35.8	806.62	35.86	806.64	36.09	806.68	36.39	806.71	46.81	807.54
52.56	807.93	59.22	809.23	65.51	809.86	65.97	809.9	73.35	810.89
79.45	811.7	80.35	811.82	80.79	811.87	94.07	812.91	95.32	813.03
98.75	813.24	107.94	813.92	114.81	814.09	117.15	814.33	128.42	814.96
128.96	814.96	139.38	815.3	141.42	815.61				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-894.09	.05	-26.43	.035	35.8	.05

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

-26.43	35.8	66	48.89	51	.1	.3
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Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
-894.09	-380	813	F

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 813.11	* Element	* Left OB	* Channel
Right OB *				
* Vel Head (ft)	* 0.22	* wt. n-val.	* 0.050	* 0.035
0.050 *				
* W.S. Elev (ft)	* 812.90	* Reach Len. (ft)	* 66.00	* 48.89
51.00 *				
* Crit w.s. (ft)	* 809.29	* Flow Area (sq ft)	* 1166.94	* 641.38
181.14 *				
* E.G. Slope (ft/ft)	* 0.000580	* Area (sq ft)	* 2150.45	* 641.38
181.14 *				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 1851.68	* 3022.74
275.58 *				



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* Top width (ft)	* 948.22	* Top Width (ft)	* 827.89	* 62.23	*
58.10 *					
* Vel Total (ft/s)	* 2.59	* Avg. vel. (ft/s)	* 1.59	* 4.71	*
1.52 *					
* Max Chl Dpth (ft)	* 10.90	* Hydr. Depth (ft)	* 3.30	* 10.31	*
3.12 *					
* Conv. Total (cfs)	*213762.6	* Conv. (cfs)	* 76858.4	*125465.8	*
11438.5 *					
* Length wtd. (ft)	* 52.86	* Wetted Per. (ft)	* 353.69	* 64.85	*
58.48 *					
* Min Ch El (ft)	* 802.00	* Shear (lb/sq ft)	* 0.12	* 0.36	*
0.11 *					
* Alpha	* 2.10	* Stream Power (lb/ft s)	* 141.42	* 0.00	*
0.00 *					
* Frctn Loss (ft)	* 0.04	* Cum Volume (acre-ft)	* 102.02	* 41.03	*
64.56 *					
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 29.00	* 3.57	*
13.92 *					

\*\*\*\*\*  
\*\*\*\*\*

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

CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 2554.54

INPUT

Description: T

Station Elevation Data		num= 139		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-980.71	816.65	-966.99	815.72	-911.36	811.71	-908.48	811.07	-902.49	810.68
-900.98	810.45	-899.91	810.48	-897.13	810.75	-896.07	811.03	-892.29	811.28
-887.6	811.56	-880.22	811.58	-864.67	810.85	-857.47	811.08	-844.2	810.59
-827.89	810.55	-810.53	810.54	-808.89	810.49	-793.01	810.03	-739.04	809.86
-733.68	809.8	-724.34	809.77	-692.73	809.42	-688.21	809.41	-662.05	809.38
-655.02	809.41	-652.17	809.09	-622.65	809.43	-607.5	809.45	-561.09	809.11
-552.41	809.15	-549.56	809.18	-504.79	809.52	-502.65	809.58	-492.03	810.02
-479.47	810.44	-478.93	810.37	-477.23	810.45	-472.11	810.51	-457.61	810.92
-451.18	810.99	-440.74	811.54	-437.51	811.53	-416.3	811.75	-415.69	811.75
-415.3	811.74	-414.24	811.88	-400.27	813.22	-381.79	814.19	-377.69	814.34
-372.13	814.15	-345.57	813.99	-344.8	813.99	-331.37	813.94	-304.29	813.83
-291.47	813.82	-282.04	813.66	-265.95	813.24	-255.64	813.03	-243.09	812.44
-238.48	812.34	-220.12	812.29	-217.37	812.29	-210.91	812.01	-200.05	811.45
-195.07	811.43	-178.84	811.24	-167.69	811.33	-160.54	811.31	-139.86	811.31
-129.03	811.32	-105.31	811.26	-98.54	811.22	-75.44	810.6	-68.79	810.44
-65.81	810.3	-51.67	809.76	-46.88	809.31	-43.87	809.05	-34.16	808.14
-31.74	807.97	-30.75	807.66	-29.78	807.07	-25.71	804.6	-25.19	804.28
-24.27	803.72	-20.91	801.64	-14.53	801.01	-13.49	800.98	-4.76	801.32
-4.06	801.36	-3.06	801.36	-3.03	801.36	-2.99	801.36	-2.95	801.36
-2.9	801.36	-2.84	801.37	-2.78	801.37	-2.17	801.38	0	801.42
13.69	801.68	15.73	802.24	21.21	803.74	26.6	805.12	29.74	806
30.15	806.06	30.83	806.16	30.99	806.18	37.76	807.72	42.93	807.76
45.16	807.86	51.27	808.01	53.64	808.06	72.68	808.47	86.63	808.59
94.2	808.73	118.85	810.47	122.89	810.79	123.74	810.9	152.29	815.32
160.72	815.76	161.08	815.74	161.18	815.74	161.39	815.75	161.98	815.77
171.11	815.96	171.87	815.94	183.22	815.73	183.71	815.73	184.32	815.73
184.46	815.73	188.65	815.68	189.99	815.55	191.72	815.42	192.1	815.42
192.46	815.56	192.97	815.92	193.47	816.19	198.2	817.61		

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Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -980.71 .05 -30.75 .035 37.76 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -30.75 37.76 83 59.92 60 .1 .3

Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 -950.83 -400.77 814.31 F

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \*\*\*\*\*  
 \* E.G. Elev (ft) \* 813.05 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.46 \* wt. n-val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 812.59 \* Reach Len. (ft) \* 83.00 \* 59.92 \*  
 60.00 \*  
 \* Crit W.S. (ft) \* 809.13 \* Flow Area (sq ft) \* 323.17 \* 652.71 \*  
 335.67 \*  
 \* E.G. slope (ft/ft) \*0.001076 \* Area (sq ft) \* 1590.28 \* 652.71 \*  
 335.67 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 412.62 \* 3989.14 \*  
 748.24 \*  
 \* Top width (ft) \* 897.47 \* Top width (ft) \* 732.09 \* 68.51 \*  
 96.87 \*  
 \* Vel Total (ft/s) \* 3.93 \* Avg. vel. (ft/s) \* 1.28 \* 6.11 \*  
 2.23 \*  
 \* Max Chl Dpth (ft) \* 11.61 \* Hydr. Depth (ft) \* 1.50 \* 9.53 \*  
 3.47 \*  
 \* Conv. Total (cfs) \*156984.4 \* Conv. (cfs) \* 12577.7 \*121598.6 \*  
 22808.2 \*  
 \* Length wtd. (ft) \* 60.85 \* Wetted Per. (ft) \* 215.63 \* 71.01 \*  
 97.09 \*  
 \* Min Ch El (ft) \* 800.98 \* Shear (lb/sq ft) \* 0.10 \* 0.62 \*  
 0.23 \*  
 \* Alpha \* 1.93 \* Stream Power (lb/ft s) \* 198.20 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.11 \* Cum Volume (acre-ft) \* 99.18 \* 40.30 \*  
 64.25 \*  
 \* C & E Loss (ft) \* 0.16 \* Cum SA (acres) \* 27.82 \* 3.50 \*  
 13.83 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

Warning: Divided flow computed for this cross-section.  
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.  
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2494.62

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INPUT

Description: U

Station Elevation Data

num=		156									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-901.35	819.77	-898.9	819.68	-886.47	820.26	-886.18	820.24	-885.75	820.23		
-841.45	821.6	-840.12	821.56	-806.37	822.34	-785.96	823.04	-779.51	823.39		
-775.49	823.42	-732.63	822.97	-727.51	822.6	-700.67	820.79	-683.4	819.64		
-672.38	818.49	-645.13	814.72	-642.97	814.69	-637.35	814.47	-612.34	816.41		
-601.72	817.34	-601.39	817.34	-600.17	817.07	-598.83	817.1	-597.4	817.13		
-597	817.19	-559.61	816.78	-549.11	816.72	-513.33	816.58	-509.48	816.55		
-501.47	816.51	-482.97	816.42	-471.22	816.35	-468.12	816.36	-441.85	816.15		
-401.4	815.76	-386.25	815.51	-373.26	815.48	-338.72	815.07	-334.28	815		
-307.86	814.49	-304.35	814.41	-304.01	814.45	-292.77	814.29	-291.75	814.28		
-289.24	814.25	-247.02	813.5	-239.27	813.37	-229.33	813.16	-224.65	813.15		
-224.32	813.11	-219.31	812.98	-213.16	812.98	-212.61	812.99	-211.09	813.02		
-185.27	813.13	-169.91	812.83	-165.7	812.79	-151.41	812.7	-129.64	812.5		
-109.68	812.37	-109.31	812.37	-108.95	812.36	-108.58	812.36	-108.22	812.36		
-107.85	812.35	-107.49	812.35	-107.13	812.35	-106.76	812.35	-106.4	812.34		
-106.04	812.34	-105.67	812.34	-105.31	812.33	-104.95	812.33	-104.59	812.33		
-104.23	812.32	-103.87	812.32	-103.51	812.32	-103.15	812.32	-102.79	812.31		
-102.43	812.31	-102.08	812.31	-101.72	812.3	-101.36	812.3	-101	812.3		
-100.65	812.29	-100.29	812.29	-99.94	812.29	-99.58	812.29	-99.23	812.28		
-98.87	812.28	-98.52	812.28	-98.16	812.27	-97.81	812.27	-97.46	812.27		
-97.11	812.27	-96.75	812.26	-96.4	812.26	-96.05	812.26	-95.7	812.25		
-95.35	812.25	-95	812.25	-94.65	812.24	-94.3	812.24	-93.95	812.24		
-93.6	812.24	-93.25	812.23	-92.91	812.23	-92.56	812.23	-92.21	812.22		
-91.87	812.22	-69.56	811.87	-68.96	811.86	-68.67	811.86	-68.37	811.85		
-68.07	811.85	-67.77	811.85	-67.48	811.84	-67.18	811.84	-66.88	811.84		
-64.43	811.75	-59.97	811.56	-52.47	811.16	-40.27	810.34	-37.57	810.15		
-35.22	809.68	-24.96	807.08	-20.95	804.26	-14.73	800.24	-13.47	800		
-6.97	799.17	-.36	799.4	0	799.4	2.38	799.36	7.84	799.97		
11.93	800.16	12.41	800.45	18.41	802.84	21.85	805.15	24.59	805.51		
32	807.83	33.12	808.4	33.79	808.65	34.78	808.68	36.69	808.9		
48.53	811.75	50.46	811.83	176.11	811.85	190.55	814.5	192.96	815		
193.65	815.27	197.2	815.43	197.28	815.43	197.36	815.43	204.13	815.64		
209.81	815.78										

Manning's n Values

num=		3			
Sta	n Val	Sta	n Val	Sta	n Val
-901.35	.05	-35.22	.035	32	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -35.22 32 170 76.77 86 .1 .3

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 -901.35 -25.4 812 T  
 21.09 209.81 812 T

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 812.78	* Element	* Left OB	* Channel	*
Right OB					
* Vel Head (ft)	* 2.03	* Wt. n-Val.	*	* 0.035	*
* W.S. Elev (ft)	* 810.75	* Reach Len. (ft)	* 19.58	* 19.58	*
19.58					
* Crit w.s. (ft)	* 808.31	* Flow Area (sq ft)	*	* 450.53	*
* E.G. slope (ft/ft)	* 0.003845	* Area (sq ft)	* 4.61	* 522.85	*
17.40					

```

* Q Total (cfs) * 5150.00 * Flow (cfs) * * 5150.00 *
* Top Width (ft) * 90.80 * Top Width (ft) * 11.20 * 67.22 *
12.39 *
* Vel Total (ft/s) * 11.43 * Avg. vel. (ft/s) * * 11.43 *
* Max Chl Dpth (ft) * 11.58 * Hydr. Depth (ft) * * 9.69 *
* Conv. Total (cfs) * 83057.4 * Conv. (cfs) * * 83057.4 *
* Length Wtd. (ft) * 19.58 * Wetted Per. (ft) * * 49.79 *
* Min Ch El (ft) * 799.17 * Shear (lb/sq ft) * * 2.17 *
* Alpha * 1.00 * Stream Power (lb/ft s) * 209.81 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.09 * Cum volume (acre-ft) * 97.66 * 39.49 *
64.01 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 27.11 * 3.40 *
13.75 *
*****
*****

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BRIDGE

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2460.04

INPUT

Description:  
 Distance from Upstream XS = 19.58  
 Deck/Roadway Width = 30  
 Weir Coefficient = 2.6  
 Upstream Deck/Roadway Coordinates  
 num= 5

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-167.99	812	0	-50.53	812	0	-22.88	812	810.5						
42.47	812	810.5	99.43	812	0									

Upstream Bridge Cross Section Data

Station Elevation Data num= 156

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-901.35	819.77	-898.9	819.68	-886.47	820.26	-886.18	820.24	-885.75	820.23
-841.45	821.6	-840.12	821.56	-806.37	822.34	-785.96	823.04	-779.51	823.39
-775.49	823.42	-732.63	822.97	-727.51	822.6	-700.67	820.79	-683.4	819.64
-672.38	818.49	-645.13	814.72	-642.97	814.69	-637.35	814.47	-612.34	816.41
-601.72	817.34	-601.39	817.34	-600.17	817.07	-598.83	817.1	-597.4	817.13
-597	817.19	-559.61	816.78	-549.11	816.72	-513.33	816.58	-509.48	816.55
-501.47	816.51	-482.97	816.42	-471.22	816.35	-468.12	816.36	-441.85	816.15
-401.4	815.76	-386.25	815.51	-373.26	815.48	-338.72	815.07	-334.28	815
-307.86	814.49	-304.35	814.41	-304.01	814.45	-292.77	814.29	-291.75	814.28
-289.24	814.25	-247.02	813.5	-239.27	813.37	-229.33	813.16	-224.65	813.15
-224.32	813.11	-219.31	812.98	-213.16	812.98	-212.61	812.99	-211.09	813.02
-185.27	813.13	-169.91	812.83	-165.7	812.79	-151.41	812.7	-129.64	812.5
-109.68	812.37	-109.31	812.37	-108.95	812.36	-108.58	812.36	-108.22	812.36
-107.85	812.35	-107.49	812.35	-107.13	812.35	-106.76	812.35	-106.4	812.34
-106.04	812.34	-105.67	812.34	-105.31	812.33	-104.95	812.33	-104.59	812.33
-104.23	812.32	-103.87	812.32	-103.51	812.32	-103.15	812.32	-102.79	812.31
-102.43	812.31	-102.08	812.31	-101.72	812.3	-101.36	812.3	-101	812.3
-100.65	812.29	-100.29	812.29	-99.94	812.29	-99.58	812.29	-99.23	812.28

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-98.87	812.28	-98.52	812.28	-98.16	812.27	-97.81	812.27	-97.46	812.27
-97.11	812.27	-96.75	812.26	-96.4	812.26	-96.05	812.26	-95.7	812.25
-95.35	812.25	-95	812.25	-94.65	812.24	-94.3	812.24	-93.95	812.24
-93.6	812.24	-93.25	812.23	-92.91	812.23	-92.56	812.23	-92.21	812.22
-91.87	812.22	-69.56	811.87	-68.96	811.86	-68.67	811.86	-68.37	811.85
-68.07	811.85	-67.77	811.85	-67.48	811.84	-67.18	811.84	-66.88	811.84
-64.43	811.75	-59.97	811.56	-52.47	811.16	-40.27	810.34	-37.57	810.15
-35.22	809.68	-24.96	807.08	-20.95	804.26	-14.73	800.24	-13.47	800
-6.97	799.17	-.36	799.4	0	799.4	2.38	799.36	7.84	799.97
11.93	800.16	12.41	800.45	18.41	802.84	21.85	805.15	24.59	805.51
32	807.83	33.12	808.4	33.79	808.65	34.78	808.68	36.69	808.9
48.53	811.75	50.46	811.83	176.11	811.85	190.55	814.5	192.96	815
193.65	815.27	197.2	815.43	197.28	815.43	197.36	815.43	204.13	815.64
209.81	815.78								

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -901.35 .05 -35.22 .035 32 .05

Bank Sta: Left Right Coeff Contr. Expan.  
 -35.22 32 .1 .3  
 Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 -901.35 -25.4 812 T  
 21.09 209.81 812 T

Downstream Deck/Roadway Coordinates num= 7  
 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
 \*\*\*\*\*  
 -420 816 0 -276 814 0 -24.02 812 810.5  
 42.47 812 810.5 46.81 812 810.5 99.43 812 0  
 164.68 812 0

Downstream Bridge Cross Section Data Station Elevation Data num= 171  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 \*\*\*\*\*  
 -477.65 831.11 -469.76 829.04 -465.75 827.61 -459.64 827.13 -454.24 826.73  
 -429.04 816.19 -422.12 813.11 -420.53 812.35 -394.94 809.37 -383.41 809.07  
 -378.05 808.85 -362.6 808.46 -337.2 807.25 -336.84 807.26 -334.9 807.26  
 -334.48 807.27 -333.18 807.27 -332.72 807.28 -330.79 807.28 -326.17 807.36  
 -325.5 807.37 -323.36 807.43 -320.98 807.49 -319.25 807.53 -318.33 807.56  
 -317.38 807.58 -316.39 807.61 -315.36 807.63 -312 807.72 -309.5 807.78  
 -308.17 807.82 -306.77 807.85 -303.76 807.93 -300.44 808.01 -296.75 808.11  
 -294.75 808.16 -294.61 808.16 -291.67 808.2 -291.57 808.2 -288.52 808.25  
 -288.31 808.25 -285.37 808.29 -285.05 808.29 -282.23 808.33 -281.79 808.34  
 -279.09 808.37 -278.53 808.38 -275.96 808.41 -275.27 808.42 -269.71 808.49  
 -268.76 808.5 -266.59 808.53 -263.48 808.56 -262.25 808.57 -260.37 808.6  
 -257 808.64 -254.17 808.7 -251.68 808.76 -250.54 808.79 -248.46 808.83  
 -247.5 808.86 -246.15 808.86 -245.27 808.88 -243.84 808.89 -243.04 808.91  
 -241.53 808.92 -240.81 808.93 -239.21 808.94 -238.58 808.95 -236.88 808.96  
 -236.35 808.97 -234.55 808.98 -234.11 808.99 -232.22 808.99 -231.87 809  
 -229.88 809 -229.63 809.01 -224.18 809.01 -222.72 809 -220.7 808.98  
 -217.89 808.96 -216.87 808.95 -216.02 808.94 -215.31 808.94 -214.7 808.93  
 -214.17 808.93 -213.71 808.92 -212.62 808.92 -212.33 808.91 -211.41 808.91  
 -211.22 808.9 -209.11 808.9 -208.41 808.91 -206.39 808.91 -205.65 808.92  
 -125.39 811.11 -124.94 811.11 -124.48 811.13 -124.02 811.12 -123.56 811.14  
 -123.11 811.13 -122.65 811.15 -122.19 811.16 -121.73 811.16 -121.27 811.17  
 -119.9 811.17 -119.43 811.16 -117.53 811.16 -117.06 811.15 -113.73 811.15  
 -113.26 811.14 -109.94 811.14 -109.46 811.13 -106.14 811.13 -105.65 811.12  
 -102.34 811.12 -101.85 811.11 -99.49 811.11 -99 811.1 -95.69 811.1

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-95.2	811.09	-92.84	811.09	-92.34	811.08	-89.04	811.08	-88.54	811.07
-86.19	811.07	-85.69	811.06	-83.35	811.06	-82.83	811.05	-80.5	811.05
-79.98	811.04	-76.7	811.04	-76.17	811.03	-73.85	811.03	-73.32	811.02
-72.37	811.02	-72.05	810.91	-53.17	810.86	-48.44	810.69	-37.84	809.07
-30	808.33	-25.59	807.53	-22.23	806.22	-16.85	802.25	-15.05	800.91
-13.8	799.95	-13.33	799.82	-8.16	798.5	-6.82	798.57	-.39	798.8
0	798.79	1.29	798.75	6.69	799.12	8.2	799.53	13.28	800.39
15.02	801.97	21.15	805.17	21.66	805.28	26.21	805.85	26.67	805.91
30.12	807.2	37.5	809.93	37.87	810.04	38.14	810.11	39	810.16
69.62	812.05	85.89	812.92	93.96	813.4	98.67	813.65	100.06	813.69
126.28	814.65								

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -477.65 .05 -22.23 .035 21.15 .05

Bank Sta: Left Right Coeff Contr. Expan.  
 -22.23 21.15 .1 .3  
 Ineffective Flow num= 3  
 Sta L Sta R Elev Permanent  
 -410 -126.25 812.82 F  
 -50 -27 811.25 T  
 25 50 811.25 T

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

Number of Bridge Coefficient Sets = 1

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

High Flow Method  
 Energy Only

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

BRIDGE OUTPUT Profile #100-Year

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* E.G. US. (ft)	*	812.78	* Element	* Inside BR US
* Inside BR DS *				
* W.S. US. (ft)	*	810.75	* E.G. Elev (ft)	* 812.67 *
812.49 *				
* Q Total (cfs)	*	5150.00	* W.S. Elev (ft)	* 810.37 *
810.33 *				
* Q Bridge (cfs)	*	5150.00	* Crit w.s. (ft)	* 808.28 *
808.24 *				
* Q Weir (cfs)	*		* Max Chl Dpth (ft)	* 11.20 *
11.83 *				
* Weir Sta Lft (ft)	*		* Vel Total (ft/s)	* 12.17 *

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11.47 *
* Weir Sta Rgt (ft) * * Flow Area (sq ft) * 423.32 *
449.03 *
* Weir Submerg * * Froude # Ch1 * 0.64 *
0.60 *
* Weir Max Depth (ft) * * Specif Force (cu ft) * 4044.19 *
4095.24 *
* Min El Weir Flow (ft) * 812.01 * Hydr Depth (ft) * 9.63 *
9.15 *
* Min El Prs (ft) * 810.50 * W.P. Total (ft) * 51.63 *
57.22 *
* Delta EG (ft) * 0.41 * Conv. Total (cfs) * 73074.8 *
79031.8 *
* Delta WS (ft) * 0.56 * Top Width (ft) * 65.36 *
65.79 *
* BR Open Area (sq ft) * 429.04 * Frctn Loss (ft) * 0.14 *
0.12 *
* BR Open Vel (ft/s) * 12.17 * C & E Loss (ft) * 0.04 *
0.00 *
* Coef of Q * * Shear Total (lb/sq ft) * 2.54 *
2.08 *
* Br Sel Method *Energy only * Power Total (lb/ft s) * -901.35 *
-477.65 *

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

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2417.85

INPUT

Description: V

Station		Elevation Data		num= 171		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-477.65	831.11	-469.76	829.04	-465.75	827.61	-459.64	827.13	-454.24	826.73
-429.04	816.19	-422.12	813.11	-420.53	812.35	-394.94	809.37	-383.41	809.07
-378.05	808.85	-362.6	808.46	-337.2	807.25	-336.84	807.26	-334.9	807.26
-334.48	807.27	-333.18	807.27	-332.72	807.28	-330.79	807.28	-326.17	807.36
-325.5	807.37	-323.36	807.43	-320.98	807.49	-319.25	807.53	-318.33	807.56
-317.38	807.58	-316.39	807.61	-315.36	807.63	-312	807.72	-309.5	807.78
-308.17	807.82	-306.77	807.85	-303.76	807.93	-300.44	808.01	-296.75	808.11
-294.75	808.16	-294.61	808.16	-291.67	808.2	-291.57	808.2	-288.52	808.25
-288.31	808.25	-285.37	808.29	-285.05	808.29	-282.23	808.33	-281.79	808.34
-279.09	808.37	-278.53	808.38	-275.96	808.41	-275.27	808.42	-269.71	808.49
-268.76	808.5	-266.59	808.53	-263.48	808.56	-262.25	808.57	-260.37	808.6
-257	808.64	-254.17	808.7	-251.68	808.76	-250.54	808.79	-248.46	808.83
-247.5	808.86	-246.15	808.86	-245.27	808.88	-243.84	808.89	-243.04	808.91
-241.53	808.92	-240.81	808.93	-239.21	808.94	-238.58	808.95	-236.88	808.96
-236.35	808.97	-234.55	808.98	-234.11	808.99	-232.22	808.99	-231.87	809
-229.88	809	-229.63	809.01	-224.18	809.01	-222.72	809	-220.7	808.98
-217.89	808.96	-216.87	808.95	-216.02	808.94	-215.31	808.94	-214.7	808.93
-214.17	808.93	-213.71	808.92	-212.62	808.92	-212.33	808.91	-211.41	808.91
-211.22	808.9	-209.11	808.9	-208.41	808.91	-206.39	808.91	-205.65	808.92
-125.39	811.11	-124.94	811.11	-124.48	811.13	-124.02	811.12	-123.56	811.14
-123.11	811.13	-122.65	811.15	-122.19	811.16	-121.73	811.16	-121.27	811.17
-119.9	811.17	-119.43	811.16	-117.53	811.16	-117.06	811.15	-113.73	811.15
-113.26	811.14	-109.94	811.14	-109.46	811.13	-106.14	811.13	-105.65	811.12

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-102.34	811.12	-101.85	811.11	-99.49	811.11	-99	811.1	-95.69	811.1
-95.2	811.09	-92.84	811.09	-92.34	811.08	-89.04	811.08	-88.54	811.07
-86.19	811.07	-85.69	811.06	-83.35	811.06	-82.83	811.05	-80.5	811.05
-79.98	811.04	-76.7	811.04	-76.17	811.03	-73.85	811.03	-73.32	811.02
-72.37	811.02	-72.05	810.91	-53.17	810.86	-48.44	810.69	-37.84	809.07
-30	808.33	-25.59	807.53	-22.23	806.22	-16.85	802.25	-15.05	800.91
-13.8	799.95	-13.33	799.82	-8.16	798.5	-6.82	798.57	-.39	798.8
0	798.79	1.29	798.75	6.69	799.12	8.2	799.53	13.28	800.39
15.02	801.97	21.15	805.17	21.66	805.28	26.21	805.85	26.67	805.91
30.12	807.2	37.5	809.93	37.87	810.04	38.14	810.11	39	810.16
69.62	812.05	85.89	812.92	93.96	813.4	98.67	813.65	100.06	813.69
126.28	814.65								

Manning's n values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-477.65	.05	-22.23	.035	21.15	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-22.23	21.15		91 63.32	62	.1	.3
Ineffective Flow			num=	3			
Sta L	Sta R	Elev	Permanent				
-410	-126.25	812.82	F				
-50	-27	811.25	T				
25	50	811.25	T				

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 812.37	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 2.18	* wt. n-val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 810.20	* Reach Len. (ft)	* 91.00	* 63.32
62.00				
* Crit w.s. (ft)	* 808.31	* Flow Area (sq ft)	* 14.74	* 416.10
18.26				
* E.G. slope (ft/ft)	* 0.004379	* Area (sq ft)	* 413.33	* 416.10
50.39				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 59.31	* 4989.97
100.72				
* Top width (ft)	* 328.02	* Top Width (ft)	* 266.19	* 43.38
18.45				
* Vel Total (ft/s)	* 11.47	* Avg. vel. (ft/s)	* 4.02	* 11.99
5.52				
* Max Chl Dpth (ft)	* 11.70	* Hydr. Depth (ft)	* 3.09	* 9.59
4.74				
* Conv. Total (cfs)	* 77824.9	* Conv. (cfs)	* 896.3	* 75406.6
1522.0				
* Length wtd. (ft)	* 68.21	* wetted Per. (ft)	* 5.04	* 47.18
3.89				
* Min Ch El (ft)	* 798.50	* Shear (lb/sq ft)	* 0.80	* 2.41
1.28				
* Alpha	* 1.07	* Stream Power (lb/ft s)	* 126.28	* 0.00
0.00				
* Frctn Loss (ft)	* 0.10	* Cum volume (acre-ft)	* 97.53	* 38.70
63.95				
* C & E Loss (ft)	* 0.57	* Cum SA (acres)	* 27.02	* 3.32
13.72				

Warning: Divided flow computed for this cross-section.



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

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

This may indicate the need for additional cross sections.

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

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek

RS: 2354.53

INPUT

Description: W

Station Elevation Data num= 273

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-500.98	823.09	-475.76	815.71	-473	814.91	-469.19	814.37	-464.75	813.08
-456.29	811.56	-452.29	810.91	-442.76	810.55	-436.56	810.3	-393.36	808.35
-372.59	807.93	-360.28	807.95	-359.42	807.95	-358.55	807.96	-357.68	807.96
-356.8	807.97	-355.93	807.97	-355.05	807.98	-354.16	807.98	-353.27	807.99
-352.39	807.99	-351.49	808	-350.6	808	-349.7	808.01	-348.79	808.01
-347.89	808.02	-346.98	808.02	-346.07	808.03	-345.15	808.03	-344.24	808.04
-343.31	808.04	-342.39	808.05	-341.46	808.05	-340.53	808.06	-339.59	808.06
-338.66	808.07	-337.71	808.07	-336.77	808.08	-335.82	808.08	-334.87	808.09
-333.91	808.09	-332.96	808.1	-331.99	808.1	-331.03	808.11	-330.06	808.11
-328.11	808.13	-327.13	808.13	-326.15	808.14	-325.16	808.14	-324.17	808.15
-323.17	808.15	-322.18	808.16	-321.18	808.16	-319.16	808.18	-318.15	808.18
-317.13	808.19	-316.11	808.19	-315.09	808.2	-314.06	808.2	-311.99	808.22
-310.95	808.22	-309.91	808.23	-308.86	808.23	-307.81	808.24	-306.75	808.24
-304.63	808.26	-303.56	808.26	-302.49	808.27	-301.41	808.27	-299.25	808.29
-298.16	808.29	-295.97	808.31	-294.87	808.31	-293.77	808.32	-292.66	808.32
-290.42	808.34	-289.3	808.34	-288.17	808.35	-287.04	808.35	-284.76	808.37
-283.62	808.37	-281.32	808.39	-280.16	808.39	-277.83	808.41	-276.65	808.41
-274.29	808.43	-273.11	808.43	-270.72	808.45	-269.52	808.45	-267.1	808.47
-265.89	808.47	-262.33	808.5	-261.12	808.5	-256.41	808.54	-255.17	808.54
-254.04	808.55	-253.97	808.55	-252.85	808.56	-252.78	808.56	-251.67	808.57
-251.59	808.57	-250.48	808.58	-249.3	808.58	-249.21	808.59	-248.02	808.59
-246.93	808.6	-246.82	808.6	-245.75	808.61	-245.63	808.61	-244.57	808.62
-243.51	808.62	-242.47	808.63	-242.34	808.63	-241.3	808.64	-241.16	808.64
-240.14	808.65	-239.98	808.65	-238.97	808.66	-237.62	808.66	-236.64	808.67
-236.45	808.67	-235.47	808.68	-235.27	808.68	-234.3	808.69	-233.14	808.69
-232.91	808.7	-231.73	808.7	-230.81	808.71	-230.56	808.71	-229.65	808.72
-229.38	808.72	-228.49	808.73	-227.33	808.73	-227.02	808.74	-225.84	808.74
-225.01	808.75	-224.67	808.75	-223.85	808.76	-223.49	808.76	-222.69	808.77
-221.54	808.77	-221.13	808.78	-219.96	808.78	-219.23	808.79	-218.78	808.79
-218.08	808.8	-216.93	808.8	-216.42	808.81	-215.78	808.81	-215.24	808.82
-214.07	808.82	-213.5	808.83	-212.89	808.83	-212.36	808.84	-211.22	808.84
-210.53	808.85	-210.09	808.85	-209.35	808.86	-208.18	808.86	-207.84	808.87
-206.72	808.87	-205.82	808.88	-205.62	808.88	-204.64	808.89	-204.51	808.89
-203.46	808.9	-201.16	808.9	-200.9	808.91	-198.19	808.91	-198.07	808.92
-196.33	808.92	-196.11	808.93	-194.44	808.93	-194.08	808.94	-192.3	808.94
-191.74	808.95	-190.43	808.95	-189.66	808.96	-189.04	808.96	-187.97	808.97
-187.81	808.97	-186.47	808.98	-186.13	808.98	-184.95	808.99	-184.44	808.99
-183.41	809	-182.76	809	-181.85	809.01	-181.07	809.01	-180.28	809.02
-179.38	809.02	-178.69	809.03	-177.7	809.03	-177.1	809.04	-176.01	809.04
-175.49	809.05	-174.33	809.05	-173.88	809.06	-172.64	809.07	-172.26	809.07
-170.96	809.08	-170.64	809.08	-169.27	809.09	-169.01	809.09	-167.59	809.1
-167.37	809.1	-165.9	809.11	-165.74	809.11	-164.22	809.12	-164.1	809.12
-162.53	809.13	-162.45	809.13	-159.16	809.15	-158.92	809.15	-158.11	809.16
-157.18	809.16	-156.25	809.17	-155.32	809.17	-153.5	809.19	-152.59	809.19

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-151.7	809.2	-150.81	809.2	-149.92	809.21	-143.84	809.14	-140.97	809.14
-139.56	809.13	-131.4	809.13	-130.09	809.12	-122.5	809.12	-121.28	809.11
-113.06	809.11	-111.93	809.1	-103.26	809.1	-102.22	809.09	-94.24	809.09
-93.28	809.08	-72.9	809.08	-53.64	808.83	-53.3	808.83	-42.92	808.79
-36.84	808.13	-23.47	806.92	-19.51	804.16	-12.79	800.05	-10.78	799.14
-7.5	798.07	-3.16	797.95	-.23	798.13	0	798.16	7.77	799.04
12.76	799.53	14.53	799.99	19.12	802.85	22.1	804.84	29.43	805.45
40.13	805.82	47.52	806.56	48.05	806.59	49.68	806.84	53.14	806.92
59.06	807.23	74.02	807.96	88.07	809.49	111.46	811.68	126.83	812.75
130.88	812.86	132.22	812.98	148.01	813.9	183.36	815.24	188.34	815.39
189.8	815.43	195.35	815.57	196.04	814.68				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-500.98	.05	-23.47	.035	22.1	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-23.47	22.1		144	48.15	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 811.70 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.27 * Wt. n-Val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 811.43 * Reach Len. (ft) * 144.00 * 48.15 *
69.00 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 1143.18 * 501.79 *
313.90 *
* E.G. slope (ft/ft) *0.000761 * Area (sq ft) * 1143.18 * 501.79 *
313.90 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 1792.52 * 2751.89 *
605.58 *
* Top width (ft) * 564.25 * Top Width (ft) * 432.01 * 45.57 *
86.67 *
* Vel Total (ft/s) * 2.63 * Avg. Vel. (ft/s) * 1.57 * 5.48 *
1.93 *
* Max Chl Dpth (ft) * 13.48 * Hydr. Depth (ft) * 2.65 * 11.01 *
3.62 *
* Conv. Total (cfs) *186678.6 * Conv. (cfs) * 64975.9 * 99751.3 *
21951.4 *
* Length Wtd. (ft) * 85.74 * Wetted Per. (ft) * 432.21 * 49.52 *
86.96 *
* Min Ch El (ft) * 797.95 * Shear (lb/sq ft) * 0.13 * 0.48 *
0.17 *
* Alpha * 2.51 * Stream Power (lb/ft s) * 196.04 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.06 * Cum Volume (acre-ft) * 95.90 * 38.04 *
63.69 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 26.29 * 3.25 *
13.65 *
*****
*****
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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2306.38

INPUT

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Description: X

Station Elevation Data		num= 140		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-600	815.04	-596.19	813.22	-584.78	812.21	-583.55	812.22	-579.05		812	
-578.87	811.96	-558.88	811.42	-541.39	811.12	-534.26	811.07	-528.51		810.88	
-490.74	810.6	-487.37	810.58	-487.09	810.57	-483.51	810.51	-442.65		810.06	
-413.39	808.76	-404	808.13	-396.13	807.99	-392.09	807.99	-391.95		808	
-390.23	808	-390.08	808.01	-388.39	808.01	-388.23	808.02	-386.4		808.02	
-386.23	808.03	-384.64	808.03	-384.45	808.04	-382.75	808.04	-382.56		808.05	
-380.95	808.05	-380.74	808.06	-379.03	808.06	-378.81	808.07	-376.99		808.07	
-376.75	808.08	-375.31	808.08	-375.06	808.09	-373.27	808.09	-373.01		808.1	
-371.39	808.1	-371.11	808.11	-369.69	808.11	-369.4	808.12	-270.12		808.39	
-269.44	808.39	-268.76	808.4	-268.07	808.4	-267.39	808.41	-266.7		808.41	
-266	808.42	-265.31	808.42	-264.61	808.43	-263.21	808.43	-262.51		808.44	
-261.8	808.44	-261.09	808.45	-260.38	808.45	-259.66	808.46	-258.94		808.46	
-258.22	808.47	-257.5	808.47	-256.77	808.48	-256.04	808.48	-255.31		808.49	
-254.57	808.49	-253.84	808.5	-252.35	808.5	-251.61	808.51	-250.86		808.51	
-250.1	808.52	-249.35	808.52	-248.59	808.53	-247.83	808.53	-247.07		808.54	
-246.3	808.54	-245.53	808.55	-244.76	808.55	-243.98	808.56	-243.2		808.56	
-242.42	808.57	-241.63	808.57	-240.85	808.58	-240.05	808.58	-239.26		808.59	
-238.46	808.59	-237.66	808.6	-221.08	808.63	-194.05	808.39	-190.81		808.4	
-189.5	808.43	-176.68	808.62	-165.82	808.85	-165.44	808.85	-165.05		808.86	
-163.92	808.86	-163.54	808.87	-162.06	808.87	-161.7	808.88	-160.61		808.88	
-67.79	807.94	-61.68	807.94	-61.46	807.95	-55.48	807.95	-55.3		807.96	
-53.7	807.96	-46.53	807.87	-42.07	807.83	-25.4	807	-23.53		805.77	
-14.98	799.89	-14.31	799.59	-10.39	798.34	-9.53	798.4	-4.34		798.44	
0	798.76	2.37	798.93	3.33	799.04	3.92	799.19	9.66		800.26	
13.12	802.38	17.84	805.01	36.45	805.24	44.58	806.39	58.79		806.64	
63.08	806.74	90.19	807.54	99.16	807.86	114.68	808.3	122.11		808.58	
141.52	810.58	154.18	811.63	158.79	812.07	163.4	812.37	166.83		812.49	
196.42	813.78	204.95	814.18	207.15	814.28	209.93	814.36	240.28		815.28	

Manning's n Values		num= 3		Sta		n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-600	.05	-25.4	.035	17.84	.05		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-25.4	17.84		90	51.84	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.61	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.19	* wt. n-val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 811.42	* Reach Len. (ft)	* 90.00	* 51.84
42.00				
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 1354.51	* 461.50
516.45				
* E.G. Slope (ft/ft)	*0.000648	* Area (sq ft)	* 1354.51	* 461.50
516.45				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 1906.69	* 2283.32
959.99				
* Top width (ft)	* 710.67	* Top width (ft)	* 533.59	* 43.24
133.84				
* Vel Total (ft/s)	* 2.21	* Avg. Vel. (ft/s)	* 1.41	* 4.95
1.86				
* Max Chl Dpth (ft)	* 13.08	* Hydr. Depth (ft)	* 2.54	* 10.67
3.86				
* Conv. Total (cfs)	*202300.6	* Conv. (cfs)	* 74897.8	* 89692.8

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37710.1 *
* Length Wtd. (ft) * 65.18 * Wetted Per. (ft) * 533.69 * 47.12 *
134.10 *
* Min Ch El (ft) * 798.34 * Shear (lb/sq ft) * 0.10 * 0.40 *
0.16 *
* Alpha * 2.51 * Stream Power (lb/ft s) * 240.28 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.04 * Cum Volume (acre-ft) * 91.77 * 37.50 *
63.03 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 24.70 * 3.20 *
13.47 *
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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2254.54

INPUT

Description: Y

Station Elevation Data

num= 228

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-710.8	813.44	-709.97	813.28	-708.61	813.03	-707.74	812.99	-702.01	812.28
-700	811.99	-699.21	811.96	-699.07	811.96	-686.39	811.6	-681.01	811.55
-658.05	811.53	-637	811.35	-632.92	811.32	-619.88	810.88	-619.82	810.63
-610.1	808.98	-609.64	808.98	-609.18	808.97	-607.32	808.97	-606.84	808.96
-605.42	808.96	-604.93	808.95	-603.67	808.96	-603.19	808.97	-602.19	808.97
-601.67	808.98	-601.18	808.98	-600.67	808.99	-600.17	808.99	-599.67	809
-599.16	809	-598.66	809.01	-598.16	809.01	-597.66	809.02	-597.15	809.02
-595.66	809.05	-595.17	809.05	-593.69	809.08	-593.22	809.08	-592.71	809.09
-592.25	809.1	-591.73	809.11	-591.28	809.11	-590.76	809.12	-590.31	809.13
-589.23	809.15	-588.85	809.16	-588.28	809.17	-587.9	809.17	-587.32	809.18
-586.95	809.19	-586.37	809.2	-586	809.21	-585.41	809.21	-583.55	809.24
-582.89	809.26	-582.25	809.27	-579.5	809.33	-579.19	809.34	-578.43	809.36
-578.14	809.37	-577.37	809.4	-577.08	809.4	-576.3	809.43	-576	809.44
-575.19	809.46	-574.91	809.47	-574.09	809.49	-573.57	809.51	-572.68	809.53
-572.44	809.54	-571.59	809.57	-571.36	809.57	-570.49	809.6	-570.28	809.6
-569.39	809.63	-569.2	809.64	-568.29	809.66	-568.11	809.67	-567.18	809.7
-567.02	809.7	-566.07	809.73	-565.93	809.73	-564.96	809.76	-564.84	809.76
-563.85	809.79	-563.74	809.8	-562.74	809.83	-562.65	809.83	-561.62	809.86
-561.55	809.86	-560.51	809.89	-560.45	809.89	-559.39	809.92	-558.26	809.96
-558.14	809.96	-557.05	809.99	-556.82	810	-556	810	-554.99	810.01
-553.02	810.01	-552.06	810.02	-551.11	810.02	-543.84	810	-501.31	810
-501.07	809.99	-499.91	809.97	-498.78	809.94	-497.68	809.92	-496.71	809.9
-495.76	809.87	-494.82	809.85	-494.24	809.85	-493.22	809.82	-493.12	809.82
-492.13	809.79	-491.86	809.78	-490.87	809.75	-489.9	809.73	-488.97	809.7
-488.8	809.7	-487.94	809.67	-487.75	809.67	-486.9	809.65	-486.7	809.64
-485.87	809.62	-485.65	809.62	-484.82	809.6	-484.59	809.59	-483.78	809.57
-483.54	809.57	-482.73	809.55	-482.48	809.54	-481.69	809.52	-481.41	809.52
-480.63	809.5	-480.55	809.5	-480.26	809.49	-479.63	809.49	-479.33	809.48
-478.73	809.48	-478.42	809.47	-477.54	809.45	-477.22	809.44	-476.36	809.42
-476.02	809.41	-475.18	809.39	-474.82	809.39	-474	809.36	-473.62	809.36
-472.82	809.33	-472.36	809.33	-470.39	809.28	-469.96	809.28	-469.2	809.26
-468.76	809.25	-468.02	809.23	-467.57	809.23	-446.83	808.86	-445.12	808.82
-443.57	808.78	-442.84	808.76	-442.78	808.76	-423.48	808.33	-423.16	808.32
-422.85	808.32	-422.26	808.3	-421.99	808.3	-411.23	808	-355.26	808
-305.73	808.14	-305.47	808.15	-304.16	808.15	-303.9	808.16	-302.55	808.16
-302.28	808.17	-301.17	808.17	-300.89	808.18	-299.47	808.18	-299.19	808.19
-298.02	808.19	-297.73	808.2	-296.54	808.2	-296.23	808.21	-295.01	808.21
-294.7	808.22	-293.45	808.22	-293.13	808.23	-252.94	808.31	-239.24	808.19

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-207.69	808.26	-176.3	808.43	-167.71	808.62	-50.35	807.51	-26.21	806.95
-22.65	804.84	-15.41	799.87	-12.68	798.81	-11.48	798.53	-7.82	799.05
-5.45	799.34	-.27	799.85	0	799.86	1.79	799.91	8.44	800.17
10.39	800.27	12.02	801.53	18.58	804.69	33.45	805.08	33.64	805.09
33.75	805.11	41.59	806.49	61.29	806.74	63.84	806.78	69.72	806.8
99.43	807.45	99.94	807.47	126.43	807.87	140.95	808.4	142.39	808.43
163.62	809.25	175.01	810.36	176.19	810.47	193.42	812.18	221.23	813.76
226.1	814.12	234.24	814.56	253.92	815.17				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-710.8	.05	-26.21	.035	18.58	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-26.21	18.58		90	50		.1	.3

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 811.56 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.12 * Wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 811.43 * Reach Len. (ft) * 90.00 * 50.00 *
45.00 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 1721.13 * 463.64 *
639.25 *
* E.G. Slope (ft/ft) *0.000476 * Area (sq ft) * 1721.13 * 463.64 *
639.25 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 2201.24 * 1937.17 *
1011.60 *
* Top Width (ft) * 832.81 * Top width (ft) * 620.69 * 44.79 *
167.33 *
* Vel Total (ft/s) * 1.82 * Avg. Vel. (ft/s) * 1.28 * 4.18 *
1.58 *
* Max Chl Dpth (ft) * 12.90 * Hydr. Depth (ft) * 2.77 * 10.35 *
3.82 *
* Conv. Total (cfs) *236093.6 * Conv. (cfs) *100912.3 * 88806.3 *
46375.1 *
* Length Wtd. (ft) * 68.70 * Wetted Per. (ft) * 621.10 * 48.38 *
167.60 *
* Min Ch El (ft) * 798.53 * Shear (lb/sq ft) * 0.08 * 0.28 *
0.11 *
* Alpha * 2.33 * Stream Power (lb/ft s) * 253.92 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.02 * Cum volume (acre-ft) * 88.59 * 36.95 *
62.48 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 23.51 * 3.15 *
13.33 *
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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2204.54

INPUT

Description: Z  
 Station Elevation Data num= 165

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
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-920.1	820.14	-896.19	814.15	-895.12	814.33	-893.31	813.88	-892.86	813.34
-892.27	813.3	-892.03	813.32	-876.99	813.58	-876.65	813.55	-876.47	813.56
-876.24	813.54	-872.18	813.51	-870.87	813.28	-869.03	813.08	-868.31	812.86
-855.14	813.35	-849.65	813.23	-812.3	812.37	-806.56	812.06	-779.56	810.8
-766.96	810.5	-766.64	810.49	-765.57	810.49	-765.2	810.48	-764.43	810.48
-764.03	810.47	-763.26	810.47	-762.89	810.46	-761.51	810.46	-758.71	810.45
-757.65	810.45	-757.1	810.44	-756.54	810.44	-755.96	810.43	-755.35	810.43
-736.34	810.09	-727.76	810	-724.67	810	-723.11	809.93	-722.72	809.9
-720.45	809.79	-720.19	809.78	-718.07	809.67	-715.71	809.55	-715.15	809.52
-713.35	809.43	-711	809.3	-710.14	809.25	-708.66	809.18	-707.65	809.11
-706.33	809.05	-705.16	808.97	-704.01	808.91	-702.67	808.83	-701.7	808.78
-700.2	808.68	-699.4	808.64	-695.15	808.37	-694.71	808.35	-692.62	808.21
-690.13	808.04	-689.45	808	-685.9	807.81	-682.12	807.6	-679.11	807.44
-677.88	807.38	-671.69	807.04	-669.67	806.94	-668.04	806.85	-665.59	806.72
-664.32	806.65	-661.42	806.5	-657.4	806.28	-657.06	806.27	-656.63	806.24
-652.82	806.04	-652.75	806.04	-652.03	806	-593.71	806	-593.13	806.02
-588.37	806.2	-584.4	806.36	-581.06	806.48	-573.44	806.78	-573.35	806.78
-572.14	806.82	-570.81	806.86	-569.34	806.9	-567.72	806.95	-565.91	807
-558.99	807.21	-557.23	807.27	-555.81	807.33	-554.58	807.37	-553.51	807.41
-552.56	807.45	-551.72	807.48	-550.97	807.51	-550.3	807.53	-550.16	807.53
-549.52	807.56	-548.94	807.58	-548.41	807.6	-547.93	807.62	-547.49	807.63
-547.14	807.65	-546.81	807.66	-546.51	807.67	-546.19	807.68	-545.62	807.7
-545.36	807.71	-536.11	808	-297.24	808	-281.9	808.03	-280.46	808.02
-277.08	808.03	-262.39	808.11	-202.84	808.29	-173.64	807.9	-170.7	807.89
-159.9	807.7	-148.14	807.54	-117.32	807.28	-93.7	807.48	-78.23	807.81
-46.46	808.15	-36.05	807.73	-24.39	806.89	-16.87	802.56	-12.29	799.9
-10.83	799.57	-3.6	798.81	-.66	799.18	0	799.22	5.47	799.58
7.65	799.65	9.47	799.75	15.49	800.09	17.16	801.36	19.95	804.35
25.2	804.7	29.78	804.99	36.45	806.08	39.89	806.63	55.27	806.92
59.82	806.89	85.88	806.81	100.95	807.11	118.08	807.56	134.44	807.79
136.61	807.85	149.16	807.76	170.32	807.81	189.32	808.47	190.53	808.49
191.3	808.57	191.95	808.65	200.96	809.38	215.3	810.83	226.77	812.05
229.06	812.33	231.06	812.53	233.55	812.84	257.98	814.32	265.36	814.85

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-920.1	.05	-24.39	.035	19.95	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-24.39	19.95		74	50	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

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* E.G. Elev (ft)	* 811.51	* Element	* Left OB	* Channel	*
Right OB *					
* Vel Head (ft)	* 0.05	* wt. n-val.	* 0.050	* 0.035	*
0.050 *					
* w.s. Elev (ft)	* 811.46	* Reach Len. (ft)	* 74.00	* 50.00	*
44.00 *					
* Crit w.s. (ft)	*	* Flow Area (sq ft)	* 2701.08	* 472.71	*
782.92 *					
* E.G. slope (ft/ft)	* 0.000236	* Area (sq ft)	* 2701.08	* 472.71	*
782.92 *					
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 2850.12	* 1416.15	*
883.73 *					
* Top width (ft)	* 1014.95	* Top width (ft)	* 769.33	* 44.34	*
201.28 *					
* Vel Total (ft/s)	* 1.30	* Avg. vel. (ft/s)	* 1.06	* 3.00	*
1.13 *					
* Max Chl Dpth (ft)	* 12.65	* Hydr. Depth (ft)	* 3.51	* 10.66	*

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3.89 *
* Conv. Total (cfs) *334996.2 * Conv. (cfs) *185394.0 * 92117.5 *
57484.7 *
* Length Wtd. (ft) * 61.88 * Wetted Per. (ft) * 769.55 * 48.07 *
201.61 *
* Min Ch El (ft) * 798.81 * Shear (lb/sq ft) * 0.05 * 0.15 *
0.06 *
* Alpha * 1.95 * Stream Power (lb/ft s) * 265.36 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.01 * Cum volume (acre-ft) * 84.03 * 36.42 *
61.74 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 22.07 * 3.10 *
13.14 *
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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2154.54

INPUT

Description: AA

Station Elevation Data		num= 240									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-1050.25	820.63	-1046.01	819.69	-1013.47	813.55	-1012.08	813.09	-1010.95	813.03		
-1007.66	812.6	-1006.09	811.8	-1005.58	811.43	-1004.49	811.76	-1001.75	812.04		
-989.06	811.69	-985.15	811.91	-983.65	811.94	-979.51	811.82	-936.54	810.46		
-928.74	810.18	-887.18	809.85	-877.57	809.89	-877.45	809.89	-874.23	809.92		
-873.47	809.93	-872.44	809.95	-870.94	809.97	-868.31	810	-868.11	810		
-866.76	809.98	-862.23	809.89	-861.9	809.89	-860.39	809.86	-840.5	809.5		
-840.11	809.5	-839.76	809.49	-839.4	809.49	-839.03	809.48	-838.65	809.48		
-838.27	809.47	-837.88	809.47	-837.48	809.46	-837.07	809.46	-836.64	809.45		
-836.21	809.45	-835.29	809.43	-834.8	809.43	-834.3	809.42	-791.76	808.77		
-791.35	808.77	-790.71	808.76	-790.31	808.76	-789.67	808.75	-789.27	808.75		
-788.62	808.74	-788.23	808.74	-787.57	808.73	-787.19	808.73	-786.53	808.72		
-786.15	808.72	-785.48	808.71	-785.12	808.71	-784.44	808.7	-784.08	808.7		
-783.41	808.69	-782.8	808.69	-782.12	808.68	-781.77	808.68	-781.08	808.67		
-780.73	808.67	-780.03	808.66	-779.69	808.66	-778.99	808.65	-778.65	808.65		
-777.94	808.64	-777.61	808.64	-776.89	808.63	-776.56	808.63	-775.85	808.62		
-775.52	808.62	-774.8	808.61	-774.49	808.61	-773.76	808.6	-773.45	808.59		
-772.71	808.58	-772.41	808.58	-771.67	808.57	-771.38	808.57	-770.63	808.56		
-770.34	808.56	-769.59	808.55	-769.3	808.55	-768.54	808.54	-768.27	808.54		
-755.87	808.33	-754.97	808.31	-754.81	808.31	-753.89	808.29	-753.74	808.29		
-752.82	808.27	-752.67	808.27	-751.74	808.25	-751.61	808.25	-750.66	808.23		
-750.54	808.23	-749.59	808.21	-749.47	808.21	-748.51	808.19	-748.41	808.18		
-747.01	808.18	-746.94	808.17	-745.76	808.17	-745.04	808.16	-744.9	808.16		
-737.16	808	-722.98	808	-705.02	807.3	-704.02	807.25	-701.59	807.16		
-700.41	807.1	-697	806.95	-695.48	806.88	-693.78	806.81	-692.11	806.73		
-690.19	806.63	-688.92	806.58	-687.86	806.53	-686.95	806.5	-680.97	806.2		
-677.18	806.02	-676.84	806	-628.87	806	-624.75	806.11	-623.33	806.14		
-621.96	806.18	-621.8	806.18	-619.64	806.26	-617.64	806.32	-615.79	806.38		
-613.24	806.47	-612.44	806.5	-612.16	806.5	-611.37	806.52	-611.08	806.53		
-610.3	806.55	-610	806.55	-609.26	806.58	-608.94	806.58	-608.55	806.59		
-607.55	806.62	-607.22	806.62	-606.55	806.64	-606.21	806.64	-605.55	806.66		
-605.2	806.67	-604.55	806.68	-604.19	806.69	-603.55	806.7	-603.18	806.71		
-602.55	806.72	-602.16	806.73	-601.54	806.74	-601.12	806.74	-600.5	806.76		
-600.1	806.76	-599.49	806.78	-599.08	806.78	-598.48	806.8	-597.21	806.8		
-586.51	807.05	-585.97	807.05	-585.09	807.07	-584.53	807.07	-584.1	807.08		
-583.54	807.08	-583.12	807.09	-582.51	807.09	-582.08	807.1	-581.52	807.1		
-581.1	807.11	-580.52	807.11	-580.11	807.12	-579.13	807.12	-578.55	807.13		

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-577.56	807.13	-576.79	807.15	-576.19	807.15	-575.81	807.16	-574.83	807.16
-574.23	807.17	-573.24	807.17	-572.87	807.18	-572.26	807.18	-570.36	807.19
-569.13	807.19	-543.02	808	-182.12	808	-177.95	807.96	-177.84	807.96
-139.2	807.49	-77.02	808.07	-43.93	808.02	-37.15	807.53	-21.68	806.24
-11.01	799.74	-10.69	799.54	-10.59	799.52	-5.56	798.6	-5.29	798.62
3.35	798.83	3.54	798.82	12.36	799.3	12.69	799.28	17.23	800.15
17.56	800.21	18.08	800.51	22.06	801.88	28.84	804.5	30.21	804.68
31.01	804.81	38.21	806.5	53.53	806.9	56.01	806.89	83.27	805.56
90.16	805.89	97.72	805.35	98.09	805.33	98.41	805.31	119.58	805.49
134.35	805.66	139.08	805.15	140.47	805.07	142.84	805.35	145.72	805.7
173.74	807.13	185.9	807.67	200.7	808.17	219.31	808.96	227.19	809.44
230.22	809.96	238.42	810.98	255.45	812.86	266.7	813.74	275.06	814.33

Manning's n Values num= 3

Sta	n val	Sta	n val	Sta	n val
-1050.25	.05	-21.68	.035	38.21	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-21.68	38.21		63	48.8	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.50	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.04	* wt. n-val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 811.46	* Reach Len. (ft)	* 63.00	* 48.80
47.00				
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 3182.74	* 603.31
928.67				
* E.G. Slope (ft/ft)	*0.000163	* Area (sq ft)	* 3182.74	* 603.31
928.67				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 2710.09	* 1474.98
964.93				
* Top width (ft)	* 1211.03	* Top width (ft)	* 946.59	* 59.89
204.56				
* Vel Total (ft/s)	* 1.09	* Avg. Vel. (ft/s)	* 0.85	* 2.44
1.04				
* Max Chl Dpth (ft)	* 12.86	* Hydr. Depth (ft)	* 3.36	* 10.07
4.54				
* Conv. Total (cfs)	*403391.3	* Conv. (cfs)	*212277.4	*115532.4
75581.5				
* Length wtd. (ft)	* 56.27	* wetted Per. (ft)	* 946.79	* 62.98
204.91				
* Min Ch El (ft)	* 798.60	* Shear (lb/sq ft)	* 0.03	* 0.10
0.05				
* Alpha	* 1.92	* Stream Power (lb/ft s)	* 275.06	* 0.00
0.00				
* Frctn Loss (ft)	* 0.01	* Cum volume (acre-ft)	* 79.03	* 35.80
60.88				
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 20.61	* 3.04
12.93				

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Buckeye Creek



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REACH: Buckeye Creek

RS: 2105.74

INPUT

Description: BB

Station Elevation Data

num= 200

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-1284.71	828.4	-1264.69	825.28	-1263.81	824.96	-1255.01	824.13	-1251.56	823.73
-1212.64	819.73	-1195.99	817.6	-1171.48	814.52	-1154.57	811.39	-1154.51	811.39
-1152.14	811.04	-1146.22	810.54	-1138.02	810.11	-1130.04	809.79	-1118.28	809.73
-1102.85	809.11	-1094.7	808.94	-1092.67	808.85	-1081.42	809.01	-1046.4	808.93
-1040.72	808.97	-1038.97	808.94	-1035.49	808.84	-992.45	809.89	-987.58	810
-938.5	810	-913.54	809.72	-907.64	809.6	-907.57	809.6	-906.11	809.58
-904.69	809.55	-898.14	809.45	-895.76	809.41	-894.62	809.4	-891.36	809.34
-890.32	809.33	-890.09	809.32	-889.08	809.31	-887.57	809.28	-887.02	809.28
-886.05	809.26	-885.48	809.25	-884.53	809.24	-883.95	809.23	-883.02	809.21
-882.41	809.2	-881.5	809.19	-880.88	809.18	-867.82	808.94	-866.93	808.93
-865.98	808.91	-865.12	808.9	-864.15	808.88	-863.32	808.86	-862.31	808.84
-861.52	808.83	-860.39	808.81	-859.63	808.8	-858.47	808.77	-857.74	808.76
-856.55	808.74	-855.85	808.73	-854.63	808.7	-853.97	808.69	-852.7	808.66
-852.56	808.66	-850.64	808.63	-849.3	808.6	-848.72	808.59	-847.34	808.56
-846.81	808.55	-843.44	808.48	-842.97	808.48	-841.48	808.45	-841.06	808.44
-840.69	808.43	-840.29	808.42	-839.89	808.42	-839.51	808.41	-839.14	808.41
-838.43	808.39	-838.09	808.39	-837.76	808.38	-837.69	808.38	-832.66	808.3
-831.42	808.27	-827.51	808.21	-826.14	808.18	-823.27	808.14	-823.16	808.13
-821.7	808.11	-821.62	808.11	-820.13	808.08	-820.07	808.08	-818.57	808.06
-815.34	808	-742.79	808	-655.57	806.72	-655.26	806.72	-654.72	806.74
-654.43	806.75	-654.15	806.75	-645.4	807.05	-644.35	807.05	-643.86	807.06
-640.51	807.06	-640.44	807.07	-638.73	807.1	-638.13	807.12	-636.88	807.14
-636.24	807.16	-635.57	807.17	-634.89	807.19	-634.2	807.2	-632.75	807.24
-631.09	807.27	-620.02	807.57	-619.11	807.6	-618.17	807.62	-617.2	807.65
-614.9	807.71	-612.76	807.75	-610.73	807.81	-610.24	807.81	-610.12	807.82
-609.89	807.82	-602.84	808	-143.09	808	-135.89	807.88	-134.92	807.87
-134.16	807.85	-134.09	807.85	-127.27	807.75	-115.54	807.75	-111.92	807.81
-109.05	807.88	-107.52	807.88	-106.87	807.89	-105.45	807.89	-104.68	807.9
-103.86	807.9	-102.99	807.91	-101.07	807.91	-90.85	807.94	-89.1	807.94
-77.29	807.99	-69.47	807.99	-68.7	808	-60.94	808	-60.01	807.99
-57.27	807.99	-55.07	807.82	-38.23	806.81	-35.2	806.61	-34.55	806.6
-34.29	806.56	-33.82	806.54	-19.98	805.6	-19	805.03	-11.8	800.15
-7.71	799.5	-5.17	799.19	0	799.12	1.4	799.11	4.01	798.92
10.22	798.03	12.53	797.84	16.97	798.1	18.46	798.17	19.54	798.4
23.6	799.5	26.39	801.64	29.68	803.93	34.42	805.9	38.23	806.07
42.74	806.3	47.09	806.22	62.78	806.13	63.27	806.12	63.62	806.12
64.44	806.15	83.44	806.15	91.23	806.63	94.72	806.8	100.52	806.83
132.42	807.25	132.77	807.26	132.86	807.26	133.05	807.27	173.39	808.66
193.45	809.45	210.92	809.38	236.84	810.04	248.49	810.08	253.06	810.27
259.03	810.45	272.22	811.95	279.37	812.68	292.07	813.79	296.17	814.12

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-1284.71	.05	-19.98	.035	34.42	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-19.98	34.42		190 202.35	215	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.49	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.04	* Wt. n-Val.	* 0.050	* 0.035
0.050				

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* W.S. Elev (ft)	* 811.45	* Reach Len. (ft)	* 190.00	* 202.35	*
215.00 *					
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 3589.67	* 607.54	*
787.18 *					
* E.G. slope (ft/ft)	*0.000161	* Area (sq ft)	* 3589.67	* 607.54	*
787.18 *					
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 2918.29	* 1563.93	*
667.78 *					
* Top Width (ft)	* 1422.68	* Top Width (ft)	* 1134.90	* 54.40	*
233.38 *					
* Vel Total (ft/s)	* 1.03	* Avg. Vel. (ft/s)	* 0.81	* 2.57	*
0.85 *					
* Max Chl Dpth (ft)	* 13.61	* Hydr. Depth (ft)	* 3.16	* 11.17	*
3.37 *					
* Conv. Total (cfs)	*405600.4	* Conv. (cfs)	*229836.4	*123171.1	*
52592.9 *					
* Length wtd. (ft)	* 196.94	* Wetted Per. (ft)	* 1135.13	* 58.22	*
233.53 *					
* Min Ch El (ft)	* 797.84	* Shear (lb/sq ft)	* 0.03	* 0.11	*
0.03 *					
* Alpha	* 2.32	* Stream Power (lb/ft s)	* 296.17	* 0.00	*
0.00 *					
* Frctn Loss (ft)	* 0.02	* Cum Volume (acre-ft)	* 74.13	* 35.12	*
59.95 *					
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 19.11	* 2.97	*
12.70 *					

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CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 1903.41

INPUT

Description: CC

Station Elevation Data num= 299

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-1413.08	816.72	-1407.17	816.44	-1397.75	816.01	-1388.84	815.67	-1377.66	815.3
-1366.03	814.77	-1359.93	814.45	-1351.29	814.1	-1335.15	813.35	-1330.71	813.1
-1329.95	813.06	-1327.67	812.99	-1311.67	812.18	-1308.35	812.07	-1306.25	810.9
-1302.09	807.29	-1301.39	807.14	-1295.3	807.3	-1292.12	807.21	-1288.74	807.57
-1286.35	807.86	-1281.48	808.5	-1273.69	809.7	-1271.01	810.13	-1270.85	810.19
-1265.96	810.47	-1263.08	810.63	-1256.33	810.92	-1254.83	810.96	-1254.52	810.97
-1250.44	811.04	-1235.5	811.18	-1232.76	811.29	-1226.9	811.26	-1221.86	811.26
-1192.42	811.42	-1178.27	811.68	-1173.41	811.87	-1164.4	811.94	-1147.89	811.78
-1132.78	811.57	-1120.92	811.3	-1104.29	810.83	-1092.34	809.98	-1084.47	809.39
-1078.79	809.03	-1060.74	808.69	-1034.31	808.1	-1002.08	807.01	-988.32	806.88
-983.24	806.72	-979.96	806.54	-962.01	805.21	-957.69	804.98	-957.01	805.11
-947.73	806.94	-947.71	807.06	-945.84	807.99	-944.47	807.48	-858.15	808
-799.47	808	-736.49	807.13	-689.04	806.61	-688.74	806.61	-628.45	806.52
-628.28	806.53	-628.11	806.53	-627.93	806.54	-627.75	806.54	-627.57	806.55
-627.38	806.55	-627.19	806.56	-627	806.56	-626.8	806.57	-626.6	806.57
-626.4	806.58	-626.19	806.59	-625.97	806.59	-625.76	806.6	-625.53	806.6
-625.31	806.61	-625.07	806.62	-624.83	806.62	-624.59	806.63	-624.07	806.65
-623.81	806.65	-623.55	806.66	-622.7	806.69	-622.41	806.69	-621.8	806.71
-620.81	806.74	-619.38	806.78	-618.6	806.8	-618.2	806.82	-616.86	806.85
-616.41	806.87	-615.45	806.89	-614.95	806.91	-614.43	806.92	-613.34	806.96
-612.77	806.97	-611.56	807.01	-610.92	807.02	-609.58	807.06	-608.87	807.08
-608.13	807.11	-607.36	807.13	-606.49	807.15	-605.65	807.18	-604.78	807.2
-602.91	807.26	-601.92	807.28	-587.74	807.73	-586.05	807.79	-584.26	807.85

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-582.34	807.91	-580.28	807.98	-579.52	808	-497.85	808	-489.92	807.75
-488.12	807.69	-484.48	807.58	-483.72	807.56	-482.13	807.51	-481.69	807.5
-480.17	807.45	-479.66	807.44	-478.21	807.4	-477.65	807.38	-476.26	807.34
-475.65	807.32	-474.32	807.28	-473.66	807.27	-472.47	807.23	-471.77	807.21
-468.8	807.13	-468	807.11	-466.97	807.08	-466.13	807.06	-465.15	807.03
-464.11	807.01	-461.88	806.95	-459.38	806.89	-458.02	806.86	-456.71	806.82
-455.33	806.79	-453.87	806.75	-452.92	806.72	-451.38	806.69	-450.52	806.66
-448.13	806.6	-440.76	806.39	-439.42	806.36	-439.1	806.35	-436.3	806.29
-431.15	806.17	-427.32	806.09	-425.27	806.04	-423.45	806	-374	806
-373.56	806.01	-372.23	806.02	-370.93	806.04	-369.65	806.05	-368.39	806.07
-367.15	806.08	-365.72	806.1	-365.57	806.1	-358.39	806.22	-357.27	806.23
-354.06	806.29	-342.7	806.44	-335.04	806.52	-334.69	806.53	-333.81	806.54
-333.44	806.55	-332.57	806.57	-332.19	806.57	-331.34	806.59	-330.94	806.59
-330.1	806.61	-329.69	806.61	-328.43	806.64	-327.61	806.65	-327.35	806.66
-326.9	806.66	-326.02	806.68	-325.56	806.68	-324.69	806.7	-324.22	806.71
-323.37	806.72	-322.88	806.73	-322.04	806.74	-321.54	806.75	-320.71	806.77
-320.2	806.77	-319.39	806.79	-319.27	806.79	-318.73	806.8	-317.94	806.81
-317.39	806.82	-316.6	806.83	-316.04	806.84	-315.27	806.86	-314.69	806.86
-313.94	806.88	-292.28	807.29	-291.62	807.31	-290.98	807.32	-290.48	807.33
-290	807.33	-287.07	807.39	-286.61	807.4	-286.15	807.4	-285.72	807.41
-284.96	807.43	-261.22	807.95	-261.14	807.96	-260.71	807.96	-259.22	807.99
-258.97	808	-191.55	808	-160.29	808.57	-159.61	808.57	-158.94	808.58
-154.42	808.58	-153.85	808.59	-138.43	808.58	-137.74	808.57	-135.64	808.57
-134.94	808.56	-132.25	808.56	-131.6	808.55	-129.06	808.55	-128.42	808.54
-125.81	808.54	-125.15	808.53	-122.41	808.53	-103.56	808	-61.32	808
-61.14	807.99	-60.4	808	-59.58	808	-57.87	807.98	-57.25	807.68
-56.22	807.71	-40.74	807.96	-40.56	807.88	-39.48	807.93	-39.31	807.9
-38.39	807.84	-31.6	806.91	-23.04	804.62	-18.39	802.72	-15.31	799.68
-13.61	799.14	-11.15	798.59	-8.71	798.6	-4.88	798.82	-2.24	798.91
0	799.21	2.77	799.59	5.36	799.74	15.86	800.78	19.21	801.07
25.98	801.39	28.13	801.7	34.86	801.78	40.98	802.22	64.91	803.69
67.69	803.76	85.92	804.31	102.91	804.36	107.15	804.41	109.56	804.63
123.37	806.87	124.99	806.92	138.39	807.04	154.02	807.98	175.38	808.83
193.46	809.77	211.27	810.13	232.8	810.02	248.61	809.84	261.98	809.75
286.4	809.66	312.77	809.79	322.37	809.86	329.27	809.78	332.46	809.82
341.59	809.72	361.96	809.56	373.32	809.63	394.07	809.51	398.94	809.45
403.05	809.94	422.39	812.19	432.81	813.02	439.57	813.46		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-1413.08	.05	-18.39	.035	28.13	.05

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	-18.39	28.13		512	298.87	86		.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.46	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.02	* wt. n-val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 811.44	* Reach Len. (ft)	* 512.00	* 298.87
86.00				
* Crit w.s. (ft)	*	* Flow Area (sq ft)	* 4455.71	* 530.61
1318.23				
* E.G. slope (ft/ft)	* 0.000097	* Area (sq ft)	* 4455.71	* 530.61
1318.23				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 3175.30	* 1101.72
872.98				
* Top width (ft)	* 1658.44	* Top width (ft)	* 1224.15	* 46.52
387.78				

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* Vel Total (ft/s)	* 0.66 *	* 0.82	* Avg. Vel. (ft/s)	* 0.71	* 2.08	*
* Max Chl Dpth (ft)	* 3.40 *	* 12.85	* Hydr. Depth (ft)	* 3.64	* 11.41	*
* Conv. Total (cfs)	* 88500.4 *	* 522094.5	* Conv. (cfs)	* 321904.3	* 111689.8	*
* Length wtd. (ft)	* 388.23 *	* 376.86	* Wetted Per. (ft)	* 1227.59	* 48.06	*
* Min Ch El (ft)	* 0.02 *	* 798.59	* Shear (lb/sq ft)	* 0.02	* 0.07	*
* Alpha	* 0.00 *	* 1.96	* Stream Power (lb/ft s)	* 439.57	* 0.00	*
* Frctn Loss (ft)	* 54.75 *	* 0.05	* Cum Volume (acre-ft)	* 56.59	* 32.48	*
* C & E Loss (ft)	* 11.16 *	* 0.00	* Cum SA (acres)	* 13.96	* 2.74	*

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Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek      RS: 1604.54

INPUT

Description: DD

Station Elevation Data		num= 120		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-254.5	820.31	-253.81	820	-249.36	818.13	-249.04	818	-248.71	817.86		
-244.27	816	-241.75	814.97	-239.41	814	-235.77	812.52	-234.46	812		
-232.56	811.25	-229.43	810	-228.2	809.57	-224.74	808.38	-223.94	808.1		
-223.65	808	-223.48	808	-221.86	808	-221.07	808	-220.61	808.01		
-220.31	808.01	-220.09	808.01	-219.93	808.01	-219.8	808.01	-219.7	808.01		
-219.62	808.01	-219.56	808.01	-219.5	808.01	-219.45	808.01	-219.42	808.01		
-219.4	808.01	-219.38	808.01	-219.31	808.01	-219.29	808.01	-219.27	808.01		
-219.26	808.01	-219.22	808.01	-219.21	808.01	-219.2	808.01	-219.19	808.01		
-219.18	808.01	-219.17	808.01	-219.17	808.05	-218.46	808.05	-218.07	808.25		
-208.9	807.97	-202.66	807.8	-202.47	807.73	-199.15	806.81	-197.39	806.65		
-185.15	805.67	-168.49	805.12	-165.13	805.01	-163.48	805.02	-161.69	805.03		
-150.76	805.17	-148.36	804.05	-144.6	801.99	-144.14	801.94	-143.94	801.8		
-140.03	799.92	-137.84	799.77	-137.23	799.58	-137.01	799.73	-134.93	801.41		
-134.51	801.43	-126.72	801.94	-117.53	801.92	-102.19	801.63	-88	801.53		
-78.33	801.45	-66.67	801.3	-53.5	801.47	-51.58	801.47	-36.89	801.33		
-18.11	800.66	-15.8	800.56	-15.31	800.44	-11.66	798.9	-2.59	797.82		
-2.27	797.8	-1.95	797.77	0	797.54	4.56	797	9.86	796.53		
9.89	796.53	14.62	798.12	14.69	798.14	14.81	798.26	20.33	807.16		
23.78	807.16	38.24	807.17	53.5	807.14	57.16	807.14	70.39	807.14		
74	807.13	112.25	806.72	127.42	806.39	151.27	806.51	160.35	807.08		
183.69	807.64	190.99	807.66	210.11	808.16	216.56	808.05	241.85	807.55		
242.96	807.5	249.5	807.18	265.56	806.74	289.15	808.84	301.45	809.04		
322.56	809.76	342.42	809.63	360.59	809.45	381.97	809.41	400.9	809.43		
411.27	809.32	419.05	810.3	430.18	811.75	441.82	812.55	451.46	813.19		

Manning's n Values		num= 3		Sta		n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-254.5	.05	-15.8	.035	20.33	.05		

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

-15.8 20.33

.1 .3

CROSS SECTION OUTPUT Profile #100-Year

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* E.G. Elev (ft) * 811.40 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.05 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 811.35 * Reach Len. (ft) * 149.00 * 184.82 *
41.00 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 1713.42 * 459.70 *
1358.78 *
* E.G. slope (ft/ft) *0.000177 * Area (sq ft) * 1713.42 * 459.70 *
1358.78 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 2665.06 * 1284.07 *
1200.87 *
* Top width (ft) * 659.94 * Top Width (ft) * 217.02 * 36.13 *
406.80 *
* Vel Total (ft/s) * 1.46 * Avg. Vel. (ft/s) * 1.56 * 2.79 *
0.88 *
* Max Chl Dpth (ft) * 14.82 * Hydr. Depth (ft) * 7.90 * 12.72 *
3.34 *
* Conv. Total (cfs) *386773.2 * Conv. (cfs) *200150.6 * 96435.3 *
90187.4 *
* Length wtd. (ft) * 128.00 * Wetted Per. (ft) * 219.87 * 41.85 *
407.09 *
* Min Ch El (ft) * 796.53 * Shear (lb/sq ft) * 0.09 * 0.12 *
0.04 *
* Alpha * 1.59 * Stream Power (lb/ft s) * 451.46 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.02 * Cum Volume (acre-ft) * 20.33 * 29.08 *
52.11 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 5.49 * 2.46 *
10.38 *
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CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 1419.72

INPUT

Description: EE

Station Elevation Data		num= 82		Elev		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-133.24	824.56	-130.81	824	-124.37	822.44	-122.58	822	-118.66	821.04				
-114.37	820	-112.36	819.49	-106.45	818	-101.64	816.16	-98.65	815.34				
-97.21	814.61	-89.43	814.27	-83.42	814	-82.62	813.97	-80.92	813.88				
-75.91	810	-75.9	810	-72.82	810.28	-72.74	810.29	-71.16	810.43				
-60.51	809.88	-58.71	809.82	-58.63	809.84	-57.68	809.87	-55.63	809.3				
-52.04	808.3	-48.95	808.06	-43.9	807.61	-33.31	807.36	-29.68	807.31				
-18.8	797.35	-18.51	797.15	-18.37	797.12	-9.34	796.76	-8.3	796.83				
-1.89	796.37	-.01	796.51	0	796.51	5.24	797.45	10.42	797.23				
15.88	797.82	25.35	798.02	28.91	797.99	35.53	800.94	37.02	801.47				
37.8	801.6	46.24	803.46	74.68	805.31	77.76	805.47	79.29	805.55				
80.95	805.57	112.25	806.16	129.82	806.8	146.42	807.27	181.61	807.14				
183.67	807.12	193.95	807.06	228.2	806.84	237.5	806.83	265.27	806.79				
281.86	806.66	304.04	806.21	331.38	805.94	344.68	806.3	350.86	806.46				
385.2	806.66	387.18	806.61	399.69	807.42	427.18	809.24	432.84	809.27				

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465.47	809.54	480.67	809.4	493.5	809.13	509.05	808.96	518.95	808.89
532.2	808.89	549.9	809.02	555.9	809.02	563.05	809.83	577.38	811.63
584.8	812.16	599.7	813.15						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -133.24 .05 -29.68 .035 46.24 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -29.68 46.24 173 185.67 44 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \* E.G. Elev (ft) \* 811.38 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.09 \* Wt. n-Val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 811.29 \* Reach Len. (ft) \* 173.00 \* 185.67 \*  
 44.00 \*  
 \* Crit W.S. (ft) \* \* Flow Area (sq ft) \* 116.41 \* 941.47 \*  
 2092.18 \*  
 \* E.G. slope (ft/ft) \*0.000197 \* Area (sq ft) \* 116.41 \* 941.47 \*  
 2092.18 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 86.90 \* 2879.95 \*  
 2183.15 \*  
 \* Top Width (ft) \* 652.23 \* Top Width (ft) \* 47.89 \* 75.92 \*  
 528.42 \*  
 \* Vel Total (ft/s) \* 1.63 \* Avg. Vel. (ft/s) \* 0.75 \* 3.06 \*  
 1.04 \*  
 \* Max Chl Dpth (ft) \* 14.92 \* Hydr. Depth (ft) \* 2.43 \* 12.40 \*  
 3.96 \*  
 \* Conv. Total (cfs) \*366923.6 \* Conv. (cfs) \* 6191.5 \*205188.9  
 \*155543.3 \*  
 \* Length wtd. (ft) \* 125.81 \* Wetted Per. (ft) \* 48.62 \* 80.94 \*  
 528.76 \*  
 \* Min Ch El (ft) \* 796.37 \* Shear (lb/sq ft) \* 0.03 \* 0.14 \*  
 0.05 \*  
 \* Alpha \* 2.13 \* Stream Power (lb/ft s) \* 599.70 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.02 \* Cum Volume (acre-ft) \* 17.20 \* 26.11 \*  
 50.49 \*  
 \* C & E Loss (ft) \* 0.01 \* Cum SA (acres) \* 5.04 \* 2.22 \*  
 9.94 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 1234.05

INPUT

Description: FF  
 Station Elevation Data num= 125  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 \*\*\*\*\*  
 -206.29 819.46 -200.65 818 -197.84 817.3 -192.78 816 -189.46 815.12  
 -185.16 814 -177.52 812.02 -177.45 812 -177.24 811.95 -169.56 810  
 -163.3 808.42 -161.62 808 -160.3 807.77 -150.98 806 -149.55 805.99  
 -141.69 805.98 -141.5 805.98 -140.88 805.98 -133.89 805.95 -130.64 805.94

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-129.27	805.94	-125.41	805.92	-125.27	805.92	-119.66	805.91	-119.47	805.91
-113.88	805.9	-113.72	805.9	-113.55	805.9	-109.15	805.89	-108.89	805.89
-108.61	805.89	-79.16	805.07	-45.36	804.14	-44.53	804.12	-43.45	804.1
-40.44	804.07	-38.68	804.06	-38.54	804.07	-38.37	804.07	-37.77	804.01
-37.24	804.01	-37.19	804	-30.78	802.5	-29.84	802	-26.29	800.22
-25.87	800	-25.24	799.69	-24.32	799.25	-21.9	798	-21.56	798
-18.9	798	-18.8	798	-18.64	798	-17.59	798	-6.79	798
-.56	798	0	798	12.11	798	12.88	798	16.74	798
19.43	799.16	21.39	800	22.15	800.53	22.62	800.82	24.24	801.82
24.53	802	24.55	802.01	24.8	802.16	25.01	802.28	25.19	802.38
25.35	802.48	25.49	802.56	25.62	802.63	25.72	802.69	25.82	802.75
25.91	802.8	25.99	802.85	26.06	802.9	26.13	802.94	26.19	802.97
26.24	803.01	26.29	803.04	26.34	803.07	26.39	803.09	26.43	803.12
26.47	803.14	26.5	803.16	26.54	803.18	26.57	803.2	26.6	803.22
26.63	803.24	26.66	803.24	54.23	804.14	56.94	804.2	74.1	806.44
77.21	806.52	80.14	806.6	85.51	806.59	126.38	806.77	130.45	806.77
167.98	806.63	179.11	806.59	180.44	806.58	215.96	806.5	220.86	806.45
248.62	806.24	255.71	806.16	256.04	806.17	276.79	805.61	282.15	805.6
287.71	805.65	319.14	806.74	339.94	807.72	355.88	808.41	377.43	808.5
408.02	808.34	427.41	808.18	441.89	808.29	466.55	808.44	473.08	808.48
487.87	810.16	499.3	811.52	507.36	812.1	507.64	812.12	523.13	813.21

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-206.29	.05	-37.19	.035	26.66	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-37.19	26.66		117 131.34	192.99	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 811.35 * Element * Left OB * Channel *
* Right OB *
* Vel Head (ft) * 0.06 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 811.28 * Reach Len. (ft) * 117.00 * 131.34 *
192.99 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 748.73 * 770.55 *
2034.00 *
* E.G. slope (ft/ft) *0.000169 * Area (sq ft) * 748.73 * 770.55 *
2034.00 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 891.95 * 2176.63 *
2081.42 *
* Top width (ft) * 671.93 * Top width (ft) * 137.42 * 63.85 *
470.65 *
* Vel Total (ft/s) * 1.45 * Avg. vel. (ft/s) * 1.19 * 2.82 *
1.02 *
* Max Chl Dpth (ft) * 13.28 * Hydr. Depth (ft) * 5.45 * 12.07 *
4.32 *
* Conv. Total (cfs) *396595.9 * Conv. (cfs) * 68688.3 *167620.0
*160287.7 *
* Length wtd. (ft) * 151.19 * wetted Per. (ft) * 138.05 * 66.44 *
471.05 *
* Min Ch El (ft) * 798.00 * Shear (lb/sq ft) * 0.06 * 0.12 *
0.05 *
* Alpha * 1.92 * Stream Power (lb/ft s) * 523.13 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.03 * Cum volume (acre-ft) * 15.48 * 22.46 *
48.40 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 4.67 * 1.92 *
9.44 *

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CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 1102.70

INPUT

Description: GG

Station Elevation Data		num= 117									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-289.51	823.17	-284.72	822.19	-283.86	822	-283.27	821.86	-274.9	820		
-267.4	818.33	-265.91	818	-264.06	817.59	-257.15	816	-249.19	814.26		
-248.06	814	-239.53	812.19	-238.72	812	-237.74	811.8	-228.6	810		
-224.13	809.14	-217.49	808	-212.35	807.38	-210.24	807.28	-205.93	806.82		
-205.12	806.75	-199.07	806.63	-196.69	806.46	-195.3	806.37	-195.04	806.35		
-193.44	806.27	-192.41	806.23	-183.22	806.24	-178.07	806.21	-172.74	806.18		
-171.92	806.16	-171.25	806.15	-161.2	806.03	-158.18	806.03	-156.25	806.02		
-151.54	806.03	-151.43	806.03	-146.32	806.01	-146.26	806.01	-142.51	806		
-133.64	805.85	-132.12	805.82	-129.94	805.78	-114.43	805.52	-102.78	805.34		
-97.86	805.26	-93.46	805.2	-90.78	805.15	-87.77	805.1	-80.07	804.98		
-73.86	804.89	-67.18	804.76	-58.77	804.6	-42.37	804.25	-31.66	804.01		
-31.15	804.01	-29.92	804.01	-28.29	804	-27.99	804	-27.33	804		
-26.85	804	-25.69	803.66	-25.11	803.49	-22.2	802	-19.2	800.47		
-18.27	800	-17.41	799.56	-14.62	798	-7.66	798	0	798		
1.73	798	17.37	798	17.58	798	18.13	798	18.51	798.19		
22.22	800	24.75	801.24	26.32	802	28.22	802.93	31	804		
31.94	804	41.11	804.07	45.61	804.3	54.04	804.54	83.33	805.28		
91.06	805.49	94.01	805.59	95.91	805.61	132.94	806.3	136.29	806.33		
139.49	806.35	164.42	806.54	183.4	806.63	186.37	806.61	231.26	806.05		
238.05	806.05	275.37	806.2	280.92	806.2	282.25	806.21	307.77	807.46		
324.8	809.33	330.91	809.81	335.5	810.13	336.15	810.18	372.12	812.23		
372.24	812.18	373.78	812.33	375.76	812.44	382.54	812.44	392.23	812.55		
401.64	812.64	414.95	812.72	417.44	812.75	433.14	812.79	442.12	812.72		
464.37	812.83	472.75	812.9								

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
-289.51	.05	-25.69	.035	31	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-25.69	31		138.99	130.59	147.99	.1 .3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.32	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.07	* Wt. n-Val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 811.25	* Reach Len. (ft)	* 138.99	* 130.59
147.99				
* Crit w.s. (ft)	*	* Flow Area (sq ft)	* 1123.69	* 678.76
1543.08				
* E.G. slope (ft/ft)	* 0.000185	* Area (sq ft)	* 1123.69	* 678.76
1543.08				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 1392.40	* 1990.72
1766.88				
* Top width (ft)	* 589.97	* Top width (ft)	* 209.28	* 56.69



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324.00 *
* Vel Total (ft/s) * 1.54 * Avg. Vel. (ft/s) * 1.24 * 2.93 *
  1.15 *
* Max Chl Dpth (ft) * 13.25 * Hydr. Depth (ft) * 5.37 * 11.97 *
  4.76 *
* Conv. Total (cfs) *378186.5 * Conv. (cfs) *102249.7 *146187.4
*129749.4 *
* Length Wtd. (ft) * 138.17 * Wetted Per. (ft) * 209.73 * 59.40 *
  324.23 *
* Min Ch El (ft) * 798.00 * Shear (lb/sq ft) * 0.06 * 0.13 *
  0.06 *
* Alpha * 1.77 * Stream Power (lb/ft s) * 472.75 * 0.00 *
  0.00 *
* Frctn Loss (ft) * 0.03 * Cum Volume (acre-ft) * 12.97 * 20.27 *
  40.48 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 4.21 * 1.74 *
  7.67 *
*****
*****

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 972.12

INPUT

Description: HH

Station Elevation Data		num=		163							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-326.96	813.78	-325.06	813.78	-324.62	813.77	-312.1	813.79	-311.71	813.79		
-311.3	813.78	-310.79	813.77	-310.71	813.77	-310.04	813.76	-309.09	813.74		
-299.86	813.58	-299.5	813.58	-299.13	813.57	-296.5	813.51	-289.07	813.22		
-281.87	812.99	-279.84	812.9	-276.56	812.81	-272.63	812.68	-270.91	812.59		
-269.58	812.52	-264.51	812.38	-258.25	812.17	-257.11	812.12	-253.96	812.01		
-252.79	812	-247.85	811.77	-247.06	811.74	-246.01	811.7	-235.69	811.04		
-234.51	810.98	-230.45	810.9	-224.77	810.76	-217.17	810.53	-213.54	810.36		
-203.45	810	-201.81	809.91	-179	808.59	-178.36	808.56	-174.95	808.41		
-168.88	808	-168.86	807.99	-167.73	807.99	-167.72	807.99	-166.02	807.98		
-162.03	807.97	-158.82	807.97	-157.81	807.96	-156.68	807.96	-153.18	807.93		
-152.17	807.93	-147.01	807.71	-124.98	806.82	-98.36	806.05	-98.02	806.03		
-96.39	806	-96.31	806	-91.58	805.99	-90.9	805.99	-90.29	805.98		
-88.68	805.98	-87.34	805.98	-85.9	805.97	-82.63	805.96	-80.47	805.95		
-78.95	805.94	-77.59	805.94	-55.94	805.33	-51.01	805.29	-46.29	805.27		
-42.91	805.22	-39.87	805.19	-36.91	805.19	-33.31	804.55	-30.41	804.02		
-30.31	804.02	-30.21	804	-28.09	802.54	-27.19	802	-25.5	801.1		
-22.96	800	-18.37	797.56	-17.49	797.56	-17.43	797.56	-17.42	797.56		
-13.96	797.56	0	797.56	1.22	797.56	14.24	797.56	17.93	797.56		
20.45	798	26.11	799.94	26.31	800	32.11	801.03	32.83	802		
49.01	803.35	49.44	803.36	55.53	803.3	55.72	803.39	56.74	803.46		
60.16	803.53	85.01	805.01	113.83	805.2	119.81	805.24	126.8	805.29		
131.99	805.27	139.45	805.25	147.43	805.3	150.86	805.04	162.7	804.62		
166.24	804.54	176.45	805.43	177.27	805.48	179.3	805.58	201.26	806.42		
208.15	807.25	223.45	808.52	236.82	809.7	252.78	811.09	252.86	811.07		
252.99	811.08	255.67	811.11	272.38	811.61	292.88	811.69	300.43	811.78		
310.06	811.68	312.5	811.63	314.79	811.65	317.61	811.73	317.72	811.84		
317.8	811.83	320.16	811.81	334.73	811.83	341.58	811.8	343.41	811.9		
345.47	811.78	346.96	811.81	348.55	811.78	352.07	811.8	367.83	811.79		
370.45	811.82	383.76	811.8	383.94	811.82	395.49	811.86	398.25	811.88		
398.32	812.08	398.42	811.98	398.86	812.41	408.62	812.42	418.24	812.27		
427.48	812.07	437.72	811.84	443.56	811.77	454.65	811.84	466.98	811.99		
475.86	812.18	480.39	812.38	482.7	812.57	490.96	812.47	496.51	812.45		

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496.72 812.45 505.62 812.64 511.92 812.78

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -326.96 .05 -30.21 .035 32.83 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -30.21 32.83 168 161.32 108 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \*\*\*\*\*  
 \* E.G. Elev (ft) \* 811.29 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.10 \* wt. n-val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 811.18 \* Reach Len. (ft) \* 168.00 \* 161.32 \*  
 108.00 \*  
 \* Crit w.s. (ft) \* \* Flow Area (sq ft) \* 764.22 \* 793.48 \*  
 1203.93 \*  
 \* E.G. Slope (ft/ft) \*0.000228 \* Area (sq ft) \* 764.22 \* 793.48 \*  
 1203.93 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 817.49 \* 2681.48 \*  
 1651.03 \*  
 \* Top width (ft) \* 496.01 \* Top width (ft) \* 207.71 \* 63.04 \*  
 225.26 \*  
 \* Vel Total (ft/s) \* 1.86 \* Avg. vel. (ft/s) \* 1.07 \* 3.38 \*  
 1.37 \*  
 \* Max Chl Dpth (ft) \* 13.62 \* Hydr. Depth (ft) \* 3.68 \* 12.59 \*  
 5.34 \*  
 \* Conv. Total (cfs) \*340731.2 \* Conv. (cfs) \* 54086.5 \*177410.4  
 \*109234.3 \*  
 \* Length wtd. (ft) \* 140.95 \* wetted Per. (ft) \* 207.94 \* 65.65 \*  
 225.68 \*  
 \* Min Ch El (ft) \* 797.56 \* Shear (lb/sq ft) \* 0.05 \* 0.17 \*  
 0.08 \*  
 \* Alpha \* 1.94 \* Stream Power (lb/ft s) \* 511.92 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.04 \* Cum Volume (acre-ft) \* 9.96 \* 18.07 \*  
 35.81 \*  
 \* C & E Loss (ft) \* 0.00 \* Cum SA (acres) \* 3.54 \* 1.56 \*  
 6.74 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 810.82

INPUT

Description: II

Station Elevation Data num= 159  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 \*\*\*\*\*  
 -216.91 814 -209.47 814 -201.74 814 -195.8 813.64 -188.84 813.23  
 -185.45 813.15 -179.25 812.94 -152.13 813.27 -151.81 813.26 -149.47 813.17  
 -146.37 813.02 -146.36 813.01 -146.32 813.02 -140.6 812.84 -136.23 812.99  
 -129.02 812.75 -127.18 812.76 -123.2 812.8 -119.29 812.67 -118.82 812.66  
 -111.87 812.43 -109.55 812.36 -100.54 812.03 -99.84 812 -98.62 811.93  
 -97.8 811.89 -83.42 811.14 -76.85 810.72 -74.41 810.56 -73.74 810.51

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-71.49	810.36	-66.78	810	-61.45	809.65	-58.64	809.44	-52.08	808.96
-50.37	808.85	-41.46	808	-38.34	807.75	-37.59	807.68	-36.09	807.5
-24.8	806	-20.35	804.6	-18.41	804	-18.33	803.94	-15.01	802
-12.97	800.82	-11.05	800	-10.24	799.15	-8.85	797.3	0	797.3
3.17	797.3	10.08	797.3	17.92	797.3	24.85	797.3	27.53	798
27.87	801.86	28.46	802.53	32.36	803.16	42.61	804.76	59.3	804.95
77.03	805.06	103.24	805.26	119.26	805.35	128.03	805.42	149.59	805.57
160.78	805.68	192.07	805.53	197.51	805.48	238.72	804.72	239.38	804.7
240.47	804.67	256.38	804.26	262.57	804.13	266.56	804.18	293.85	808.49
296.89	808.94	300.24	809.22	329.56	811.43	333.28	811.66	333.32	811.67
333.59	811.64	340.57	811.73	344.49	811.76	350.15	811.95	362.33	812.32
365.48	812.39	381.25	812.44	388.26	812.42	396.23	812.36	413.4	812.25
424.49	812.31	455.96	812.46	456.15	812.5	459.79	812.5	467.99	812.4
475.02	812.37	475.36	812.37	475.71	812.37	476.06	812.37	486.93	812.37
487.23	812.37	487.54	812.37	487.85	812.37	488.18	812.37	488.5	812.37
488.83	812.37	489.17	812.37	489.52	812.38	497.79	812.49	497.9	812.49
498.02	812.49	498.14	812.49	498.28	812.49	498.41	812.49	498.56	812.48
498.71	812.48	498.87	812.48	499.04	812.48	499.21	812.48	499.39	812.48
499.57	812.48	499.76	812.48	499.96	812.48	500.17	812.48	500.38	812.49
500.59	812.49	500.81	812.49	501.04	812.49	501.11	812.49	501.27	812.49
501.51	812.49	501.75	812.49	501.99	812.49	502.24	812.49	502.49	812.49
502.74	812.49	503	812.49	503.25	812.49	503.51	812.49	503.76	812.49
504.02	812.49	504.27	812.5	504.52	812.5	504.78	812.5	505.02	812.5
505.27	812.5	505.51	812.5	505.75	812.51	505.98	812.51	506.21	812.51
506.43	812.51	506.65	812.52	506.86	812.52	507.07	812.52	507.27	812.52
507.46	812.53	507.64	812.53	507.82	812.53	524.88	812.93		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-216.91	.05	-20.35	.035	42.61	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-20.35	42.61		200 178.48	258		.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.25	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.12	* wt. n-val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 811.13	* Reach Len. (ft)	* 200.00	* 178.48
258.00				
* Crit w.s. (ft)		* Flow Area (sq ft)	* 154.26	* 725.62
1505.53				
* E.G. Slope (ft/ft)	* 0.000312	* Area (sq ft)	* 154.26	* 725.62
1505.53				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 146.49	* 2598.76
2404.74				
* Top width (ft)	* 408.81	* Top width (ft)	* 62.89	* 62.96
282.95				
* Vel Total (ft/s)	* 2.16	* Avg. vel. (ft/s)	* 0.95	* 3.58
1.60				
* Max Chl Dpth (ft)	* 13.83	* Hydr. Depth (ft)	* 2.45	* 11.53
5.32				
* Conv. Total (cfs)	* 291710.3	* Conv. (cfs)	* 8297.8	* 147201.3
* 136211.3				
* Length wtd. (ft)	* 218.44	* Wetted Per. (ft)	* 63.35	* 69.47
283.43				
* Min Ch El (ft)	* 797.30	* Shear (lb/sq ft)	* 0.05	* 0.20
0.10				
* Alpha	* 1.65	* Stream Power (lb/ft s)	* 524.88	* 0.00

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0.00 *
* Frctn Loss (ft) * 0.05 * Cum Volume (acre-ft) * 8.18 * 15.25 *
32.46 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 3.02 * 1.33 *
6.11 *
*****
*****

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 632.35

INPUT

Description: JJ

Station Elevation Data

num= 135

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-233.17	814	-232.97	814	-232.29	814	-231.37	814	-229.74	814
-227.54	813.99	-224.26	813.99	-217.08	813.99	-215.69	813.99	-206.84	813.98
-205.84	813.98	-204.78	813.98	-194.69	813.99	-163.17	813.97	-158.17	813.97
-152.63	813.96	-146.75	813.97	-144.86	813.97	-139.53	813.97	-138.59	813.97
-138.16	813.97	-136.9	813.97	-134.88	813.97	-127.78	813.97	-125.89	813.97
-121.27	813.96	-116.23	813.98	-115.18	813.97	-115.16	813.97	-113.57	813.97
-103.05	813.98	-102.55	813.98	-96.44	814	-96.4	814	-96.31	814
-96.25	814	-92.59	813.97	-89.12	813.99	-89.1	813.99	-88.87	813.99
-88.46	813.99	-77.63	814	-76.17	814.02	-76.04	814.02	-75.04	814
-72.8	813.99	-71.53	814	-68.29	814.02	-67.62	814.01	-67.06	814
-63.13	813.78	-62.61	813.72	-62.43	813.69	-57.74	813.21	-57.27	813.17
-52.18	812.77	-48.03	812	-43.2	810.5	-41.72	810	-40.18	809.46
-37.42	808	-35.59	807.07	-33.62	806	-31.7	804.92	-29.9	804
-27.7	802.73	-26.29	802	-22.66	800.11	-22.45	800	-22.1	799.82
-21.65	799.6	-20.99	799.31	-19.21	798.49	-18.32	796.97	-6.82	796.97
-2.66	796.97	0	796.97	.16	796.97	11.62	796.97	15.58	798
15.79	798.01	16.67	798.01	16.75	798.07	16.96	798.08	20.03	798.26
21.03	798.28	27.17	798.57	31.86	800.77	32.51	802.17	32.91	802.6
36.36	804.21	36.53	804.25	37.02	804.34	47.09	805.42	47.49	805.46
49.7	805.63	55.05	805.93	68.74	806.02	86.07	805.93	99.48	805.93
103.38	805.75	123.57	805.98	131.93	806.3	155.1	806.45	176.93	806.19
200.24	806.3	221.51	806.49	244.67	806.72	265.49	806.59	289.74	806.31
312.41	806.09	337.11	806.03	356.2	805.86	381.78	805.86	408.47	805.68
427.73	805.75	446.84	805.64	455	805.63	460.39	805.71	465.48	805.94
478.6	806.16	486.66	806.62	496.58	808.09	504.39	809.32	521.17	811.33
528.01	812.14	528.42	812.31	528.56	812.35	529.4	812.29	529.44	812.28
529.77	812.28	529.97	812.27	537.83	812.44	544.99	812.58	545.64	812.59

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-233.17	.05	-52.18	.035	37.02	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -52.18 37.02 239 198.36 80 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 811.18 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.07 * wt. n-Val. * * 0.035 *
0.050 *
* W.S. Elev (ft) * 811.11 * Reach Len. (ft) * 239.00 * 198.36 *

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80.00 *
* Crit W.S. (ft) *          * Flow Area (sq ft) *          * 888.20 *
2336.33 *
* E.G. Slope (ft/ft) *0.000189 * Area (sq ft) *          * 888.20 *
2336.33 *
* Q Total (cfs) * 5150.00 * Flow (cfs) *          * 2418.72 *
2731.28 *
* Top Width (ft) * 564.55 * Top width (ft) *          * 82.20 *
482.35 *
* Vel Total (ft/s) * 1.60 * Avg. vel. (ft/s) *          * 2.72 *
1.17 *
* Max Chl Dpth (ft) * 14.14 * Hydr. Depth (ft) *          * 10.81 *
4.84 *
* Conv. Total (cfs) *374563.3 * Conv. (cfs) *          *175915.6
*198647.7 *
* Length wtd. (ft) * 136.17 * Wetted Per. (ft) *          * 88.15 *
482.78 *
* Min Chl El (ft) * 796.97 * Shear (lb/sq ft) *          * 0.12 *
0.06 *
* Alpha * 1.65 * Stream Power (lb/ft s) * 545.64 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.02 * Cum volume (acre-ft) * 7.83 * 11.95 *
21.08 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 2.87 * 1.03 *
3.85 *
*****
*****

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 433.99

INPUT

Description: KK

Station Elevation Data

num= 97

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-229.28	815.19	-223.93	814	-216.01	812.28	-214.67	812	-213.65	811.85
-199.66	810	-199.48	810	-199.29	810	-197.88	809.99	-194.25	809.96
-194.23	809.96	-190.38	809.95	-185.59	809.93	-178.39	809.93	-174.76	809.91
-173.86	809.91	-173.11	809.91	-135.76	808.85	-130.79	808.72	-124.61	808.57
-120.21	808.48	-106.09	808.19	-104.62	808.16	-97.07	808.01	-96.21	808
-91.4	808	-90.61	808	-79.64	807.53	-70.25	807.22	-64	807.02
-57.82	806.79	-47.76	806.4	-45.29	806.3	-42.52	806.21	-41.03	806.16
-37.62	806.01	-36.96	806.01	-36.96	806	-33.53	804.27	-32.99	804
-30.1	802.54	-28.88	802	-28.63	801.88	-24.46	800	-22.46	799.07
-20.14	796.7	-12.23	796.7	-4.22	796.7	-1.01	796.7	0	796.7
12.22	796.7	14.57	799.05	16.69	800	17.49	800.3	22.91	802
23.15	802	25.9	802.22	28.38	802.57	34	802.72	35.29	802.76
46.96	803	49.07	803.48	55.32	804.73	65.63	804.46	75.14	804.3
82.19	804.93	83.76	805.01	94.64	805.48	107.93	805.05	115.02	805.14
115.99	805.19	132.95	805.87	140.41	806.12	179.17	805.81	186.1	805.75
218.99	805.95	229.65	806.12	243.46	805.89	273.03	805.79	295.71	805.5
315.95	805.54	342.46	805.87	360.5	806.18	374.77	806.1	406.56	805.76
412.8	805.7	423.66	805.74	441.5	805.56	452.35	805.52	466.16	806.57
471.85	806.85	475.67	807.36	490.39	809.41	494.83	809.91	511.44	811.92
511.84	812.08	511.9	812.12						

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
*****		*****		*****	

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-229.28 .05 -36.96 .035 28.38 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -36.96 28.38 150.99 144.27 75.99 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 811.15 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.05 * Wt. n-Val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 811.10 * Reach Len. (ft) * 150.99 * 144.27 *
75.99 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 444.32 * 788.87 *
2529.67 *
* E.G. Slope (ft/ft) *0.000148 * Area (sq ft) * 444.32 * 788.87 *
2529.67 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 303.77 * 2061.26 *
2784.97 *
* Top Width (ft) * 712.65 * Top Width (ft) * 171.02 * 65.34 *
476.29 *
* Vel Total (ft/s) * 1.37 * Avg. Vel. (ft/s) * 0.68 * 2.61 *
1.10 *
* Max Chl Dpth (ft) * 14.40 * Hydr. Depth (ft) * 2.60 * 12.07 *
5.31 *
* Conv. Total (cfs) *422843.5 * Conv. (cfs) * 24941.4 *169240.6
*228661.6 *
* Length Wtd. (ft) * 108.76 * Wetted Per. (ft) * 171.16 * 69.45 *
476.88 *
* Min Ch El (ft) * 796.70 * Shear (lb/sq ft) * 0.02 * 0.11 *
0.05 *
* Alpha * 1.82 * Stream Power (lb/ft s) * 511.90 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.02 * Cum Volume (acre-ft) * 6.61 * 8.13 *
16.61 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 2.41 * 0.69 *
2.97 *
*****
*****
    
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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 289.71

INPUT

Description: LL

Station Elevation Data		num=		117					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-348.33	816.57	-348.24	816.54	-347.81	816.44	-345.95	816	-342.84	815.36
-339.64	814.72	-336.02	814	-328.13	813.43	-322.18	813.05	-305.65	812
-302.14	811.76	-298.26	811.43	-280.91	810	-279.28	809.93	-246.45	808.55
-235.55	808	-235.47	808	-231.89	808	-230.12	808	-225.75	808
-220.81	808	-220.77	808	-216.44	808	-211.33	808	-195.52	808
-194.47	808	-194.45	808	-184.64	808	-182.43	808	-178.88	808.05
-178.72	808.05	-178.43	808.06	-178.1	808.06	-172.71	808.2	-168.02	808.31
-160.86	808.55	-144.31	808.1	-141.52	808.02	-137.87	808.02	-133.47	808.03
-127.35	808.03	-116.67	808.04	-91.7	808.03	-68.94	808.02	-63.03	808.02
-59.01	808.02	-55.88	808.02	-55.76	808.02	-55.73	808.02	-53.31	808.01
-52.54	808.01	-49.34	808.01	-47.14	808.01	-46.11	808.01	-43.69	808.01

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-42.03	808.01	-41.16	808	-36.46	808	-36.18	807.96	-34.84	807.82
-34.01	807.45	-33.88	807.41	-30.5	806	-28.59	805.2	-25.72	804
-24.06	803.13	-22.27	802	-20.72	801.07	-18.75	800	-17.18	799.08
-15.4	796.46	-1.4	796.46	0	796.46	1.93	796.46	6.13	796.46
16.91	796.46	18.38	798	18.87	798	19.47	798	19.95	798.46
21.23	799.6	21.7	799.87	24.37	800.38	35.61	802.38	50.22	802.63
53.88	802.69	63.02	802.91	78.8	802.53	78.99	802.53	82.81	802.65
94.02	803.02	100.69	804.05	109.95	805.3	112.56	805.37	144.08	805.37
153.1	805.31	186.57	805.2	205.42	805.47	226.33	805.61	253.41	805.45
264.38	805.23	289.6	805.11	294.8	805.28	315.35	805.29	333.93	805.43
339.25	805.41	361.21	806.06	367.63	805.99	382.77	805.65	385.82	805.7
412.49	806.66	414.12	806.72	415.41	806.89	435.44	809.42	453.47	811.42
458.91	812.07	459.37	812.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-348.33	.05	-34.84	.035	35.61	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-34.84	35.61		142 180.45	179	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 811.14 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.05 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 811.09 * Reach Len. (ft) * 142.00 * 180.45 *
179.00 *
* Crit w.s. (ft) * * Flow Area (sq ft) * 707.26 * 825.10 *
2378.05 *
* E.G. Slope (ft/ft) *0.000137 * Area (sq ft) * 707.26 * 825.10 *
2378.05 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 480.47 * 2020.46 *
2649.07 *
* Top width (ft) * 744.61 * Top width (ft) * 259.28 * 70.45 *
414.88 *
* Vel Total (ft/s) * 1.32 * Avg. vel. (ft/s) * 0.68 * 2.45 *
1.11 *
* Max Chl Dpth (ft) * 14.63 * Hydr. Depth (ft) * 2.73 * 11.71 *
5.73 *
* Conv. Total (cfs) *439699.1 * Conv. (cfs) * 41021.7 *172504.1
*226173.4 *
* Length wtd. (ft) * 174.95 * wetted Per. (ft) * 259.40 * 75.50 *
415.36 *
* Min Ch El (ft) * 796.46 * Shear (lb/sq ft) * 0.02 * 0.09 *
0.05 *
* Alpha * 1.75 * Stream Power (lb/ft s) * 459.37 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.03 * Cum volume (acre-ft) * 4.62 * 5.46 *
12.33 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 1.66 * 0.47 *
2.19 *
*****
*****

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek

RS: 109.26

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INPUT

Description: MM

Station Elevation Data

num= 85		85		85		85		85		85	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-420.57	814.39	-419.2	814	-407.77	813.42	-407.7	813.42	-379.04	812		
-378.22	811.99	-334.8	811.11	-302.12	810.46	-279.5	810	-278.77	810		
-199.19	808.01	-198.67	808	-196.73	808	-196.71	808	-160.16	807.18		
-150.67	806.97	-143.98	806.83	-123.71	806.44	-101.58	806	-100.78	806		
-92.21	805.99	-80.49	805.97	-77.36	805.97	-69.5	805.98	-53.95	806		
-46.87	806	-41.13	806	-38.95	806	-35.79	806	-33.95	804.99		
-32.14	804	-29.75	802.69	-28.49	802	-26.52	800.92	-25.03	800		
-24.55	799.7	-20.63	798	-13.87	796.17	-7.1	796.17	-6.45	796.17		
-5.34	796.17	-3.06	796.17	0	796.17	9.83	796.17	10.32	798		
11.65	798	12.28	798	15.39	799.59	16.21	800	18.42	801.13		
20.26	802	23.7	803.6	24.16	803.84	24.46	804	25.31	804.27		
25.55	804.34	26.05	804.45	33.05	806	33.29	806	34.24	806		
36.49	805.83	40.87	805.6	49.87	805.76	78.79	805.59	114.93	804.96		
121.77	804.87	141.12	804.61	165.89	804.29	192.3	804.3	201.03	804.39		
211.75	804.67	229.66	805	247.1	805.46	263.63	805.77	272.64	805.95		
279.01	806.31	286.81	806.72	289.32	807.18	307.42	809.78	309.29	809.95		
325.74	811.48	328.02	811.69	328.25	811.72	328.26	811.72	328.83	811.89		

Manning's n Values

num= 3		3		3	
Sta	n Val	Sta	n Val	Sta	n Val
-420.57	.05	-35.79	.035	33.05	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-35.79	33.05		105.99	109.26	120	.1
							.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.10	* Element	* Left OB	* Channel	*
Right OB *					
* Vel Head (ft)	* 0.07	* Wt. n-val.	* 0.050	* 0.035	*
0.050 *					
* W.S. Elev (ft)	* 811.03	* Reach Len. (ft)	* 105.99	* 109.26	*
120.00 *					
* Crit w.s. (ft)	*	* Flow Area (sq ft)	* 914.88	* 791.16	*
1564.78 *					
* E.G. Slope (ft/ft)	* 0.000200	* Area (sq ft)	* 914.88	* 791.16	*
1564.78 *					
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 817.04	* 2302.15	*
2030.81 *					
* Top Width (ft)	* 651.91	* Top width (ft)	* 295.18	* 68.84	*
287.89 *					
* Vel Total (ft/s)	* 1.57	* Avg. vel. (ft/s)	* 0.89	* 2.91	*
1.30 *					
* Max Chl Dpth (ft)	* 14.86	* Hydr. Depth (ft)	* 3.10	* 11.49	*
5.44 *					
* Conv. Total (cfs)	* 364262.0	* Conv. (cfs)	* 57789.4	* 162832.3	*
* 143640.3 *					
* Length wtd. (ft)	* 113.08	* wetted Per. (ft)	* 295.24	* 74.12	*
288.24 *					
* Min Ch El (ft)	* 796.17	* Shear (lb/sq ft)	* 0.04	* 0.13	*
0.07 *					
* Alpha	* 1.85	* Stream Power (lb/ft s)	* 328.83	* 0.00	*
0.00 *					
* Frctn Loss (ft)	* 0.02	* Cum volume (acre-ft)	* 1.97	* 2.11	*
4.23 *					



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\* C & E Loss (ft) \* 0.74 \*  
 \* 0.00 \* Cum SA (acres) \* 0.76 \* 0.18 \*

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 0

INPUT

Description: NN

Station Elevation Data

num= 115

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-417.03	813.82	-412.45	812.94	-406.81	812	-406.1	812	-405.22	812
-395.28	811.74	-380.91	811.39	-371.41	811.15	-364.68	810.99	-359.42	810.86
-355.34	810.77	-345.4	810.64	-340.02	810.54	-336.02	810.47	-325.13	810.34
-312.35	810.19	-297.14	810.01	-296.43	810	-296.02	810	-295.59	810
-285.2	809.91	-274.56	809.84	-274.54	809.84	-273.77	809.83	-272.94	809.82
-262.55	809.73	-253.03	809.67	-251.8	809.66	-250.49	809.65	-241.36	809.57
-232.98	809.51	-230.33	809.49	-227.4	809.46	-224.11	809.42	-220.35	809.37
-208.38	809.22	-174.4	808.34	-171.28	808.24	-167.82	808.24	-159.55	808.19
-158.48	808.19	-156.58	808.18	-145.99	808.1	-143.06	808.1	-141.48	808.1
-141.47	808.1	-141.45	808.1	-141.41	808.1	-139.97	808.09	-136.44	808.09
-134.24	808.08	-131.11	808.06	-127.77	808.05	-120.4	808.02	-118.91	808.01
-118.39	808.01	-117.91	808.01	-117.81	808.01	-115.67	808	-113.81	807.99
-106.61	807.86	-105.72	807.84	-104.61	807.82	-104.57	807.82	-102.61	807.78
-99.96	807.71	-94.79	807.56	-82.5	807.22	-39.63	806	-38.69	806
-32.64	804.46	-31.48	804	-29.07	802.86	-27.45	802	-25.43	800.91
-24.71	800.57	-23.51	800	-21.41	799	-19.3	798	-10.6	796
-.12	796	-.06	796	0	796	11.36	796	20.55	798
22.64	798.89	25.23	800	25.29	800.03	25.3	800.03	29.05	802
30.21	802.61	33.02	804	35.92	804.98	37.94	804.98	38.95	804.98
39.77	804.98	55.66	804.9	86.81	804.9	121.46	804.49	134.69	804.4
178.19	803.99	181.7	803.96	182	803.96	184.59	803.99	228.44	804.47
248.69	805.15	255.51	805.29	257.89	805.39	258.14	805.47	259.94	805.87
277.19	809.69	294.63	811.77	300.3	812.2	300.82	812.43	300.99	812.54

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-417.03	.05	-38.69	.035	35.92	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -38.69 35.92 0 0 0 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

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* E.G. Elev (ft)	* 811.08	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.08	* wt. n-val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 811.00	* Reach Len. (ft)	*	*
* Crit w.s. (ft)	* 803.91	* Flow Area (sq ft)	* 705.56	* 889.77
1504.49				
* E.G. slope (ft/ft)	* 0.000191	* Area (sq ft)	* 705.56	* 889.77
1504.49				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 484.14	* 2637.88
2027.98				

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* Top Width (ft)	* 653.27	* Top Width (ft)	* 326.41	* 74.61	*
252.25 *					
* Vel Total (ft/s)	* 1.66	* Avg. vel. (ft/s)	* 0.69	* 2.96	*
1.35 *					
* Max Chl Dpth (ft)	* 15.00	* Hydr. Depth (ft)	* 2.16	* 11.93	*
5.96 *					
* Conv. Total (cfs)	*372848.1	* Conv. (cfs)	* 35050.7	*190976.4	
*146821.0 *					
* Length Wtd. (ft)	*	* Wetted Per. (ft)	* 326.46	* 78.27	*
252.83 *					
* Min Ch El (ft)	* 796.00	* Shear (lb/sq ft)	* 0.03	* 0.14	*
0.07 *					
* Alpha	* 1.91	* Stream Power (lb/ft s)	* 300.99	* 0.00	*
0.00 *					
* Frctn Loss (ft)	*	* Cum volume (acre-ft)	*	*	*
*					
* C & E Loss (ft)	*	* Cum SA (acres)	*	*	*
*					

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SUMMARY OF MANNING'S N VALUES

River: Buckeye Creek

* Reach	* River Sta.	* n1	* n2	* n3	*
*Buckeye Creek	* 3504.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 3454.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 3404.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 3354.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 3304.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 3254.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 3204.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 3154.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 3104.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 3054.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 3004.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2954.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2904.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2854.58	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2804.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2754.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2704.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2661.29	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2603.43	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2554.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2494.62	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2460.04	* Bridge	*	*	*
*Buckeye Creek	* 2417.85	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2354.53	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2306.38	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2254.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2204.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2154.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 2105.74	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 1903.41	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 1604.54	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 1419.72	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 1234.05	* .05*	* .035*	* .05*	*
*Buckeye Creek	* 1102.70	* .05*	* .035*	* .05*	*

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*Buckeye Creek	*	972.12	*	.05*	.035*	.05*
*Buckeye Creek	*	810.82	*	.05*	.035*	.05*
*Buckeye Creek	*	632.35	*	.05*	.035*	.05*
*Buckeye Creek	*	433.99	*	.05*	.035*	.05*
*Buckeye Creek	*	289.71	*	.05*	.035*	.05*
*Buckeye Creek	*	109.26	*	.05*	.035*	.05*
*Buckeye Creek	*	0	*	.05*	.035*	.05*

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SUMMARY OF REACH LENGTHS

River: Buckeye Creek

* Reach	* River Sta.	* Left	* Channel	* Right
*Buckeye Creek	* 3504.54	* 50*	* 50*	* 50*
*Buckeye Creek	* 3454.54	* 52*	* 50*	* 50*
*Buckeye Creek	* 3404.54	* 55*	* 50*	* 50*
*Buckeye Creek	* 3354.54	* 35*	* 50*	* 50*
*Buckeye Creek	* 3304.54	* 55*	* 50*	* 47*
*Buckeye Creek	* 3254.54	* 43*	* 50*	* 52*
*Buckeye Creek	* 3204.54	* 44*	* 50*	* 51*
*Buckeye Creek	* 3154.54	* 48*	* 50*	* 52*
*Buckeye Creek	* 3104.54	* 22*	* 50*	* 48*
*Buckeye Creek	* 3054.54	* 23*	* 50*	* 53*
*Buckeye Creek	* 3004.54	* 36*	* 50*	* 48*
*Buckeye Creek	* 2954.54	* 36*	* 50*	* 48*
*Buckeye Creek	* 2904.54	* 42*	* 49.96*	* 51*
*Buckeye Creek	* 2854.58	* 40*	* 50.04*	* 52*
*Buckeye Creek	* 2804.54	* 50*	* 50*	* 60*
*Buckeye Creek	* 2754.54	* 51*	* 50*	* 58*
*Buckeye Creek	* 2704.54	* 51*	* 43.25*	* 43*
*Buckeye Creek	* 2661.29	* 134*	* 57.86*	* 63*
*Buckeye Creek	* 2603.43	* 66*	* 48.89*	* 51*
*Buckeye Creek	* 2554.54	* 83*	* 59.92*	* 60*
*Buckeye Creek	* 2494.62	* 170*	* 76.77*	* 86*
*Buckeye Creek	* 2460.04	* Bridge	* *	* *
*Buckeye Creek	* 2417.85	* 91*	* 63.32*	* 62*
*Buckeye Creek	* 2354.53	* 144*	* 48.15*	* 69*
*Buckeye Creek	* 2306.38	* 90*	* 51.84*	* 42*
*Buckeye Creek	* 2254.54	* 90*	* 50*	* 45*
*Buckeye Creek	* 2204.54	* 74*	* 50*	* 44*
*Buckeye Creek	* 2154.54	* 63*	* 48.8*	* 47*
*Buckeye Creek	* 2105.74	* 190*	* 202.35*	* 215*
*Buckeye Creek	* 1903.41	* 512*	* 298.87*	* 86*
*Buckeye Creek	* 1604.54	* 149*	* 184.82*	* 41*
*Buckeye Creek	* 1419.72	* 173*	* 185.67*	* 44*
*Buckeye Creek	* 1234.05	* 117*	* 131.34*	* 192.99*
*Buckeye Creek	* 1102.70	* 138.99*	* 130.59*	* 147.99*
*Buckeye Creek	* 972.12	* 168*	* 161.32*	* 108*
*Buckeye Creek	* 810.82	* 200*	* 178.48*	* 258*
*Buckeye Creek	* 632.35	* 239*	* 198.36*	* 80*
*Buckeye Creek	* 433.99	* 150.99*	* 144.27*	* 75.99*
*Buckeye Creek	* 289.71	* 142*	* 180.45*	* 179*
*Buckeye Creek	* 109.26	* 105.99*	* 109.26*	* 120*
*Buckeye Creek	* 0	* 0*	* 0*	* 0*

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SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Buckeye Creek

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*****
*   Reach      *   River Sta.   *   Contr.   *   Expan.   *
*****
*Buckeye Creek *   3504.54 *   .1*       .3*
*Buckeye Creek *   3454.54 *   .1*       .3*
*Buckeye Creek *   3404.54 *   .1*       .3*
*Buckeye Creek *   3354.54 *   .1*       .3*
*Buckeye Creek *   3304.54 *   .1*       .3*
*Buckeye Creek *   3254.54 *   .1*       .3*
*Buckeye Creek *   3204.54 *   .1*       .3*
*Buckeye Creek *   3154.54 *   .1*       .3*
*Buckeye Creek *   3104.54 *   .1*       .3*
*Buckeye Creek *   3054.54 *   .1*       .3*
*Buckeye Creek *   3004.54 *   .1*       .3*
*Buckeye Creek *   2954.54 *   .1*       .3*
*Buckeye Creek *   2904.54 *   .1*       .3*
*Buckeye Creek *   2854.58 *   .1*       .3*
*Buckeye Creek *   2804.54 *   .1*       .3*
*Buckeye Creek *   2754.54 *   .1*       .3*
*Buckeye Creek *   2704.54 *   .1*       .3*
*Buckeye Creek *   2661.29 *   .1*       .3*
*Buckeye Creek *   2603.43 *   .1*       .3*
*Buckeye Creek *   2554.54 *   .1*       .3*
*Buckeye Creek *   2494.62 *   .1*       .3*
*Buckeye Creek *   2460.04 *   Bridge *   *
*Buckeye Creek *   2417.85 *   .1*       .3*
*Buckeye Creek *   2354.53 *   .1*       .3*
*Buckeye Creek *   2306.38 *   .1*       .3*
*Buckeye Creek *   2254.54 *   .1*       .3*
*Buckeye Creek *   2204.54 *   .1*       .3*
*Buckeye Creek *   2154.54 *   .1*       .3*
*Buckeye Creek *   2105.74 *   .1*       .3*
*Buckeye Creek *   1903.41 *   .1*       .3*
*Buckeye Creek *   1604.54 *   .1*       .3*
*Buckeye Creek *   1419.72 *   .1*       .3*
*Buckeye Creek *   1234.05 *   .1*       .3*
*Buckeye Creek *   1102.70 *   .1*       .3*
*Buckeye Creek *   972.12 *   .1*       .3*
*Buckeye Creek *   810.82 *   .1*       .3*
*Buckeye Creek *   632.35 *   .1*       .3*
*Buckeye Creek *   433.99 *   .1*       .3*
*Buckeye Creek *   289.71 *   .1*       .3*
*Buckeye Creek *   109.26 *   .1*       .3*
*Buckeye Creek *   0 *   .1*       .3*
*****

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

X	X	XXXXXX	XXXX		XXXX	XX	XXXX
X	X	X	X	X	X	X	X
X	X	X	X		X	X	X
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	XXXX

\*\*\*\*\*

PROJECT DATA

Project Title: 110-811\_Hydraulic Study  
Project File : 110-811\_Hydraulic Study.prj  
Run Date and Time: 11/19/2013 11:17:33 AM

Project in English units

Project Description:  
Markwest Liberty Midstream & Resources, LLC  
CEC #110-811  
4600 J. Barry Ct., Suite 500  
Canonsburg, PA 15317

November 2013

Sherwood Gas Processing Plant Flood  
Study

Construction in a Floodway Study for Approval of temporary soil  
stockpiles.

FEMA Zones A, AE, and X from the Doddridge County Indiana FIS  
Study shown on FEMA FIRM Panel # 54017C0080 B, effective October 4,  
2011.

CEC Engineering Team:

Principal: Rick Celender, C.E.T., CPESC,  
CPSWQ  
Project Manager: Andy Gullone, P.E., CPESC  
Hydraulic Modelers: Tim  
Johnston  
Reviewers: Andy Gullone, Rick Celender

Model Creation:

Existing  
(Pre-project): CEC Created Model File, "110-811\_Hydraulic Study," Plan File,  
"110-811\_Existing 11-07-2013."  
Proposed (Post-project): CEC Created Model  
File, "110-811\_Hydraulic Study," Plan File, "110-811\_Proposed  
11-07-2013."  
Geometry file created in HEC-RAS.  
Steady flow file created  
from Doddridge County FIS, October 4, 2011.

110-811\_Hydraulic Study.rep

Data Sources:

Geometry -  
Surface created from West Virginia Statewide Addressing and Mapping Board DEM blended with field topo survey of the bridge, existing access road from County Route 50/34, and various locations along the reach.  
Flow - Total Buckeye Creek  
100-year flow = 5,150 CFS.  
Downstream Boundary - Known Water Surface Elevation = 811. Approximate stream distance of 3,504 feet on profile.

\*\*\*\*\*

PLAN DATA

Plan Title: 110-811\_Proposed 11-07-2013  
Plan File : p:\2011\110-811\Calculations\H and H\20131107\_HEC-RAS\110-811\_Hydraulic Study.p01

Geometry Title: 110-811\_Proposed 11-07-2013  
Geometry File : p:\2011\110-811\Calculations\H and H\20131107\_HEC-RAS\110-811\_Hydraulic Study.g02

Flow Title : 110-811\_100Year  
Flow File : p:\2011\110-811\Calculations\H and H\20131107\_HEC-RAS\110-811\_Hydraulic Study.f01

Plan Summary Information:

Number of: Cross Sections = 40 Multiple Openings = 0  
Culverts = 0 Inline Structures = 0  
Bridges = 1 Lateral Structures = 0

Computational Information

Water surface calculation tolerance = 0.01  
Critical depth calculation tolerance = 0.01  
Maximum number of iterations = 20  
Maximum difference tolerance = 0.3  
Flow tolerance factor = 0.001

Computation Options

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

\*\*\*\*\*

FLOW DATA

Flow Title: 110-811\_100Year  
Flow File : p:\2011\110-811\Calculations\H and H\20131107\_HEC-RAS\110-811\_Hydraulic Study.f01

Flow Data (cfs)

\*\*\*\*\*  
\* River Reach RS \* 100-Year \*  
\* Buckeye Creek Buckeye Creek 3504.54 \* 5150 \*  
\*\*\*\*\*

Boundary Conditions

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110-811\_Hydraulic Study.rep

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*****
* River      Reach      Profile      *      Upstream
  Downstream  *
*****
* Buckeye Creek  Buckeye Creek  100-Year      *
  Known WS = 811 *
*****

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GEOMETRY DATA

Geometry Title: 110-811\_Proposed 11-07-2013  
 Geometry File : p:\2011\110-811\Calculations\H and  
 H\20131107\_HEC-RAS\110-811\_Hydraulic Study.g02

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek      RS: 3504.54

INPUT

Description: A

Station Elevation Data

num= 147

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100	838.81	-98.96	838.29	-98.75	838.18	-98.4	838	-96.95	837.26
-96.1	836.83	-95.4	836.48	-94.48	836	-93.69	835.59	-92.75	835.1
-91.68	834.54	-90.65	834	-89.58	833.44	-88.38	832.81	-87.57	832.38
-86.84	832	-85.95	831.54	-85.41	831.26	-84.5	830.79	-83.05	830.02
-83.01	830	-81.27	829.11	-79.1	828	-79.08	827.99	-79.07	827.99
-77.37	827.11	-75.99	826.41	-75.64	826.23	-75.18	826	-74.04	825.4
-73.22	824.97	-72.55	824.62	-71.39	824	-70.83	823.7	-70.35	823.45
-69.1	822.78	-67.62	822	-67.26	821.81	-67.01	821.68	-65.6	820.94
-64.29	820.25	-64.09	820.15	-63.81	820	-62.65	819.38	-61.84	818.95
-61.13	818.57	-60.06	818	-60.02	817.91	-59.96	817.79	-59.91	817.69
-59.87	817.59	-59.83	817.5	-59.8	817.43	-59.77	817.35	-59.73	817.28
-59.7	817.21	-59.67	817.15	-59.65	817.09	-59.62	817.04	-59.6	816.99
-59.58	816.94	-59.56	816.89	-59.54	816.85	-59.46	816.69	-59.15	815.06
-47.25	813.56	-46	813.25	-45.85	813.22	-44.79	812.96	-43.56	812.66
-42.3	812.35	-41.93	812.27	-41.36	808.97	-40.43	808	-40.31	808
-40.27	808	-40.22	808	-40.14	808	-38.54	807.48	-34.04	806
-33.41	805.89	-32.05	805.65	-25.82	804.54	-22.76	804.44	-19.68	804.44
-19.3	804.44	-14.73	804.44	-5.05	804.44	0	804.44	.9	804.44
5.75	804.44	15.3	804.44	16.43	804.44	19.72	804.44	21.76	804.67
25.81	806	28.84	806.95	32.2	808	35.74	808.98	39.4	810
43.29	811.02	47.05	812	49.55	812.68	54.41	814	56.85	814.55
63.18	816	63.21	816	63.24	816	63.62	816.01	63.71	816
63.73	816	63.9	816	64.26	816	66.98	816	71.15	816
79.48	816	89.67	816	95.77	816	97.03	816	99.05	816
101.29	816	101.88	816	102.53	816	103.1	816.19	110.92	818
112.97	819.63	113.44	820	115.04	821.27	116.39	822	119.11	823.46
119.51	824	120.78	825.71	121	826	121.65	826.89	122.64	828
123.43	828.89	124.41	830	125.72	831.48	126.18	832	126.52	832.39
127.95	834	129.37	835.19	130.09	835.93	132.25	835.95	133.34	836
134.36	836.19	136.69	836.42						

Manning's n values      num= 3

Sta	n Val	Sta	n Val	Sta	n Val
*****		*****		*****	

-100 .05 -41.93 110-811\_Hydraulic Study.rep  
 .035 49.55 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -41.93 49.55 50 50 50 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 814.88 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.76 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 814.12 * Reach Len. (ft) * 50.00 * 50.00 *
50.00 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 7.66 * 731.47 *
3.81 *
* E.G. Slope (ft/ft) *0.001833 * Area (sq ft) * 7.66 * 731.47 *
3.81 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 8.20 * 5138.03 *
3.77 *
* Top width (ft) * 106.62 * Top width (ft) * 9.75 * 91.48 *
5.39 *
* Vel Total (ft/s) * 6.93 * Avg. vel. (ft/s) * 1.07 * 7.02 *
0.99 *
* Max Chl Dpth (ft) * 9.68 * Hydr. Depth (ft) * 0.79 * 8.00 *
0.71 *
* Conv. Total (cfs) *120296.7 * Conv. (cfs) * 191.5 *120017.2 *
88.0 *
* Length wtd. (ft) * 50.00 * Wetted Per. (ft) * 9.94 * 96.27 *
5.58 *
* Min Ch El (ft) * 804.44 * Shear (lb/sq ft) * 0.09 * 0.87 *
0.08 *
* Alpha * 1.02 * Stream Power (lb/ft s) * 136.69 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.11 * Cum Volume (acre-ft) * 94.18 * 54.04 *
65.71 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 26.12 * 5.02 *
14.34 *
*****
*****

```

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3454.54

INPUT

Description: B

```

Station Elevation Data num= 121
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
-106.13 826.76 -105.83 826.61 -105.52 826.46 -104.57 826 -104.45 825.95
-104.42 825.93 -103.35 825.44 -102.97 825.27 -102.28 824.95 -101.55 824.59
-101.24 824.44 -100.37 824 -100.19 823.91 -99.27 823.46 -98.9 823.29
-98.27 822.98 -97.55 822.65 -97.23 822.49 -96.16 822 -96.15 821.99
-96.14 821.99 -94.96 821.48 -94.61 821.32 -93.85 820.99 -93.19 820.71
-92.79 820.53 -91.86 820.13 -91.79 820.1 -91.59 820 -90.51 819.47
-90.04 819.26 -89.22 818.86 -88.25 818.41 -87.98 818.28 -87.37 818
-87.36 818 -87.35 818 -87.19 817.14 -86.99 814.66 -83.41 814.33
-78.27 814.15 -64.45 812.92 -42.91 811.21 -42.79 809.16 -42.41 809.13
-42.01 809.09 -41.6 809.06 -41.18 809.02 -40.66 808.97 -40.11 808.93
-39.53 808.88 -37.2 808.63 -36.6 808.56 -35.97 808.48 -35.28 808.4

```



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-32.94	808.07	-32.49	808	-31.34	807.77	-31	807.7	-29.05	807.31
-28.01	807.09	-26.05	806.67	-25.06	806.46	-22.96	806	-22.17	805.82
-21.82	805.74	-19.4	805.19	-17.82	804.84	-16.67	804.58	-14.08	804.38
-13.68	804.38	-6.61	804.38	0	804.38	17.4	804.38	17.52	804.38
23.35	805.7	24.35	806	28.89	807.47	30.57	808	37.14	809.7
38.3	810	39.73	810.36	46.16	812	52.62	813.62	54.12	814
61.82	815.78	62.8	816	62.86	816	62.93	816	62.98	816
63.03	816	63.08	816	63.12	816	63.16	816	63.2	816
63.43	816	72.23	816	72.53	816	77.56	816	88.82	816
92.29	816	92.47	816	93.12	816	93.64	816	96.03	816
98.64	816	99.53	816	101.36	816	103.41	816	105.44	816
108.77	817.27	110.92	818	112.2	819.74	112.38	820	113.85	822
113.85	822.01	115.45	823.6	115.85	824	116.26	824.42	117.85	826
118.35	826.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-106.13	.05	-42.79	.035	30.57	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-42.79	30.57		52	50	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

```

*****
*****
* E.G. Elev (ft) * 814.75 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 1.03 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 813.72 * Reach Len. (ft) * 52.00 * 50.00 *
50.00 *
* Crit w.s. (ft) * * Flow Area (sq ft) * 39.75 * 588.71 *
63.84 *
* E.G. Slope (ft/ft) *0.002433 * Area (sq ft) * 39.75 * 588.71 *
63.84 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 66.36 * 4899.73 *
183.92 *
* Top width (ft) * 126.50 * Top width (ft) * 30.68 * 73.36 *
22.46 *
* Vel Total (ft/s) * 7.44 * Avg. vel. (ft/s) * 1.67 * 8.32 *
2.88 *
* Max Chl Dpth (ft) * 9.34 * Hydr. Depth (ft) * 1.30 * 8.02 *
2.84 *
* Conv. Total (cfs) *104401.9 * Conv. (cfs) * 1345.3 * 99328.3 *
3728.4 *
* Length wtd. (ft) * 50.03 * wetted Per. (ft) * 32.72 * 74.31 *
23.17 *
* Min Ch El (ft) * 804.38 * Shear (lb/sq ft) * 0.18 * 1.20 *
0.42 *
* Alpha * 1.20 * Stream Power (lb/ft s) * 118.35 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.14 * Cum volume (acre-ft) * 94.15 * 53.28 *
65.67 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 26.10 * 4.93 *
14.33 *
*****
*****

```

CROSS SECTION

RIVER: Buckeye Creek

REACH: Buckeye Creek

INPUT

Description: C

Station Elevation Data		num= 120		Station Elevation Data		num= 120		Station Elevation Data		num= 120	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-130.31	819.94	-130.16	819.85	-127.95	818.4	-127.34	818	-124.36	816.46		
-123.5	816	-122.92	815.91	-122.44	815.86	-122.09	815.81	-121.89	815.78		
-121.74	815.75	-121.45	815.71	-121.31	815.69	-121.19	815.68	-121.09	815.66		
-121	815.65	-120.93	815.64	-120.86	815.64	-120.81	815.63	-120.78	815.51		
-118.73	815.9	-118.62	815.92	-118.37	815.95	-117.79	815.59	-115.95	814.65		
-112.35	813.89	-102.14	815.26	-94.41	813.55	-93.69	813.6	-93.3	813.59		
-91.7	813.84	-89.86	814.09	-85.86	814.99	-84.7	814.77	-82.96	814.52		
-77.51	814.54	-69.06	813.8	-67.38	813.67	-52.48	812.03	-42.72	810.75		
-39.01	809.99	-38.2	809.83	-38.11	809.8	-37.46	809.6	-37.3	809.57		
-37.12	809.53	-36.94	809.5	-36.74	809.46	-36.53	809.42	-35.73	809.24		
-35.55	809.2	-35.23	809.14	-34.89	809.07	-34.51	809	-34.1	808.92		
-33.65	808.83	-33.15	808.73	-32.59	808.62	-31.98	808.5	-31.02	808.31		
-30.29	808.16	-29.54	808	-29.5	808	-28.02	807.66	-20.74	806		
-15	804.51	-12.96	804.32	-3.54	804.32	0	804.32	4.45	804.32		
15.59	804.32	24.88	805.99	24.9	806	29.51	807.42	31.4	808		
35.16	808.93	39.43	810	41.01	810.41	47.1	812	50.37	812.89		
54.45	814	59.19	815.18	62.48	816	62.51	816	62.55	816		
62.56	816	63.15	816	63.19	816	63.22	816	63.23	816		
63.24	816	63.25	816	63.26	816	63.27	816	63.28	816		
73.18	816	75.76	816	76.08	816	82.98	816	89.81	816		
92.74	816	96.15	815.99	98.06	815.99	99.09	815.99	104.95	816		
110.42	817.6	111.76	818	112.3	818.75	113.18	820	113.8	820.86		
114.59	822	115.75	823.64	116.01	824	117.38	825.93	117.43	826		
117.52	826.13	118.81	828	119.32	828.72	120.21	830	120.39	830.24		

Manning's n Values		num= 3		Manning's n Values	
Sta	n Val	Sta	n Val	Sta	n Val
-130.31	.05	-39.01	.035	31.4	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-39.01	31.4		55	50		.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 814.60	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 1.21	* Wt. n-Val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 813.38	* Reach Len. (ft)	* 55.00	* 50.00
50.00				
* Crit w.s. (ft)	*	* Flow Area (sq ft)	* 38.90	* 539.60
56.99				
* E.G. Slope (ft/ft)	*0.003073	* Area (sq ft)	* 38.90	* 539.60
56.99				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 83.87	* 4886.12
180.01				
* Top width (ft)	* 116.93	* Top width (ft)	* 25.75	* 70.41
20.78				
* Vel Total (ft/s)	* 8.10	* Avg. Vel. (ft/s)	* 2.16	* 9.06
3.16				
* Max Chl Dpth (ft)	* 9.06	* Hydr. Depth (ft)	* 1.51	* 7.66
2.74				
* Conv. Total (cfs)	* 92903.2	* Conv. (cfs)	* 1513.1	* 88142.9
3247.2				

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* Length wtd. (ft) * 50.25 * Wetted Per. (ft) * 25.98 * 71.50 *
  21.46 *
* Min Ch El (ft) * 804.32 * Shear (lb/sq ft) * 0.29 * 1.45 *
  0.51 *
* Alpha * 1.19 * Stream Power (lb/ft s) * 120.39 * 0.00 *
  0.00 *
* Frctn Loss (ft) * 0.13 * Cum Volume (acre-ft) * 94.10 * 52.63 *
  65.60 *
* C & E Loss (ft) * 0.10 * Cum SA (acres) * 26.06 * 4.84 *
  14.30 *
*****
*****

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3354.54

INPUT

Description: D

Station Elevation Data num= 109

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-161.95	820.72	-159	819.1	-154.74	817.2	-151.93	815.9	-147.17	813.71
-145.77	813.06	-126.21	812.54	-124.87	812.51	-123.36	812.51	-123.07	812.53
-122.06	812.55	-122.03	812.53	-115.94	812.57	-115.14	812.59	-114.95	812.57
-103.12	812.35	-88.28	812.14	-82.76	812.08	-54.87	809.98	-52.64	809.81
-41.07	809.2	-39.11	809.06	-36.85	808.62	-36.78	808.61	-36.71	808.61
-36.64	808.6	-36.56	808.59	-36.14	808.54	-35.65	808.48	-35.49	808.45
-35.3	808.43	-35.09	808.4	-34.83	808.36	-34.53	808.32	-34.16	808.27
-33.7	808.2	-33.12	808.12	-32.28	808.01	-32.21	808	-31.45	807.84
-22.89	806	-21.17	805.62	-18.11	804.96	-15.26	804.34	-13.7	804.25
-13.63	804.25	-13.6	804.25	-13.5	804.25	-.57	804.25	0	804.25
4.84	804.25	8.21	804.25	16.71	804.25	17.49	804.25	26.48	806
31.46	807.35	33.9	808	38.76	809.37	40.95	810	46.89	811.73
47.8	812	48.18	812.11	54.65	814	57.78	814.8	62.56	816
62.6	816	62.66	816	62.67	816	62.73	816	62.74	816
62.91	816	63.02	816	63.12	816	63.22	816	63.3	816
63.38	816	63.45	816	63.52	816	63.58	816	63.63	816
63.69	816	63.74	816	63.78	816	63.83	816	64.54	816
66.78	816.01	67.1	816.01	67.7	816.01	68.02	816.01	68.26	816.01
71.84	816.01	73.95	816.01	74.22	816.01	85.96	816	89.03	815.99
91.01	815.98	96.63	815.95	100.33	815.97	106.93	816	112.68	817.78
113.29	818	113.56	818.18	115.15	820	116.54	821.58	116.9	822
118.58	823.91	118.65	824	118.98	824.38	119.3	824.8		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-161.95	.05	-36.56	.035	33.9	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -36.56 33.9 35 50 50 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

```

*****
* E.G. Elev (ft) * 814.37 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.90 * Wt. n-Val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 813.47 * Reach Len. (ft) * 35.00 * 50.00 *

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50.00 *
* Crit w.s. (ft) * * Flow Area (sq ft) * 204.04 * 571.26 *
52.25 *
* E.G. Slope (ft/ft) *0.002225 * Area (sq ft) * 204.04 * 571.26 *
52.25 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 430.80 * 4578.98 *
140.22 *
* Top width (ft) * 199.51 * Top width (ft) * 110.10 * 70.46 *
18.95 *
* Vel Total (ft/s) * 6.22 * Avg. Vel. (ft/s) * 2.11 * 8.02 *
2.68 *
* Max Chl Dpth (ft) * 9.22 * Hydr. Depth (ft) * 1.85 * 8.11 *
2.76 *
* Conv. Total (cfs) *109191.3 * Conv. (cfs) * 9133.9 * 97084.4 *
2972.9 *
* Length wtd. (ft) * 48.72 * Wetted Per. (ft) * 110.36 * 71.33 *
19.72 *
* Min Ch El (ft) * 804.25 * Shear (lb/sq ft) * 0.26 * 1.11 *
0.37 *
* Alpha * 1.49 * Stream Power (lb/ft s) * 119.30 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.11 * Cum volume (acre-ft) * 93.95 * 52.00 *
65.54 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 25.98 * 4.76 *
14.28 *

```

\*\*\*\*\*  
\*\*\*\*\*

CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 3304.54

INPUT

Description: E

Station Elevation Data		num=		112							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-193.15	818.45	-183.47	814.34	-183.16	814.28	-176.73	813.26	-163.3	813.13		
-138.32	812.35	-120.78	812.28	-86.53	811.72	-71.47	811.24	-56.51	810.18		
-43	809.27	-36.76	808.75	-36.03	808.62	-36	808.61	-35.97	808.61		
-35.94	808.6	-35.9	808.6	-35.86	808.59	-35.82	808.58	-35.77	808.58		
-35.72	808.57	-35.67	808.56	-35.62	808.55	-35.57	808.54	-35.45	808.52		
-35.38	808.51	-35.31	808.49	-35.22	808.47	-35.13	808.45	-35.02	808.43		
-34.88	808.4	-34.73	808.37	-34.53	808.33	-34.3	808.28	-33.99	808.22		
-33.59	808.13	-33.11	808.03	-32.95	808	-29.62	807.39	-22.04	806		
-15.25	804.68	-11.71	804.25	-11.66	804.25	0	804.25	11.43	804.25		
12.59	804.25	14.93	804.25	22.78	805.33	26.75	806	35.39	807.94		
35.56	807.97	35.68	808	36.05	808.12	42.24	810	48.06	811.81		
48.44	811.93	48.47	811.94	48.67	812	48.97	812.09	55.11	814		
58.52	814.76	64.02	816	64.05	816	64.06	816	64.11	816		
64.12	816	64.16	816	64.18	816	64.21	816	64.23	816		
64.27	816	64.29	816	64.51	816	64.55	816	64.59	816		
64.63	816	64.66	816	64.7	816	64.72	816	64.98	816		
65.48	816	65.86	816	66.57	816	71.47	816.01	72.7	816.02		
72.75	816.02	73.29	816.02	74.51	816.02	75.35	816.02	84.84	816		
93.89	815.84	94	815.84	95.83	815.82	98.76	815.86	102.88	815.92		
106.57	816	109.76	817.28	111.63	818	113.65	818.64	117.46	820		
123.18	821.49	124.76	821.91	125.09	822	125.17	822	125.18	822		
125.45	822.01	125.65	822.02	126.04	822.04	126.82	822.08	127.57	822.09		
152.93	822.56	166.8	822.78								

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Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -193.15 .05 -36.76 .035 35.39 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -36.76 35.39 55 50 47 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \*\*\*\*\*  
 \* E.G. Elev (ft) \* 814.26 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.89 \* Wt. n-Val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 813.37 \* Reach Len. (ft) \* 55.00 \* 50.00 \*  
 47.00 \*  
 \* Crit W.S. (ft) \* \* Flow Area (sq ft) \* 227.89 \* 570.53 \*  
 48.43 \*  
 \* E.G. slope (ft/ft) \*0.002293 \* Area (sq ft) \* 227.89 \* 570.53 \*  
 48.43 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 447.15 \* 4571.92 \*  
 130.93 \*  
 \* Top width (ft) \* 230.48 \* Top width (ft) \* 140.65 \* 72.15 \*  
 17.69 \*  
 \* Vel Total (ft/s) \* 6.08 \* Avg. Vel. (ft/s) \* 1.96 \* 8.01 \*  
 2.70 \*  
 \* Max Chl Dpth (ft) \* 9.12 \* Hydr. Depth (ft) \* 1.62 \* 7.91 \*  
 2.74 \*  
 \* Conv. Total (cfs) \*107543.2 \* Conv. (cfs) \* 9337.5 \* 95471.7 \*  
 2734.0 \*  
 \* Length wtd. (ft) \* 50.54 \* Wetted Per. (ft) \* 140.77 \* 72.91 \*  
 18.50 \*  
 \* Min Ch El (ft) \* 804.25 \* Shear (lb/sq ft) \* 0.23 \* 1.12 \*  
 0.37 \*  
 \* Alpha \* 1.56 \* Stream Power (lb/ft s) \* 166.80 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.10 \* Cum Volume (acre-ft) \* 93.78 \* 51.34 \*  
 65.48 \*  
 \* C & E Loss (ft) \* 0.08 \* Cum SA (acres) \* 25.88 \* 4.68 \*  
 14.26 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3254.54

INPUT

Description: F

Station Elevation Data num= 117  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 \*\*\*\*\*  
 -240.13 819.89 -227.21 814.66 -216.19 812.98 -198.11 812.16 -175.25 811.94  
 -165.06 811.8 -160.59 811.79 -152.22 811.82 -122.44 811.41 -109.35 811.26  
 -104.94 811.11 -102.58 811.05 -67.55 810.05 -42.46 809.03 -36.68 808.81  
 -36.67 808.63 -36.63 808.62 -36.6 808.62 -36.56 808.61 -36.51 808.6  
 -36.47 808.59 -36.42 808.58 -36.36 808.57 -36.3 808.56 -36.24 808.55  
 -36.18 808.54 -36.1 808.52 -35.72 808.43 -35.62 808.41 -35.52 808.39  
 -35.41 808.37 -35.28 808.34 -35.14 808.31 -34.99 808.27 -34.82 808.23  
 -34.63 808.18 -34.4 808.13 -34.14 808.06 -33.88 808 -31.55 807.56

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-23.17	806	-20.88	805.53	-17.84	804.92	-15.28	804.39	-13.32	804.12
-7.98	804.12	-6.03	804.12	-.01	804.12	0	804.12	4.38	804.12
7.24	804.12	15.16	804.12	15.2	804.12	15.21	804.12	15.81	804.12
16.56	804.21	16.72	804.23	28.47	806	32.29	806.81	35.63	807.52
37.86	808	42.77	809.48	44.49	810	46.47	810.68	50.28	812
53.04	812.93	56.3	814	60.48	814.91	63.23	815.52	63.61	815.59
64.3	815.74	65.6	816	65.65	816	65.74	816	65.87	816
65.99	816	66.12	816	66.23	816	66.36	816	66.47	816
66.61	816	66.72	816	66.85	816	66.96	816	67.1	816
67.21	816	67.34	816	67.45	816	67.55	816	67.63	816
67.97	816	68.02	816	68.06	816	68.1	816	68.14	816
68.72	816	68.76	816	69.87	816.02	70.51	816.02	71.52	816.02
71.91	816.03	77.35	816	78.14	816	85.05	814.92	90.53	814.08
91.07	814	91.75	814	98.34	814	102.59	815.16	106.43	816
110.08	817.66	110.84	818	113.36	819.15	115.21	820	116.17	820.22
116.63	820.29	122.85	821.87						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-240.13	.05	-36.68	.035	37.86	.05

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

-36.68	37.86	43	50	52	.1	.3
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Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
-227.46	-166.52	814.03	F

CROSS SECTION OUTPUT Profile #100-Year

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*****
* E.G. Elev (ft) * 814.08 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.64 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 813.45 * Reach Len. (ft) * 43.00 * 50.00 *
52.00 *
* Crit W.S. (ft) * 810.89 * Flow Area (sq ft) * 347.10 * 605.19 *
46.80 *
* E.G. Slope (ft/ft) *0.001685 * Area (sq ft) * 409.35 * 605.19 *
46.80 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 815.54 * 4224.96 *
109.51 *
* Top Width (ft) * 273.88 * Top width (ft) * 182.58 * 74.54 *
16.76 *
* Vel Total (ft/s) * 5.15 * Avg. vel. (ft/s) * 2.35 * 6.98 *
2.34 *
* Max Chl Dpth (ft) * 9.33 * Hydr. Depth (ft) * 2.67 * 8.12 *
2.79 *
* Conv. Total (cfs) *125442.2 * Conv. (cfs) * 19864.6 *102910.2 *
2667.3 *
* Length wtd. (ft) * 48.81 * wetted Per. (ft) * 129.89 * 75.50 *
17.62 *
* Min Ch El (ft) * 804.12 * Shear (lb/sq ft) * 0.28 * 0.84 *
0.28 *
* Alpha * 1.54 * Stream Power (lb/ft s) * 122.85 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.08 * Cum volume (acre-ft) * 93.38 * 50.67 *
65.43 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 25.67 * 4.60 *
14.24 *
*****
*****

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

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3204.54

INPUT

Description: G

Station Elevation Data		num= 99		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-283.58	819.8	-266.29	814.14	-266.24	814.12	-266.23	814.12	-266.09	814.11
-217.5	811.93	-217.38	811.93	-173.11	811.45	-163.78	811.46	-160.93	811.43
-155.76	811.36	-150	811.26	-144.17	811.18	-124.33	810.91	-109.74	810.72
-100.63	810.59	-93.13	810.46	-70.42	809.9	-50.46	809.14	-38.7	808.69
-33.59	808.48	-31.92	807.96	-31.88	807.94	-31.83	807.93	-31.78	807.91
-31.73	807.89	-31.68	807.88	-31.63	807.86	-31.57	807.84	-31.51	807.81
-31.44	807.79	-31.37	807.77	-31.29	807.74	-31.2	807.71	-31.1	807.69
-30.89	807.62	-30.78	807.58	-30.66	807.54	-30.52	807.5	-30.38	807.45
-30.22	807.4	-29.76	807.22	-29.6	807.16	-29.42	807.08	-29.23	807
-28.94	806.91	-28.61	806.8	-28.23	806.67	-27.79	806.53	-27.29	806.36
-26.69	806.17	-26.19	806	-21.56	805.01	-18.47	804.35	-16.86	804.05
-8.24	804.05	-2.99	804.05	0	804.05	3.37	804.05	15.21	804.05
15.24	804.05	16.56	804.21	27.88	806	30.45	806.52	37.81	808
39.9	808.63	44.4	810	47.91	811.09	50.79	812	54.71	813.27
56.99	814	57.54	814.1	57.74	814.13	60.08	814.54	62.07	814.88
63.39	815.06	64.64	815.27	69.51	816	69.65	816	69.72	816
69.9	816	69.98	816	70.07	816	70.16	816	70.17	816
70.18	816	70.19	816	70.2	816	71.28	816	71.34	816
71.39	816	71.44	816	71.49	816	88.72	817.7	91.55	818
96.32	818.82	102.84	820	107.71	820.7	116.72	821.98		

Manning's n Values		num= 3		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
-283.58	.05	-33.59	.035	37.81	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-33.59	37.81		44	50	.1	.3
Ineffective Flow			num= 1				
	Sta L	Sta R	Elev	Permanent			
	-267.35	-166.84	813.91	F			

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 813.99	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.59	* Wt. n-Val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 813.40	* Reach Len. (ft)	* 44.00	* 50.00
51.00				
* Crit w.s. (ft)	* 810.81	* Flow Area (sq ft)	* 406.21	* 593.96
47.48				
* E.G. slope (ft/ft)	* 0.001554	* Area (sq ft)	* 518.78	* 593.96
47.48				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 1000.14	* 4044.24
105.62				
* Top Width (ft)	* 305.51	* Top Width (ft)	* 216.78	* 71.40

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```

17.32 *
* Vel Total (ft/s) * 4.92 * Avg. Vel. (ft/s) * 2.46 * 6.81 *
  2.22 *
* Max Chl Dpth (ft) * 9.35 * Hydr. Depth (ft) * 3.05 * 8.32 *
  2.74 *
* Conv. Total (cfs) *130661.6 * Conv. (cfs) * 25374.8 *102607.1 *
2679.7 *
* Length wtd. (ft) * 48.84 * Wetted Per. (ft) * 133.29 * 72.36 *
  18.15 *
* Min Ch El (ft) * 804.05 * Shear (lb/sq ft) * 0.30 * 0.80 *
  0.25 *
* Alpha * 1.56 * Stream Power (lb/ft s) * 116.72 * 0.00 *
  0.00 *
* Frctn Loss (ft) * 0.08 * Cum Volume (acre-ft) * 92.92 * 49.98 *
  65.37 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 25.48 * 4.51 *
  14.22 *
*****
*****

```

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

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3154.54

INPUT

Description: H

Station Elevation Data num= 130

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-344.06	820.17	-341.76	819.33	-335.3	817.11	-317.4	813.56	-307.81	813.2
-291.22	811.81	-276.12	811.8	-258.35	811.75	-229.19	811.76	-224.11	811.69
-223.80	811.6886	-211.371	814.442	-210.431	814.6503	-198.584	817.2742	-198.451	817.3037
-196.82	817.6647	-185.797	820.1064	-182.091	819.9894	-178.355	819.778	-174.571	819.4698
-170.718	819.061	-170.391	819.022	-170.058	818.9817	-169.844	818.9553	-165.462	818.3547
-160.933	817.6149	-156.218	816.723	-151.268	815.6623	-147.136	814.6756	-142.256	812.295
-139.20	810.7883	-117.3	810.47	-103.72	810.29	-98.64	810.21	-79.31	809.67
-63.22	809.32	-54.02	808.86	-34.08	808.02	-31.16	807.11	-31.09	807.09
-31.01	807.06	-30.93	807.04	-30.84	807.02	-30.75	806.99	-30.65	806.96
-30.55	806.93	-30.44	806.9	-30.32	806.86	-30.2	806.83	-30.06	806.79
-29.91	806.74	-29.75	806.7	-29.57	806.66	-29.38	806.61	-28.95	806.49
-28.71	806.42	-28.43	806.33	-28.13	806.24	-27.79	806.14	-27.4	806.02
-27.33	806	-25.54	805.56	-19.16	804	-17.81	803.9	-14.84	803.9
-12.95	803.9	-11.52	803.9	-10.4	803.9	-9.49	803.9	-8.03	803.9
-7.43	803.9	-6.92	803.9	-6.49	803.9	-6.11	803.9	-5.77	803.9
-5.54	803.9	-5.32	803.9	0	803.9	3.09	803.9	3.31	803.9
3.55	803.9	3.82	803.9	4.15	803.9	4.52	803.9	4.96	803.9
5.47	803.9	6.08	803.9	6.81	803.9	7.72	803.9	8.87	803.9
10.64	803.9	13.16	803.9	14.82	804	20.71	805.01	26.47	806
34.72	807.69	36.26	808	41.95	809.75	42.76	810	43.86	810.36
48.82	812	51.4	812.8	55.27	814	56.44	814.25	58.83	814.76
62.79	815.6	64.71	816	64.81	816	65.06	816	65.18	816
65.22	816	65.34	816	66.33	816	66.69	816	71	816
71.46	816	71.82	816	76.48	816.77	77.53	816.86	80.56	817.14
83.2	817.46	87.71	817.86	89.18	817.99	89.27	818	89.46	818.03
100.7	820	108.63	821.17	115.16	822	115.51	822	115.58	822

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



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\*\*\*\*\*  
 -344.06 .05 -34.08 .035 34.72 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -34.08 34.72 48 50 52 .1 .3  
 Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 -322.41 -208.71 813.7 F

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \*\*\*\*\*  
 \* E.G. Elev (ft) \* 813.91 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.60 \* Wt. n-Val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 813.32 \* Reach Len. (ft) \* 48.00 \* 50.00 \*  
 52.00 \*  
 \* Crit W.S. (ft) \* 810.97 \* Flow Area (sq ft) \* 383.85 \* 580.83 \*  
 53.36 \*  
 \* E.G. Slope (ft/ft) \*0.001555 \* Area (sq ft) \* 507.96 \* 580.83 \*  
 53.36 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 1029.22 \* 3997.20 \*  
 123.57 \*  
 \* Top width (ft) \* 291.93 \* Top width (ft) \* 204.78 \* 68.80 \*  
 18.35 \*  
 \* Vel Total (ft/s) \* 5.06 \* Avg. Vel. (ft/s) \* 2.68 \* 6.88 \*  
 2.32 \*  
 \* Max Chl Dpth (ft) \* 9.42 \* Hydr. Depth (ft) \* 3.48 \* 8.44 \*  
 2.91 \*  
 \* Conv. Total (cfs) \*130605.1 \* Conv. (cfs) \* 26101.3 \*101370.0 \*  
 3133.9 \*  
 \* Length wtd. (ft) \* 49.67 \* Wetted Per. (ft) \* 110.91 \* 69.69 \*  
 19.20 \*  
 \* Min Ch El (ft) \* 803.90 \* Shear (lb/sq ft) \* 0.34 \* 0.81 \*  
 0.27 \*  
 \* Alpha \* 1.50 \* Stream Power (lb/ft s) \* 115.58 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.08 \* Cum Volume (acre-ft) \* 92.40 \* 49.30 \*  
 65.31 \*  
 \* C & E Loss (ft) \* 0.00 \* Cum SA (acres) \* 25.26 \* 4.43 \*  
 14.20 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

Warning: Divided flow computed for this cross-section.  
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3104.54

INPUT

Description: I  
 Station Elevation Data num= 161  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 \*\*\*\*\*  
 -401.627825.3816-399.444824.5747-399.393 824.556-394.797822.8226-394.749822.8047  
 -389.983820.9722-389.922820.9488-382.882818.1834-382.852818.1719-376.057 815.443  
 -376.053815.4416-375.248815.1116 -361.18 811.96 -358.34 811.62-348.174811.3547

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-340.208814.1063-339.986814.1827-337.747814.9561-325.953819.0302-321.132820.6955
-320.254820.9987-311.115824.1556-304.655 826.387-301.627827.4332-299.087827.9403
-297.466 828.264-292.235829.3085-287.265830.3009-280.148831.7219-275.442832.6615
-275.215832.7069-275.081832.7337-272.718833.2054-270.423833.6636-267.622 834.223
-265.675834.6118-264.567834.8329-258.243836.0958-256.427836.4583-251.748837.3926
-243.394839.0606-238.929839.9523-238.279840.0819-230.393841.6565-226.109842.5119
-224.656842.4353-223.186842.3211 -221.69 842.168 -220.16 841.974-220.029841.9558
-219.897 841.937-219.812841.9248-218.061841.6493-216.243 841.316-214.339840.9187
-212.329840.4498-210.193839.9005-207.907839.2593-205.435 838.511-202.734837.6358
-195.93834.9425-188.378831.9534-184.831830.5495-182.057829.4515-170.906825.0375
-165.728822.9877-165.134822.7526 -141.57810.8612 -138.76 810.85 -128.69 810.69
-108.79 810.52 -62.36 809.45 -61.73 809.43 -61.33 809.43 -61.1 809.42
-34.68 808.63 -32.1 807.88 -32.06 807.85 -32.01 807.83 -31.95 807.8
-31.9 807.77 -31.84 807.74 -31.78 807.71 -31.72 807.68 -31.65 807.64
-31.58 807.61 -31.5 807.57 -31.37 807.53 -31.23 807.48 -30.68 807.28
-30.54 807.22 -30.4 807.16 -30.24 807.1 -30.08 807.03 -29.9 806.95
-29.7 806.87 -29.49 806.78 -29.26 806.69 -29.02 806.58 -28.7 806.46
-28.35 806.33 -27.96 806.18 -27.52 806.01 -27.48 806 -22.31 804.38
-21.08 804 -11.63 803.47 -11.58 803.47 -11.54 803.47 -11.44 803.47
-7.05 803.47 -4.63 803.47 -2.3 803.47 -.93 803.47 0 803.47
2.92 803.47 3.66 803.47 3.67 803.47 8.94 803.47 13.25 803.47
15.58 804 23.04 805.4 26.21 806 31.87 807.14 36.15 808
38.74 808.76 43 810 46.9 811.41 48.53 812 53.61 813.61
54.83 814 54.97 814.03 55.06 814.05 64.07 816 64.37 816
64.47 816 64.78 816 64.82 816 64.83 816 64.85 816
64.86 816 64.88 816 68.81 816 71.72 816 73.12 816
74.23 816 84.17 817.64 87 818 87.13 818 91.93 818.78
99.35 820 104.37 820.67 104.41 820.68 115.25 822 115.59 822
115.69 822 124.72 822.11 135.24 822.23 144.49 822.33 144.6 822.33
151.56 822.39

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

-401.627 .05 -34.68 .035 36.15 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -34.68 36.15 22 50 48 .1 .3  
 Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 -374.52 -333.29 814.03 F

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 813.83	* Element	* Left OB	* Channel	*
Right OB					
* Vel Head (ft)	* 0.62	* Wt. n-val.	* 0.050	* 0.035	*
0.050					
* W.S. Elev (ft)	* 813.21	* Reach Len. (ft)	* 22.00	* 50.00	*
48.00					
* Crit W.S. (ft)	* 810.52	* Flow Area (sq ft)	* 353.22	* 597.20	*
43.31					
* E.G. Slope (ft/ft)	* 0.001599	* Area (sq ft)	* 383.17	* 597.20	*
43.31					
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 902.16	* 4151.87	*
95.97					
* Top width (ft)	* 222.49	* Top Width (ft)	* 135.47	* 70.83	*
16.19					
* Vel Total (ft/s)	* 5.18	* Avg. Vel. (ft/s)	* 2.55	* 6.95	*
2.22					
* Max Chl Dpth (ft)	* 9.74	* Hydr. Depth (ft)	* 3.17	* 8.43	*
2.68					

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* Conv. Total (cfs)	*128775.4	* Conv. (cfs)	* 22558.4	*103817.2	*
2399.8	*				
* Length wtd. (ft)	* 45.27	* Wetted Per. (ft)	* 112.12	* 72.08	*
17.01	*				
* Min Ch El (ft)	* 803.47	* Shear (lb/sq ft)	* 0.31	* 0.83	*
0.25	*				
* Alpha	* 1.50	* Stream Power (lb/ft s)	* 151.56	* 0.00	*
0.00	*				
* Frctn Loss (ft)	* 0.07	* Cum Volume (acre-ft)	* 91.91	* 48.63	*
65.25	*				
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 25.08	* 4.35	*
14.18	*				
*****					
*****					

Warning: Divided flow computed for this cross-section.  
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3054.54

INPUT

Description: J

Station Elevation Data num= 160

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
*****									
-429.242828	4364	-429.044828	3544	-428.83828	2658	-422.615825	6423	-414.533822	1714
-414.489822	1528	-409.726820	1806	-409.594820	1851	-404.261818	0418	-400.311816	3679
-400.304816	3683	-398.313815	4587	-397.744815	6574	-393.853817	0158	-393.703817	0682
-393.496817	1402	-392.096817	6291	-390.327818	2466	-388.595818	8514	-379.167822	1428
-371.205824	9225	-370.162825	2867	-359.56828	9881	-356.922829	9088	-345.234833	9895
-343.099834	7349	-342.055835	0992	-334.911837	5933	-330.428838	4776	-330.062838	5497
-327.389839	0768	-318.775840	7757	-318.235840	8823	-307.091843	0801	-306.408843	2149
-306.066843	2823	-306.046843	2862	-302.499843	9858	-299.055844	665	-298.585844	7578
-295.724	845	-295.529845	3605	-286.329847	1749	-283.69847	6954	-282.704847	8899
-270.962850	2057	-269.88850	4192	-268.993850	5942	-258.22852	7189	-257.056852	9485
-256.66852	9267	-256.26852	8947	-255.853852	8521	-255.436852	7983	-255.401852	7932
-255.365	852	-255.341852	7847	-254.864852	7085	-254.368852	6165	-253.849	852
-253.3852	3778	-252.717852	2265	-252.091	852	-251.415851	8439	-250.675851	6029
-248.808850	8612	-236.258845	8747	-234.761845	2799	-229.91843	3527	-224.664841	2685
-213.511836	8369	-207.092834	2867	-201.969832	2514	-199.681	831	-191.393828	0492
-185.851825	8472	-183.884825	0657	-173.57820	5049	-169.816818	8448	-153.747811	7386
-153.416811	5925	-151.882	810	-122.32	810	-114.52	810	-84.08	809
-75.91	809	-67.79	809	-35.1	809	-35.07	808	-34.81	808
-34.74	808	-34.67	808	-34.6	808	-34.52	808	-34.44	808
-34.36	808	-34.27	808	-34.17	808	-33.73	808	-33.7	808
-33.64	808	-33.6	808	-33.59	808	-33.58	808	-33.56	808
-33.54	808	-31.01	807	-27.53	806	-23.61	804	-21.27	804
-16.03	803	-12.18	803	-12.13	803	-12.11	803	-11.95	803
-11.89	803	-4.65	803	-2.06	803	0	803	1.54	803
2.63	803	6.59	803	7.86	803	9.9	803	14.57	803
17.29	804	21.31	804	26.85	806	28.59	806	33.57	807
35.91	807	36.86	808	38.61	808	44.41	810	49.01	811
50.23	812	51.33	812	57.04	814	66.81	815	75.8	816
75.82	816	75.86	816	75.89	816	75.91	816	75.93	816
75.94	816	75.95	816	75.96	816	77.14	816	78.3	816
78.68	816	79.1	816	79.86	816	81.74	816	83.22	816
89.82	818	93.81	818	99.8	820	105.59	821	110.84	821

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Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -429.242 .05 -35.1 .035 38.61 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -35.1 38.61 23 50 53 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \*\*\*\*\*  
 \* E.G. Elev (ft) \* 813.75 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.60 \* wt. n-val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 813.15 \* Reach Len. (ft) \* 23.00 \* 50.00 \*  
 53.00 \*  
 \* Crit W.S. (ft) \* \* Flow Area (sq ft) \* 352.53 \* 628.46 \*  
 37.55 \*  
 \* E.G. Slope (ft/ft) \*0.001511 \* Area (sq ft) \* 352.53 \* 628.46 \*  
 37.55 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 824.67 \* 4249.48 \*  
 75.85 \*  
 \* Top Width (ft) \* 211.10 \* Top Width (ft) \* 121.85 \* 73.71 \*  
 15.54 \*  
 \* Vel Total (ft/s) \* 5.06 \* Avg. vel. (ft/s) \* 2.34 \* 6.76 \*  
 2.02 \*  
 \* Max Chl Dpth (ft) \* 10.11 \* Hydr. Depth (ft) \* 2.89 \* 8.53 \*  
 2.42 \*  
 \* Conv. Total (cfs) \*132486.7 \* Conv. (cfs) \* 21215.0 \*109320.4 \*  
 1951.3 \*  
 \* Length wtd. (ft) \* 45.65 \* Wetted Per. (ft) \* 122.34 \* 75.78 \*  
 16.24 \*  
 \* Min Ch El (ft) \* 803.04 \* Shear (lb/sq ft) \* 0.27 \* 0.78 \*  
 0.22 \*  
 \* Alpha \* 1.51 \* Stream Power (lb/ft s) \* 110.84 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.07 \* Cum Volume (acre-ft) \* 91.72 \* 47.92 \*  
 65.21 \*  
 \* C & E Loss (ft) \* 0.01 \* Cum SA (acres) \* 25.01 \* 4.27 \*  
 14.16 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 3004.54

INPUT

Description: K  
 Station Elevation Data num= 290  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 \*\*\*\*\*  
 -509.903838.3859-473.543821.2359-473.243821.2344-468.948 821.833-467.725 822  
 -466.272 822.334-466.058822.3815 -464.12822.8253 -463.59822.9431-461.943823.3189  
 -461.091823.5076 -459.74823.8146 -458.56 824.075 -457.51824.3127-455.998824.6453  
 -455.254 824.813-453.403825.2187-452.972825.3156-450.776 825.795-450.663825.8212  
 -448.585826.2726-448.441826.3023-446.652826.6898-446.288826.7645-444.732827.1074  
 -444.149827.2261-442.816827.5175-441.032827.8775-439.897828.1216-438.654828.3706  
 -437.785828.5561-436.292828.8527-435.682 828.982-433.945829.3242-433.586829.3997  
 -431.613829.7856-431.499829.8093-428.246 830.441-427.883830.5055-426.778830.7176

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-425.409830.9578-424.524831.1238-423.878831.2405-422.878831.4129-422.447831.4902  
 -421.254831.6946-421.031831.7344-419.651831.9692 -419.47 832-418.236832.2132  
 -418.153832.2271-416.835832.4542-416.657832.4838-415.425832.6957-415.151832.7411  
 -414.005832.9376-413.634832.9989-412.575 833.18-412.107833.2572-411.136833.4229  
 -410.272833.5617-409.687833.6581-408.899833.7847-408.228833.8953-406.882834.1121  
 -406.13834.2244 -405.56834.3158-404.733834.4387-404.231 834.519-403.731 834.593  
 -403.049834.7232-402.389834.8536-400.647 835.185-400.223835.2684-398.217835.6487  
 -398.033835.6847-396.364 836-395.913 836.078-394.084836.3914-393.902836.4194  
 -390.862836.9228-390.466836.9834-389.184837.1878-388.676837.2653-387.518837.4494  
 -386.9837.5433-385.864837.7077-385.139837.8175-384.222837.9626-383.391838.0879  
 -382.591838.2142-381.658838.3547-380.971838.4627-377.765838.9454-376.985839.0592  
 -375.859839.2165 -375.57839.2585-374.375839.4252-374.163839.4559-372.899839.6317  
 -372.764839.6513-371.433839.8361-371.373839.8447-370.252 840-369.991840.0508  
 -367.227840.5888-367.074840.6184-364.695841.0813-364.425841.1334-362.352841.5209  
 -361.988841.5914-360.172841.9174-359.729841.9948-358.901842.1431-358.405842.2298  
 -357.624842.3697-357.074842.4658-356.339842.5971-355.734842.7026-355.047842.8254  
 -354.387842.9404-353.748843.0545-353.032 843.179-352.441843.2845 -351.38 843.465  
 -350.623843.5968-350.152 843.673-349.347843.8135-348.513843.9487-347.675844.0779  
 -347.308844.1374-346.428 844.273-346.097844.3264-345.174844.4683 -344.88844.5158  
 -343.915 844.664-343.658844.7054 -342.65 844.86 -342.43844.8954-341.024845.1101  
 -340.861845.1334 -339.82845.2932 -339.69845.3117 -338.61845.4777-338.423845.5045  
 -337.333845.6483 -337.27845.6574-336.147845.8051-334.667 846-333.793846.1123  
 -332.646846.2596-332.576846.2684-331.507846.4057-331.399846.4194-330.376846.5506  
 -330.23846.5691-329.254846.6943-328.343846.7909-328.142846.8166-327.267846.9098  
 -327.036846.9394-326.198847.0293-325.937847.0628-325.135847.1493-324.536847.2269  
 -323.031847.3908-322.682847.4282-321.986 847.504-321.611847.5443-320.546847.6596  
 -319.914847.7208-319.487847.7668-318.886847.8252-318.434 847.874-317.864847.9296  
 -317.388847.9811-316.848848.0339-316.347848.0882-315.837848.1382-315.312848.1953  
 -314.832848.2425-314.283848.3023-309.946848.7254-309.608848.7587-308.862848.8309  
 -308.552848.8614-307.779848.9362-307.497848.9639-306.697849.0414-306.443849.0664  
 -305.614849.1465-305.388849.1687-304.533849.2514-304.334849.2709 -302.37 849.461  
 -302.227 849.475 -301.29849.5655-301.175849.5768-300.209 849.67-300.122849.6786  
 -299.13849.7743 -299.07849.7802 -298.05849.8785-296.971849.9826-277.335851.8658  
 -247.886840.5198-246.856840.1802-245.748839.7987 -244.55839.3689-243.245838.8828  
 -241.811838.3303-240.224837.6989-238.451836.9723-236.449836.1296-234.166835.1448  
 -231.533 833.983 -228.45832.5947-224.777830.9097-220.307828.8255-214.729826.1859  
 -207.54822.7404-197.887818.0617-183.573811.0466 -180.38 811.02 -178.06 811.01  
 -142.44 810.98 -125 810.7 -123.4 810.68 -103.48 810.53 -85.36 810  
 -63.3 809.72 -38.45 809.01 -35.94 808.19 -35.5 808.15 -35.41 808.15  
 -35.23 808.13 -34.91 808.11 -34.74 808.1 -34.56 808.09 -34.37 808.07  
 -33.97 808.05 -33.76 808.03 -33.54 808.02 -33.31 808.01 -33.23 808  
 -29.25 806.47 -28.04 806 -24.92 804.84 -22.64 804 -21.26 803.52  
 -19.32 802.84 -16.91 802.19 7.83 802.19 15.01 804 24.08 806  
 34.36 808 39.34 809.23 42.42 810 43.7 810.36 46.48 811.12  
 48.67 811.73 49.66 812 51.94 812.56 53.3 812.86 55.11 813.29  
 58.2 813.97 58.31 814 58.56 814 58.91 814.04 59.21 814.08  
 59.5 814.11 59.78 814.15 60.05 814.18 60.31 814.21 60.56 814.25  
 60.8 814.28 65.04 814.69 65.28 814.71 67.85 814.94 69.06 815.07  
 71.32 815.3 73.81 815.51 77.92 815.88 78.98 816 81.68 816.58  
 88.8 818 91.98 818.82 96.72 820 100.95 821.02 104.2 821.84

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -509.903 .05 -38.45 .035 34.36 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -38.45 34.36 36 50 48 .1 .3

CROSS SECTION OUTPUT Profile #100-Year  
 \*\*\*\*\*  
 \* E.G. Elev (ft) \* 813.68 \* Element \* Left OB \* Channel \*

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Right OB *
* Vel Head (ft) * 0.56 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 813.12 * Reach Len. (ft) * 36.00 * 50.00 *
48.00 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 401.83 * 637.05 *
51.11 *
* E.G. Slope (ft/ft) *0.001376 * Area (sq ft) * 401.83 * 637.05 *
51.11 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 855.07 * 4191.88 *
103.05 *
* Top width (ft) * 242.18 * Top Width (ft) * 149.35 * 72.81 *
20.02 *
* Vel Total (ft/s) * 4.72 * Avg. Vel. (ft/s) * 2.13 * 6.58 *
2.02 *
* Max Chl Dpth (ft) * 10.93 * Hydr. Depth (ft) * 2.69 * 8.75 *
2.55 *
* Conv. Total (cfs) *138826.0 * Conv. (cfs) * 23049.7 *112998.4 *
2777.9 *
* Length wtd. (ft) * 47.28 * Wetted Per. (ft) * 149.85 * 74.60 *
20.67 *
* Min Ch El (ft) * 802.19 * Shear (lb/sq ft) * 0.23 * 0.73 *
0.21 *
* Alpha * 1.62 * Stream Power (lb/ft s) * 104.20 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.06 * Cum Volume (acre-ft) * 91.52 * 47.20 *
65.16 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 24.94 * 4.19 *
14.14 *
*****
*****

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2954.54

INPUT

Description: L

Station Elevation Data num= 280

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-509.903838	3859	-473.543821	2359	-473.243821	2344	-468.948	821.833	-467.725	822
-466.272	822.334	-466.058822	3815	-464.12822	8253	-463.59822	9431	-461.943823	3189
-461.091823	5076	-459.74823	8146	-458.56	824.075	-457.51824	3127	-455.998824	6453
-455.254	824.813	-453.403825	2187	-452.972825	3156	-450.776	825.795	-450.663825	8212
-448.585826	2726	-448.441826	3023	-446.652826	6898	-446.288826	7645	-444.732827	1074
-444.149827	2261	-442.816827	5175	-441.032827	8775	-439.897828	1216	-438.654828	3706
-437.785828	5561	-436.292828	8527	-435.682	828.982	-433.945829	3242	-433.586829	3997
-431.613829	7856	-431.499829	8093	-428.246	830.441	-427.883830	5055	-426.778830	7176
-425.409830	9578	-424.524831	1238	-423.878831	2405	-422.878831	4129	-422.447831	4902
-421.254831	6946	-421.031831	7344	-419.47	832	-418.236832	2132	-418.153832	2271
-416.835832	4542	-416.657832	4838	-415.425832	6957	-415.151832	7411	-414.005832	9376
-413.634832	9989	-412.575	833.18	-412.107833	2572	-411.136833	4229	-410.272833	5617
-409.687833	6581	-408.899833	7847	-408.228833	8953	-406.882834	1121	-406.13834	2244
-405.56834	3158	-404.733834	4387	-404.231	834.519	-403.731	834.593	-403.049834	7232
-402.389834	8536	-400.647	835.185	-400.223835	2684	-398.217835	6487	-398.033835	6847
-396.364	836	-395.913	836.078	-394.084836	3914	-393.902836	4194	-390.862836	9228
-390.468836	9834	-389.184837	1878	-388.676837	2653	-387.518837	4494	-386.9837	5433
-385.864837	7077	-385.139837	8175	-384.222837	9626	-383.391838	0879	-382.591838	2142
-381.658838	3547	-380.971838	4627	-377.765838	9454	-376.985839	0592	-375.859839	2165
-375.57839	2585	-374.375839	4252	-374.163839	4559	-372.899839	6317	-372.764839	6513

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-371.433839.8361-371.373839.8447-370.252 840-367.227840.5888-367.074840.6184  
 -364.695841.0813-364.425841.1334-362.352841.5209-361.988841.5914-360.172841.9174  
 -359.729841.9948-358.901842.1431-358.405842.2298-357.624842.3697-357.074842.4658  
 -356.339842.5971-355.734842.7026-355.047842.8254-354.387842.9404-353.748843.0545  
 -353.032 843.179-352.441843.2845 -351.38 843.465-350.623843.5968-350.152 843.673  
 -349.347843.8135-348.513843.9487-347.675844.0779-347.308844.1374-346.428 844.273  
 -346.097844.3264-345.174844.4683 -344.88844.5158-343.915 844.664-343.658844.7054  
 -342.65 844.86 -342.43844.8954-341.024845.1101-340.861845.1334 -339.82845.2932  
 -339.69845.3117 -338.61845.4777-338.423845.5045-337.333845.6483 -337.27845.6574  
 -334.667 846-332.646846.2596-332.576846.2684-331.507846.4057-331.399846.4194  
 -330.376846.5506 -330.23846.5691-329.254846.6943-328.343846.7909-328.142846.8166  
 -327.267846.9098-327.036846.9394-326.198847.0293-325.937847.0628-325.135847.1493  
 -324.536847.2269-323.031847.3908-322.682847.4282-321.986 847.504-320.546847.6596  
 -319.914847.7208-319.487847.7668-318.886847.8252-318.434 847.874-317.864847.9296  
 -317.388847.9811-316.848848.0339-316.347848.0882-315.837848.1382-315.312848.1953  
 -314.832848.2425-314.283848.3023-309.946848.7254-309.608848.7587-308.862848.8309  
 -308.552848.8614-307.779848.9362-307.497848.9639-306.697849.0414-306.443849.0664  
 -305.614849.1465-305.388849.1687-304.533849.2514-304.334849.2709 -302.37 849.461  
 -302.227 849.475 -301.29849.5655-301.175849.5768-300.209 849.67-300.122849.6786  
 -299.13849.7743 -299.07849.7802-277.335851.8658-247.886840.5198-246.856840.1802  
 -245.748839.7987 -244.55839.3689-243.245838.8828-241.811838.3303-240.224837.6989  
 -238.451836.9723-236.449836.1296-234.166835.1448-231.533 833.983 -228.45832.5947  
 -224.777830.9097-220.307828.8255-214.729826.1859 -207.54822.7404-197.887818.0617  
 -183.573811.0466 -133.05 810.2 -130.8 810.14 -120.98 809.94 -119.28 809.94  
 -113.78 809.93 -103.13 809.97 -93.69 809.92 -67.94 809.52 -52.45 809.04  
 -45.11 808.85 -35.47 808.67 -31.5 808.25 -31.42 808.24 -31.35 808.22  
 -31.26 808.21 -31.16 808.19 -31.04 808.18 -30.92 808.16 -30.8 808.15  
 -30.67 808.13 -30.53 808.11 -29.89 808 -29.7 808 -29.05 807.78  
 -23.67 806 -21.63 805.31 -17.79 804 -10.69 802.19 9.16 802.19  
 11.62 802.51 18.63 804 27.88 806 35.22 807.49 37.75 808  
 47.2 810 53.42 811.42 56 812 58.23 812.39 61.48 812.94  
 62.86 813.17 63.48 813.27 64.67 813.47 67.71 813.95 68.01 814  
 68.17 814 77.77 815.04 78.82 815.15 86.29 816 88.24 816.57  
 94.41 818 97.98 819.07 101.06 820 106.62 821.6 108.05 822  
 110.66 822.46 119.91 823.94 120.29 824 125.67 824.01 128.68 824.01  
 130.18 824.02 131.37 824.02 132.17 824.03 141.52 824.19 144.3 824.23

Manning's n values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -509.903 .05 -31.5 .035 35.22 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -31.5 35.22 36 50 48 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \* E.G. Elev (ft) \* 813.60 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.52 \* wt. n-val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 813.08 \* Reach Len. (ft) \* 36.00 \* 50.00 \*  
 48.00 \*  
 \* Crit w.s. (ft) \* \* Flow Area (sq ft) \* 486.46 \* 596.86 \*  
 73.79 \*  
 \* E.G. slope (ft/ft) \*0.001304 \* Area (sq ft) \* 486.46 \* 596.86 \*  
 73.79 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 1110.65 \* 3887.18 \*  
 152.17 \*  
 \* Top width (ft) \* 250.06 \* Top Width (ft) \* 156.23 \* 66.72 \*  
 27.12 \*  
 \* Vel Total (ft/s) \* 4.45 \* Avg. vel. (ft/s) \* 2.28 \* 6.51 \*

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2.06 *
* Max Chl Dpth (ft) * 10.89 * Hydr. Depth (ft) * 3.11 * 8.95 *
2.72 *
* Conv. Total (cfs) *142624.9 * Conv. (cfs) * 30758.4 *107652.2 *
4214.3 *
* Length wtd. (ft) * 46.72 * Wetted Per. (ft) * 156.75 * 68.16 *
27.69 *
* Min Ch El (ft) * 802.19 * Shear (lb/sq ft) * 0.25 * 0.71 *
0.22 *
* Alpha * 1.68 * Stream Power (lb/ft s) * 144.30 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.05 * Cum Volume (acre-ft) * 91.16 * 46.49 *
65.09 *
* C & E Loss (ft) * 0.05 * Cum SA (acres) * 24.81 * 4.11 *
14.11 *
*****
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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2904.54

INPUT

Description: M

Station Elevation Data num= 137

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-555.077	839.5762	-553.119	838.6375	-516.885	820.523	-515.891	820.5243	-505.129	822
-503.819	822.2322	-503.023	822.3696	-495.466	823.6955	-489.502	824.7146	-486.772	825.1889
-481.979	826	-481.158	826.1046	-461.457	828.976	-461.047	829.0245	-451.122	830.1144
-443.891	830.9504	-442.741	831.0708	-439.458	831.3967	-434.136	831.1273	-291.958	836.6874
-290.959	836.5913	-289.945	836.4755	-288.911	836.339	-287.854	836.1808	-286.541	835.9593
-285.182	835.7017	-283.766	835.4046	-282.285	835.0641	-280.78	834.689	-279.193	834.2646
-277.513	833.7846	-275.721	833.2416	-273.999	832.6919	-272.155	832.0762	-270.169	831.3848
-268.016	830.606	-265.673	829.7269	-263.102	828.7302	-260.26	827.594	-257.089	826.29
-251.598	823.9544	-244.846	820.9909	-237.129	817.5021	-230.835	814.5998	-223.288	811.0691
-221.767	810.3487	-208.28	810.47	-187.1	810.73	-185.09	810.59	-179.54	810.57
-153.52	809.97	-147.04	809.8	-143.48	809.78	-131.45	809.67	-109.41	809.57
-105.87	809.47	-105.74	809.47	-73.37	809.04	-65.8	808.97	-57.78	808.78
-50.48	808.91	-36.42	808.86	-35.58	808.5	-32.25	807.93	-29.14	806.3
-25.8	805.38	-22.8	804.42	-20.89	804	-20.73	803.97	-20.58	803.93
-20.41	803.9	-20.24	803.86	-20.06	803.82	-19.87	803.78	-19.67	803.73
-19.45	803.68	-19.23	803.64	-19	803.58	-18.75	803.53	-18.49	803.47
-18.21	803.41	-16.63	802.28	-16.25	802	11.76	802	12.15	802.07
12.83	802.2	18.97	803.35	22.4	804	30.97	806	31.31	806.08
31.62	806.15	36.43	807.28	36.84	807.37	37.52	807.53	37.59	807.55
37.65	807.56	37.94	807.62	38.35	807.71	38.4	807.72	38.87	807.81
39.41	807.93	39.96	808.04	40.52	808.15	41.11	808.27	41.79	808.41
43.87	808.86	44.37	808.96	44.9	809.07	45.41	809.17	45.95	809.28
46.53	809.39	47.15	809.52	47.83	809.65	49.22	809.95	49.46	810
58.66	812	59.36	812.09	59.65	812.13	63.68	812.64	65.81	812.9
68.23	813.21	73.02	813.8	74.71	814	79.31	814.6	82.93	815.09
86.03	815.5	89.61	816	89.68	816	96.64	818	100.75	819.42
102.44	820	107.15	821.46	108.87	822	113.42	823.17	116.74	824
116.89	824	117.07	824.01						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-555.077	.05	-36.42	.035	41.79	.05



Bank Sta: Left Right  
 -36.42 41.79

Coeff Contr. Expan.  
 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

```

*****
*****
* E.G. Elev (ft) * 813.50 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.35 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 813.15 * Reach Len. (ft) * 42.00 * 49.96 *
51.00 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 642.30 * 705.15 *
55.24 *
* E.G. Slope (ft/ft) *0.000888 * Area (sq ft) * 642.30 * 705.15 *
55.24 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 1272.22 * 3797.83 *
79.96 *
* Top Width (ft) * 295.51 * Top Width (ft) * 191.32 * 78.21 *
25.98 *
* Vel Total (ft/s) * 3.67 * Avg. vel. (ft/s) * 1.98 * 5.39 *
1.45 *
* Max Chl Dpth (ft) * 11.15 * Hydr. Depth (ft) * 3.36 * 9.02 *
2.13 *
* Conv. Total (cfs) *172855.6 * Conv. (cfs) * 42700.9 *127471.1 *
2683.7 *
* Length wtd. (ft) * 47.87 * Wetted Per. (ft) * 191.97 * 80.26 *
26.43 *
* Min Ch El (ft) * 802.00 * Shear (lb/sq ft) * 0.19 * 0.49 *
0.12 *
* Alpha * 1.66 * Stream Power (lb/ft s) * 117.07 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.04 * Cum Volume (acre-ft) * 90.69 * 45.74 *
65.02 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 24.67 * 4.02 *
14.08 *
*****
*****
    
```

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2854.58

INPUT

Description: N

Station Elevation Data num= 115

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-604.73	6837.03	23-560.355	815.475	-548.091	814.803	-464.42	810.21	53-322.785	817.085
-320.32	6816.87	04-317.83	1816.60	77-315.291	816.295	-312.69	7815.92	97-309.484	815.415
-306.16	1814.81	35-302.70	9814.11	76-299.10	3813.31	81-295.44	5812.43	59-291.59	9811.43
-287.53	4810.30	63-285.57	4809.72	68-284.47	809.73	-253.74	809.76	-239.62	809.94
-231.28	810.08	-222.63	810.03	-219.09	810.11	-207.99	810.26	-195.77	810.2
-192.67	809.81	-189.75	809.76	-188.94	809.79	-181.12	809.87	-161.13	809.86
-148.17	809.64	-131.76	809.27	-129.32	809.24	-116.92	809.12	-99.47	808.99
-99.21	808.99	-87.45	808.85	-82.36	808.91	-76.54	808.84	-69.24	808.81
-62.26	808.9	-35.56	808.9	-34.29	808.35	-33.72	808.09	-31.28	806.16
-27.8	804.33	-27.74	804.32	-27.67	804.3	-27.61	804.29	-27.54	804.27
-27.46	804.25	-27.39	804.23	-27.21	804.19	-27.11	804.17	-27.01	804.14
-26.89	804.12	-26.77	804.09	-26.64	804.06	-26.49	804.02	-26.4	804
-23.28	802	14.53	802	25.91	804	26.55	804.15	26.9	804.23

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27.08	804.29	27.23	804.33	27.28	804.35	27.38	804.38	27.43	804.4
27.53	804.43	27.59	804.45	28.53	804.72	28.64	804.74	28.75	804.77
28.87	804.79	29.39	804.91	29.49	804.94	29.6	804.97	29.75	805
29.91	805.04	30.09	805.09	30.28	805.13	30.48	805.18	30.7	805.24
30.95	805.3	31.21	805.36	31.5	805.43	31.85	805.52	32.24	805.61
32.68	805.72	33.18	805.84	34.31	806.12	34.94	806.28	35.68	806.46
38.78	807.25	40.46	807.67	42.6	808.2	45.44	808.91	49.4	809.9
49.81	810	57.71	811.96	57.86	812	67.88	814	68.24	814
87.56	815.69	88.39	815.76	90.98	816	96.75	818	100.5	819.34
102.36	820	103.49	820.39	108.11	822	115.56	824	115.88	824.04

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -604.736 .05 -35.56 .035 45.44 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -35.56 45.44 40 50.04 52 .1 .3  
 Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 -546.73 -250.58 814.18 F

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \* E.G. Elev (ft) \* 813.44 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.27 \* wt. n-val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 813.17 \* Reach Len. (ft) \* 40.00 \* 50.04 \*  
 52.00 \*  
 \* Crit w.s. (ft) \* 808.73 \* Flow Area (sq ft) \* 794.32 \* 764.32 \*  
 37.17 \*  
 \* E.G. Slope (ft/ft) \* 0.000664 \* Area (sq ft) \* 1105.33 \* 764.32 \*  
 37.17 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 1453.11 \* 3652.05 \*  
 44.85 \*  
 \* Top Width (ft) \* 477.09 \* Top Width (ft) \* 377.80 \* 81.00 \*  
 18.29 \*  
 \* Vel Total (ft/s) \* 3.23 \* Avg. vel. (ft/s) \* 1.83 \* 4.78 \*  
 1.21 \*  
 \* Max Chl Dpth (ft) \* 11.17 \* Hydr. Depth (ft) \* 3.69 \* 9.44 \*  
 2.03 \*  
 \* Conv. Total (cfs) \* 199905.2 \* Conv. (cfs) \* 56404.6 \* 141759.9 \*  
 1740.8 \*  
 \* Length wtd. (ft) \* 46.89 \* Wetted Per. (ft) \* 215.06 \* 83.71 \*  
 18.78 \*  
 \* Min Ch El (ft) \* 802.00 \* Shear (lb/sq ft) \* 0.15 \* 0.38 \*  
 0.08 \*  
 \* Alpha \* 1.65 \* Stream Power (lb/ft s) \* 115.88 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.03 \* Cum volume (acre-ft) \* 89.85 \* 44.90 \*  
 64.96 \*  
 \* C & E Loss (ft) \* 0.01 \* Cum SA (acres) \* 24.40 \* 3.93 \*  
 14.06 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

Warning: Divided flow computed for this cross-section.  
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

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RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2804.54

INPUT

Description: 0

Station Elevation Data

num=		155									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-636.987	836.7009	-582.846	810.4836	-573.43	809.84	-567.39	809.75	-532.59	809.32		
-523.1	809.82	-493.13	809.57	-486.12	809.6	-483.76	809.54	-473.25	809.31		
-455.93	809.7	-446.03	809.76	-418.52	809.68	-391.12	809.35	-353.59	809.07		
-310.49	809.4	-285.69	809.54	-264.41	809.57	-260.62	809.62	-252.37	809.53		
-243.1	809.46	-235.49	809.62	-210.66	809.92	-203.19	809.88	-197.84	809.23		
-197.64	809.22	-194.22	809.36	-191.11	809.39	-177.26	809.36	-170.33	809.28		
-164.3	809.01	-153.82	808.7	-139.84	808.71	-132.13	808.6	-123.32	808.22		
-121.92	808.15	-120.95	808.13	-107.12	808.07	-97.1	807.93	-90.23	807.96		
-83.62	808.09	-65.83	808.29	-65.47	808.31	-61.61	808.39	-41.95	809.2		
-35.53	809.4	-34.23	808.97	-33.63	808.75	-31.2	806.83	-29.7	805.77		
-29.59	805.69	-25.99	803.67	-25.94	803.61	-25.89	803.55	-25.84	803.48		
-25.78	803.4	-25.73	803.35	-25.68	803.29	-23.62	802	18.54	802		
18.64	802.02	18.75	802.05	18.87	802.08	18.97	802.1	19.06	802.12		
19.15	802.15	19.24	802.17	19.32	802.19	19.44	802.21	19.51	802.23		
19.59	802.25	19.66	802.27	19.73	802.28	19.8	802.3	19.86	802.31		
19.92	802.33	19.98	802.34	20.04	802.36	20.15	802.38	20.21	802.4		
20.36	802.43	20.46	802.46	20.55	802.48	20.75	802.53	20.82	802.54		
20.88	802.56	20.95	802.57	21.08	802.61	21.14	802.62	21.2	802.64		
21.26	802.65	21.34	802.67	21.41	802.69	21.48	802.7	21.53	802.71		
21.59	802.73	21.65	802.74	21.7	802.75	21.89	802.8	23.53	803.12		
23.69	803.16	23.81	803.19	24.81	805.05	24.86	805.07	25.04	805.13		
25.21	805.2	25.55	805.32	25.64	805.35	26.14	805.53	37.03	807.89		
42.61	809.52	47.89	809.79	48.09	809.82	48.29	809.86	49.78	810.2		
50.26	810.32	50.54	810.38	50.84	810.45	51.15	810.51	51.47	810.58		
51.81	810.66	52.17	810.74	52.9	810.9	53.26	810.98	53.64	811.07		
54.04	811.17	54.47	811.27	55.97	811.53	56.29	811.59	56.63	811.67		
57.01	811.75	58.18	812	66	813.35	69.49	813.96	69.71	814		
82.33	815.19	85.64	815.5	87.9	815.68	88.33	815.71	90.91	815.91		
91.03	815.92	92.13	816	93.67	816.33	94.43	816.53	96.39	816.99		
98.88	817.68	99.33	817.79	100.04	818	105.58	819.9	105.87	820		
106.47	820.21	111.67	822	117.68	823.92	117.92	824	124.8	825.92		

Manning's n Values

num=		3			
Sta	n Val	Sta	n Val	Sta	n Val
-636.987	.05	-35.53	.035	42.61	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -35.53 42.61 50 50 60 .1 .3

Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 -593.85 -250.7 814.12 F

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 813.39	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.22	* wt. n-val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 813.17	* Reach Len. (ft)	* 50.00	* 50.00
60.00				
* Crit w.s. (ft)	* 809.69	* Flow Area (sq ft)	* 920.99	* 728.54

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```

45.73 *
* E.G. Slope (ft/ft) *0.000620 * Area (sq ft) * 2143.65 * 728.54 *
45.73 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 1796.44 * 3299.55 *
54.01 *
* Top width (ft) * 653.35 * Top Width (ft) * 552.86 * 78.14 *
22.35 *
* Vel Total (ft/s) * 3.04 * Avg. Vel. (ft/s) * 1.95 * 4.53 *
1.18 *
* Max Chl Dpth (ft) * 11.17 * Hydr. Depth (ft) * 4.28 * 9.32 *
2.05 *
* Conv. Total (cfs) *206790.9 * Conv. (cfs) * 72133.5 *132488.8 *
2168.7 *
* Length wtd. (ft) * 50.13 * Wetted Per. (ft) * 215.26 * 82.18 *
22.69 *
* Min Ch El (ft) * 802.00 * Shear (lb/sq ft) * 0.17 * 0.34 *
0.08 *
* Alpha * 1.57 * Stream Power (lb/ft s) * 124.80 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.03 * Cum Volume (acre-ft) * 88.36 * 44.04 *
64.91 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 23.97 * 3.84 *
14.03 *
*****
*****

```

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

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2754.54

INPUT

Description: P

Station Elevation Data num= 116

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-699.01	1835.6449	-649.44	6811.5111	-625.31	809.39	-622.52	809.03	-621.43	808.74
-620.24	808.77	-617.21	808.47	-615.7	809.01	-614.94	809.2	-612.78	809.4
-602.34	810.16	-597.05	810.51	-583.44	810.88	-579.93	811.01	-565.86	810.75
-532.33	809.93	-525.05	809.13	-523.29	809	-508.02	809.38	-501.8	809.78
-500.21	809.87	-489.56	810.2	-459.58	810.12	-459.41	810.12	-433.44	9809.8344
-373.272	812.964	-367.92	3813.3464	-366.69	813.4106	-365.58	813.4946	-355.63	4814.3518
-294.45	7818.9828	-231.01	1810.4409	-230.44	3810.3644	-198.52	809.87	-197.68	809.58
-194.2	808.77	-193.07	808.52	-178.48	807.88	-177.88	807.85	-177.82	807.85
-164.45	807.34	-162.67	807.33	-155.89	807.28	-155.32	806.98	-153.6	807.57
-151.86	807.58	-138.74	807.52	-135.54	807.51	-132.75	807.16	-130.02	806.85
-127	806.75	-124.24	806.57	-118.5	806.53	-110.43	805.94	-108.29	805.37
-106.35	805.03	-104.76	805.01	-102.17	805.14	-99.69	805.76	-99.06	805.87
-98.96	805.86	-84.59	807.47	-83.07	807.51	-82.25	807.53	-68.99	807.62
-59.02	807.76	-50.91	807.97	-37.84	808.52	-37.49	808.63	-35.61	808.13
-29.14	805.37	-23.52	803.77	-22.8	802.87	-22.74	802.78	-22.67	802.68
-22.58	802.55	-22.48	802.41	-22.35	802.23	-22.28	802.17	-22.01	802
21.2	802	21.31	802.03	21.41	802.05	21.51	802.08	21.6	802.1
21.69	802.12	21.78	802.14	21.86	802.16	21.93	802.18	25.86	802.95
25.93	802.96	28.32	807.37	28.38	807.39	28.47	807.42	28.53	807.45
28.66	807.49	31.44	808.11	45.69	812.31	49.98	813.62	59.57	813.62
60.31	813.64	61.18	813.66	62.21	813.69	67.15	813.81	69.83	813.88
73.34	813.96	74.76	814	74.91	814	99.32	816	107.54	818
124.37	823.8	124.94	824	126.17	824.38	131.32	826	136.21	827.34

138.39 827.91

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -699.011 .05 -37.49 .035 28.66 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -37.49 28.66 51 50 58 .1 .3  
 Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 -661.72 -354.42 813.92 F

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \*\*\*\*\*  
 \* E.G. Elev (ft) \* 813.36 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.20 \* wt. n-val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 813.16 \* Reach Len. (ft) \* 51.00 \* 50.00 \*  
 58.00 \*  
 \* Crit W.S. (ft) \* 809.03 \* Flow Area (sq ft) \* 1060.83 \* 667.97 \*  
 58.09 \*  
 \* E.G. slope (ft/ft) \*0.000539 \* Area (sq ft) \* 1834.00 \* 667.97 \*  
 58.09 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 2123.93 \* 2946.08 \*  
 79.99 \*  
 \* Top width (ft) \* 581.95 \* Top width (ft) \* 495.99 \* 66.15 \*  
 19.81 \*  
 \* Vel Total (ft/s) \* 2.88 \* Avg. vel. (ft/s) \* 2.00 \* 4.41 \*  
 1.38 \*  
 \* Max Chl Dpth (ft) \* 11.16 \* Hydr. Depth (ft) \* 4.96 \* 10.10 \*  
 2.93 \*  
 \* Conv. Total (cfs) \*221794.0 \* Conv. (cfs) \* 91470.7 \*126878.3 \*  
 3444.9 \*  
 \* Length wtd. (ft) \* 50.48 \* wetted Per. (ft) \* 214.65 \* 70.58 \*  
 20.61 \*  
 \* Min Ch El (ft) \* 802.00 \* Shear (lb/sq ft) \* 0.17 \* 0.32 \*  
 0.09 \*  
 \* Alpha \* 1.54 \* Stream Power (lb/ft s) \* 138.39 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.03 \* Cum volume (acre-ft) \* 86.07 \* 43.24 \*  
 64.84 \*  
 \* C & E Loss (ft) \* 0.01 \* Cum SA (acres) \* 23.37 \* 3.76 \*  
 14.01 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

Warning: Divided flow computed for this cross-section.  
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2704.54

INPUT

Description: Q  
 Station Elevation Data num= 116  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

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*****
-748.451828.4788-716.199813.1079 -700.4 811.68 -692.77 810.93 -683.87 809.81
-680.17 809.65 -677.45 809.68 -674.56 810.19 -673.33 810.49 -666 811.13
-662.97 811.41-647.874811.5278 -644.34813.0943-641.028814.5197-638.233815.6829
-635.828816.6469-633.724817.4553-631.863818.1379-629.236819.0371 -626.97 819.738
-624.974820.2857-623.175820.7122-621.355821.0694-619.668821.3252-618.071821.4943
-616.527821.5859-410.208842.4503-410.081842.4657-397.483843.7381-333.676851.6286
-280.48843.4602-280.424843.4515-257.308839.8927-257.027839.8482-256.739839.7973
-256.441839.7396-256.134839.6745-255.561839.5396-254.942839.3757-254.458839.2359
-253.937839.0753-253.094838.7956-252.131838.4515-251.007838.0228-249.661837.4796
-249.472837.4004-181.481808.8596 -176.48 808.66 -164.04 808.06 -132.48 807.88
-131.43 807.87 -131.03 807.87 -128.5 807.82 -127.59 807.8 -97.03 807.18
-93.87 807.15 -65.52 808.11 -59.38 808.03 -40.14 808.49 -33.94 808.23
-32.14 808.15 -31.27 808.03 -31.03 807.98 -30.36 807.89 -29.98 807.71
-28.02 805.88 -27.8 805.81 -27.72 805.78 -27.39 805.67 -27.27 805.61
-27.07 805.53 -26.7 805.38 -25.82 805.02 -20.72 802.94 -18.43 802
18.59 802 19.75 802.24 20.4 802.37 21.76 802.65 22.53 802.8
23.36 802.97 23.61 803.02 23.8 803.06 23.95 803.09 24.07 803.12
24.17 803.14 24.26 803.16 24.33 803.17 24.39 803.19 24.45 803.2
24.54 803.22 24.61 803.23 24.67 803.24 24.74 803.26 24.8 803.27
24.85 803.28 25.13 803.34 30 808.07 30.08 808.22 30.78 808.43
49.1 815.09 102.85 815.17 114.4 816 114.7 816 115.25 816.16
116.5 816.52 121.57 818 127.43 819.88 127.81 820 128.27 820.15
133.84 822 139.7 823.91 139.98 824 140.39 824.13 152.47 828
161.88 829.95

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Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
*****
-748.451 .05 -33.94 .035 30 .05

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Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-33.94 30 51 43.25 43 .1 .3
Ineffective Flow num= 1
Sta L Sta R Elev Permanent
-725.74 -632.27 814.12 F

```

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 813.32 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.30 * Wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 813.02 * Reach Len. (ft) * 51.00 * 43.25 *
43.00 *
* Crit W.S. (ft) * 809.53 * Flow Area (sq ft) * 775.55 * 629.87 *
32.64 *
* E.G. Slope (ft/ft) *0.000761 * Area (sq ft) * 903.01 * 629.87 *
32.64 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 1834.26 * 3269.42 *
46.33 *
* Top Width (ft) * 305.49 * Top width (ft) * 228.15 * 63.94 *
13.40 *
* Vel Total (ft/s) * 3.58 * Avg. vel. (ft/s) * 2.37 * 5.19 *
1.42 *
* Max Chl Dpth (ft) * 11.02 * Hydr. Depth (ft) * 4.93 * 9.85 *
2.44 *
* Conv. Total (cfs) *186635.3 * Conv. (cfs) * 66473.2 *118483.3 *
1678.8 *
* Length wtd. (ft) * 45.92 * wetted Per. (ft) * 158.34 * 67.54 *
14.33 *
* Min Ch El (ft) * 802.00 * Shear (lb/sq ft) * 0.23 * 0.44 *

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0.11 *
* Alpha * 1.49 * Stream Power (lb/ft s) * 161.88 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.04 * Cum Volume (acre-ft) * 84.47 * 42.50 *
64.78 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 22.94 * 3.68 *
13.98 *
*****
*****

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Warning: Divided flow computed for this cross-section.  
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2661.29

INPUT

Description: R

Station Elevation Data num= 280

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-783.322829	9.282	-749.538813	5.413	-733.81	811.97	-729.95	811.66	-716.71	810.33
-715.94	810.19	-714.02	810.18	-707.96	809.91	-707.14	810.05	-704.49	810.53
-699.47	810.98	-692.88	811.53	-680.874811	7038	-645.447828	9853	-643.405830	0317
-624.596839	7.464	-623.545839	7.865	-622.025839	7.931	-617.553	839.335	-617.229839	3.199
-616.578839	3.302	-616.252839	3.145	-615.604839	3.251	-615.275839	3.087	-613.307839	3.419
-612.988839	3.401	-612.316839	3.515	-612.001839	3.497	-611.324839	3.614	-611.015839	3.596
-609.639839	3.836	-609.343839	3.958	-608.637	839.408	-608.352839	4.196	-607.634839	4.318
-607.361839	4.428	-606.63839	4.551	-606.377839	4.662	-605.634839	4.785	-605.392839	4.889
-603.919839	5.341	-603.168839	5.684	-602.959839	5.773	-602.188839	6.125	-602839	6.205
-601.208839	6.568	-601.042839	6.639	-600.228839	7.012	-600.084839	7.074	-599.25839	7.457
-599.126	839.751	-598.322839	7.913	-598.222839	7.956	-597.398	839.837	-597.32839	8.404
-596.477839	8.829	-596.421839	8.853	-595.56839	9.289	-594.557839	9.975	-593.563840	0.875
-592.569840	1.746	-592.477840	1.791	-591.571840	2.584	-591.435840	2.649	-590.571	840.339
-590.408840	3.504	-589.589840	4.202	-589.171	840.449	-588.383840	5.352	-588.117840	5.531
-587.385840	6.317	-587.072840	6.524	-586.392840	7.239	-586.034	840.747	-585.403840	8.122
-585.004840	8.375	-584.571840	8.745	-583.977840	9.341	-583.496840	9.749	-582.957841	0.286
-581.852841	1.215	-581.376841	1.784	-580.745841	2.303	-580.329	841.279	-579.647841	3.341
-579.288841	3.753	-578.558841	4.332	-577.748841	5.124	-577.471841	5.435	-576.602841	6.278
-576.391841	6.513	-575.466841	7.403	-575.32841	7.565	-572.768	842	-571.023	842.129
-570.879842	1.407	-569.821842	2.329	-569.692842	2.433	-569.524842	2.581	-567.539842	4.306
-567.258842	4.556	-566.374842	5.325	-561.62842	9.507	-560.976843	0.144	-560.253843	0.782
-550.786	844	-549.685	844.076	-548.494844	1.549	-543.9844	4.904	-543.055844	5.548
-542.542844	5.951	-541.299844	6.867	-540.666844	7.368	-539.551844	8.194	-538.796844	8.793
-537.808844	9.528	-536.933845	10.227	-536.073	845.087	-535.076	845.167	-534.345845	2.219
-533.226845	3.122	-530.404845	5.468	-529.945	845.584	-528.245845	7.298	-527.972845	7.519
-526.096845	9.136	-526.009845	9.207	-525.094	846	-523.809	846.097	-523.672846	1.077
-521.376846	2.816	-520.979846	3.129	-518.923846	4.693	-518.257846	5.219	-516.448	846.66
-515.506846	7.348	-513.951	846.854	-499.568	848	-469.53	850	-467.042	850.137
-466.909850	1.425	-465.188850	2.361	-464.959850	2.454	-463.333850	3.328	-463.01850	3.458
-461.477850	4.272	-461.062850	4.437	-459.619850	5.194	-459.115850	5.393	-457.76850	6.094
-457.169850	6.325	-455.9850	6.975	-455.223850	7.236	-454.038850	7.835	-453.279850	8.125
-452.176850	8.676	-451.334850	8.993	-450.312850	9.499	-449.391850	9.842	-448.447851	0.303
-447.448851	0.671	-446.581851	1.091	-445.506851	1.482	-444.714851	1.861	-443.565851	2.275
-442.847851	2.615	-441.624851	3.051	-440.978851	3.353	-439.684	851.381	-439.108851	4.077
-437.745851	4.553	-437.238851	4.785	-435.806	851.528	-435.366851	5.479	-433.867851	5.991
-433.494851	6.159	-431.929851	6.688	-431.621851	6.825	-429.992851	7.371	-426.028851	8.591
-425.126851	8.918	-425.061851	8.916	-422.144	852	-419.849852	1.209	-419.303852	1.069
-410.988852	4.197	-409.014852	3.791	-401.871852	5.852	-400852	5.526	-398.411852	5.619

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-391.681	852.775	-372.673	853.502	-364.794	853.488	-361.375	853.625	-352.853	853.596
-346.597	853.731	-331.016	853.647	-327.573	853.615	-318.261	853.567	-316.658	853.552
-306.948	853.504	-305.785	853.493	-292.638	853.430	-291.802	853.422	-281.487	853.342
-271.425	853.323	-246.848	843.107	-163.953	808.837	-159.48	808.73	-159.26	808.71
-158.2	808.66	-149.61	808.37	-138.25	808.02	-108.81	808.05	-104.98	807.98
-98.95	808.1	-76.28	808.02	-66.27	807.74	-50.69	807.61	-35.72	807.37
-30.35	806.7	-28.35	806.46	-21.76	804.95	-15.72	804.22	-15.2	803.46
-14.95	803.31	-14.91	803.25	-14.86	803.17	-14.8	803.08	-14.77	803.02
-14.73	802.96	-14.69	802.89	-14.63	802.8	-14.58	802.71	-14.51	802.6
-14.43	802.47	-14.33	802.31	-14.21	802.11	-14.14	802	20.6	802
20.72	802.01	20.95	802.03	21.16	802.04	21.36	802.06	21.55	802.07
21.72	802.09	27.88	802.57	31.67	806.67	33.46	808.35	46.36	812.63
47.42	812.95	50.63	813.48	56.04	813.65	57.86	813.75	101.72	813.93
102.64	813.94	103.63	813.96	106.86	813.99	107.53	814	107.58	814
109.13	814.12	109.42	814.15	113.04	814.43	114.04	814.51	117.7	814.79
121.05	815.06	124.84	815.34	126.67	815.49	132.02	815.89	132.34	815.91
133.53	816	136.37	816.61	137.94	816.96	139.77	817.36	142.54	818
143.12	818.18	147.7	819.64	148.85	820	155.2	822	158.68	823.11

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-783.322	.05	-28.35	.035	31.67	.05

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

-28.35	31.67	134	57.86	63	.1	.3
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Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
-755.51	-669.72	813.89	F

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 813.27	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.35	* wt. n-val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 812.92	* Reach Len. (ft)	* 134.00	* 57.86
63.00				
* Crit w.s. (ft)	* 809.57	* Flow Area (sq ft)	* 695.95	* 601.72
41.22				
* E.G. Slope (ft/ft)	* 0.000862	* Area (sq ft)	* 803.52	* 601.72
41.22				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 1716.97	* 3368.28
64.75				
* Top Width (ft)	* 286.14	* Top Width (ft)	* 210.46	* 60.02
15.66				
* Vel Total (ft/s)	* 3.85	* Avg. vel. (ft/s)	* 2.47	* 5.60
1.57				
* Max Chl Dpth (ft)	* 10.92	* Hydr. Depth (ft)	* 4.78	* 10.03
2.63				
* Conv. Total (cfs)	* 175411.7	* Conv. (cfs)	* 58480.9	* 114725.5
2205.4				
* Length wtd. (ft)	* 80.28	* Wetted Per. (ft)	* 146.37	* 63.22
17.06				
* Min Ch El (ft)	* 802.00	* Shear (lb/sq ft)	* 0.26	* 0.51
0.13				
* Alpha	* 1.52	* Stream Power (lb/ft s)	* 158.68	* 0.00
0.00				
* Frctn Loss (ft)	* 0.07	* Cum volume (acre-ft)	* 83.47	* 41.88
64.74				
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 22.69	* 3.62
13.97				



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Warning: Divided flow computed for this cross-section.  
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 2603.43

INPUT

Description: S

Station Elevation Data num= 138

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-894.092	826.7682	-868.301	813.8406	-831.94	811.38	-830.85	811.3	-830.72	811.29
-823.48	810.55	-823.34	810.52	-820.05	810.19	-818.82	810.68	-818.75	810.7
-818.67	810.71	-815.87	811.16	-809.43		811	-784.07	810.46	-778.607
-753.738	21.8736	-741.279	827.1201	-725.869	820.6486	-715.286	816.5553	-682.726	812.3173
-681.342	812.1154	-679.886	811.848	-678.327	811.5052	-676.631	811.073	-674.758	810.5311
-673.507	810.1341	-664.69	810.04	-638.25	809.64	-625.96	809.74	-618.61	809.75
-599.23	809.86	-586.027	810.1049	-583.937	810.8707	-578.552	812.7253	-573.857	814.2028
-569.673	815.3867	-565.885	816.331	-562.397	817.0777	-559.138	817.6574	-556.038	818.0902
-553.047	818.3911	-550.701	818.5441	-549.155	818.6037	-547.612	818.6301	-547.363	818.6312
-514.363	820.1801	-514.304	820.1828	-477.999	821.8868	-467.126	824.9402	-381.274	853.3576
-380.853	853.3361	-359.936	853.7808	-357.372	853.7671	-341.569	853.6195	-339.431	853.6086
-330.782	853.5292	-328.213	853.5167	-319.964	853.4423	-316.076	853.4239	-286.131	853.1774
-274.027	853.0478	-268.184	852.9961	-251.588	852.8127	-246.356	852.7652	-236.055	852.6413
-212.159	842.4311	-136.691	810.3872	-131.638	808.4305	-128.47	808.6	-126.5	808.4
-112.75	808.41	-101.83	808.22	-87.87	808.42	-79.46	808.57	-70.73	808.12
-56.58	807.63	-41.5	806.76	-36.54	806.63	-31.16	806.57	-28.47	806.55
-26.43	806.53	-26.25	806.42	-25.52	805.98	-22.05	802.88	-21.93	802.8
-21.2	802.12	-21.15	802.08	-21.08	802.04	-21.01	802	19.91	802
21.64	802.22	23.61	802.46	25.62	802.71	26.21	802.79	27	802.88
27.27	802.92	27.5	802.95	27.69	802.97	27.85	802.99	27.99	803.01
28.11	803.02	28.22	803.04	28.31	803.05	28.47	803.07	28.54	803.08
28.6	803.08	28.7	803.1	28.79	803.11	28.87	803.12	28.93	803.12
28.99	803.13	29.04	803.14	29.1	803.15	29.16	803.15	29.37	803.21
29.76	803.33	29.88	803.36	35.8	806.62	35.86	806.64	36.09	806.68
36.39	806.71	46.81	807.54	52.56	807.93	59.22	809.23	65.51	809.86
65.97	809.9	80.35	811.82	80.79	811.87	94.07	812.91	95.32	813.03
98.75	813.24	107.94	813.92	114.81	814.09	117.15	814.33	128.42	814.96
128.96	814.96	139.38	815.3	141.42	815.61				

Manning's n values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-894.092	.05	-26.43	.035	35.8	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
-26.43 35.8 66 48.89 51 .1 .3

Ineffective Flow num= 1  
Sta L Sta R Elev Permanent  
-875.54 -568.25 813.51 F

CROSS SECTION OUTPUT Profile #100-Year

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\* E.G. Elev (ft) \* 813.21 \* Element \* Left OB \* Channel \*  
Right OB \*

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* Vel Head (ft) * 0.35 * Wt. n-Val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 812.85 * Reach Len. (ft) * 66.00 * 48.89 *
51.00 *
* Crit w.s. (ft) * 809.23 * Flow Area (sq ft) * 546.75 * 638.75 *
178.72 *
* E.G. Slope (ft/ft) *0.000807 * Area (sq ft) * 969.39 * 638.75 *
178.72 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 1290.12 * 3540.16 *
319.72 *
* Top width (ft) * 425.05 * Top Width (ft) * 305.26 * 62.23 *
57.56 *
* Vel Total (ft/s) * 3.78 * Avg. Vel. (ft/s) * 2.36 * 5.54 *
1.79 *
* Max Chl Dpth (ft) * 10.85 * Hydr. Depth (ft) * 4.71 * 10.26 *
3.11 *
* Conv. Total (cfs) *181294.6 * Conv. (cfs) * 45415.8 *124623.7 *
11255.2 *
* Length wtd. (ft) * 51.82 * Wetted Per. (ft) * 117.00 * 64.84 *
57.94 *
* Min Ch El (ft) * 802.00 * Shear (lb/sq ft) * 0.24 * 0.50 *
0.16 *
* Alpha * 1.59 * Stream Power (lb/ft s) * 141.42 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.05 * Cum Volume (acre-ft) * 80.74 * 41.06 *
64.58 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 21.89 * 3.54 *
13.92 *
*****
*****

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Warning: Divided flow computed for this cross-section.  
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 2554.54

INPUT

Description: T

Station Elevation Data

num= 135

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-980.71	826.5328	-957.92	815.0655	-911.36	811.71	-908.48	811.07	-902.49	810.68
-900.98	810.45	-899.91	810.48	-897.13	810.75	-896.07	811.03	-892.29	811.28
-887.6	811.56	-880.22	811.58	-864.67	810.85	-857.47	811.08	-844.2	810.59
-810.53	810.54	-808.89	810.49	-793.01	810.03	-739.04	809.86	-733.68	809.8
-724.34	809.77	-692.73	809.42	-662.05	809.38	-655.02	809.41	-652.17	809.09
-622.65	809.43	-607.5	809.45	-561.09	809.11	-552.41	809.15	-549.56	809.18
-504.79	809.52	-502.65	809.58	-492.03	810.02	-479.47	810.44	-478.93	810.37
-477.23	810.45	-472.11	810.51	-457.61	810.92	-451.18	810.99	-440.74	811.54
-437.51	811.53	-430.31	811.6001	-405.628	819.737	-402.695	820.5853	-400.482	821.2053
-398.19	821.7611	-396.04	822.2624	-393.97	822.7057	-391.20	823.2325	-388.56	823.661
-251.08	842.5277	-250.78	842.5696	-250.711	842.579	-238.80	844.2137	-233.96	844.1167
-233.88	844.1276	-233.43	844.1176	-228.26	844.0136	-225.97	843.9628	-219.43	843.8316
-217.54	843.7895	-207.347	843.585	-206.34	843.5629	-189.08	843.2167	-168.78	842.8097
-160.58	839.3339	-160.47	839.2886	-160.02	839.0959	-159.48	838.8584	-158.82	838.5592
-157.98	838.1718	-156.88	837.6525	-155.36	836.9241	-153.11	835.8317	-149.42	834.0171
-143.25	830.9603	-128.47	823.6018	-103.76	811.2491	-98.54	811.22	-75.44	810.6
-68.79	810.44	-65.81	810.3	-51.67	809.76	-46.88	809.31	-43.87	809.05

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-34.16	808.14	-31.74	807.97	-30.75	807.66	-29.78	807.07	-25.71	804.6
-25.19	804.28	-24.27	803.72	-20.91	801.64	-14.53	801.01	-13.49	800.98
-4.76	801.32	-4.06	801.36	-2.9	801.36	-2.84	801.37	-2.78	801.37
-2.17	801.38	13.69	801.68	21.21	803.74	26.6	805.12	29.74	806
30.83	806.16	30.99	806.18	37.76	807.72	42.93	807.76	45.16	807.86
51.27	808.01	72.68	808.47	86.63	808.59	94.2	808.73	118.85	810.47
122.89	810.79	123.74	810.9	152.29	815.32	160.72	815.76	161.08	815.74
161.18	815.74	161.39	815.75	161.98	815.77	171.11	815.96	171.87	815.94
183.22	815.73	184.46	815.73	188.65	815.68	189.99	815.55	191.72	815.42
192.1	815.42	192.46	815.56	192.97	815.92	193.47	816.19	198.2	817.61

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -980.714 .05 -30.75 .035 37.76 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -30.75 37.76 83 59.92 60 .1 .3  
 Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 -950.83 -400.77 814.31 F

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \* E.G. Elev (ft) \* 813.15 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.47 \* wt. n-Val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 812.67 \* Reach Len. (ft) \* 83.00 \* 59.92 \*  
 60.00 \*  
 \* Crit w.s. (ft) \* 809.14 \* Flow Area (sq ft) \* 190.02 \* 658.71 \*  
 344.18 \*  
 \* E.G. Slope (ft/ft) \*0.001069 \* Area (sq ft) \* 1484.86 \* 658.71 \*  
 344.18 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 339.04 \* 4036.57 \*  
 774.39 \*  
 \* Top Width (ft) \* 739.50 \* Top Width (ft) \* 573.55 \* 68.51 \*  
 97.44 \*  
 \* Vel Total (ft/s) \* 4.32 \* Avg. vel. (ft/s) \* 1.78 \* 6.13 \*  
 2.25 \*  
 \* Max Chl Dpth (ft) \* 11.69 \* Hydr. Depth (ft) \* 2.50 \* 9.61 \*  
 3.53 \*  
 \* Conv. Total (cfs) \*157524.3 \* Conv. (cfs) \* 10370.4 \*123467.4 \*  
 23686.4 \*  
 \* Length wtd. (ft) \* 60.69 \* wetted Per. (ft) \* 76.36 \* 71.01 \*  
 97.67 \*  
 \* Min Ch El (ft) \* 800.98 \* Shear (lb/sq ft) \* 0.17 \* 0.62 \*  
 0.24 \*  
 \* Alpha \* 1.63 \* Stream Power (lb/ft s) \* 198.20 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.11 \* Cum Volume (acre-ft) \* 78.88 \* 40.33 \*  
 64.28 \*  
 \* C & E Loss (ft) \* 0.15 \* Cum SA (acres) \* 21.23 \* 3.47 \*  
 13.83 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

Warning: Divided flow computed for this cross-section.  
 warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.  
 warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

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This may indicate the need for additional cross sections.  
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2494.62

INPUT

Description: U

Station Elevation Data num= 128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-901.35	819.77	-898.9	819.68	-886.47	820.26	-886.18	820.24	-885.75	820.23
-841.45	821.6	-840.12	821.56	-806.37	822.34	-785.96	823.04	-779.51	823.39
-775.49	823.42	-732.63	822.97	-727.51	822.6	-683.4	819.64	-672.38	818.49
-645.13	814.72	-642.97	814.69	-637.35	814.47	-612.34	816.41	-601.72	817.34
-601.39	817.34	-600.17	817.07	-597.4	817.13	-597	817.19	-559.61	816.78
-549.11	816.72	-513.33	816.58	-509.48	816.55	-471.22	816.35	-468.12	816.36
-441.85	816.15	-401.4	815.76	-386.25	815.51	-373.26	815.48	-338.72	815.07
-334.28	815	-307.86	814.49	-304.35	814.41	-304.01	814.45	-292.77	814.29
-291.75	814.28	-289.24	814.25	-239.27	813.37	-229.33	813.16	-224.65	813.15
-224.32	813.11	-219.31	812.98	-213.16	812.98	-212.61	812.99	-211.09	813.02
-185.27	813.13	-169.91	812.83	-165.7	812.79	-151.41	812.7	-129.64	812.5
-109.68	812.37	-109.31	812.37	-108.95	812.36	-108.22	812.36	-107.85	812.35
-106.76	812.35	-106.4	812.34	-105.67	812.34	-105.31	812.33	-104.59	812.33
-104.23	812.32	-103.15	812.32	-102.79	812.31	-102.08	812.31	-101.72	812.3
-101	812.3	-100.65	812.29	-99.58	812.29	-99.23	812.28	-98.52	812.28
-98.16	812.27	-97.11	812.27	-96.75	812.26	-96.05	812.26	-95.7	812.25
-95	812.25	-94.65	812.24	-93.6	812.24	-93.25	812.23	-92.56	812.23
-92.21	812.22	-91.87	812.22	-68.96	811.86	-68.67	811.86	-68.37	811.85
-67.77	811.85	-67.48	811.84	-66.88	811.84	-64.43	811.75	-59.97	811.56
-52.47	811.16	-40.27	810.34	-37.57	810.15	-35.22	809.68	-24.96	807.08
-20.95	804.26	-14.73	800.24	-13.47	800	-6.97	799.17	-.36	799.4
0	799.4	2.38	799.36	7.84	799.97	11.93	800.16	12.41	800.45
18.41	802.84	21.85	805.15	24.59	805.51	32	807.83	33.12	808.4
33.79	808.65	34.78	808.68	36.69	808.9	48.53	811.75	50.46	811.83
176.11	811.85	190.55	814.5	192.96	815	193.65	815.27	197.2	815.43
197.36	815.43	204.13	815.64	209.81	815.78				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-901.35	.05	-35.22	.035	32	.05

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

-35.22	32	170	76.77	86	.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-901.35	-25.4	812	T
21.09	209.81	812	T

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*

* E.G. Elev (ft)	* 812.89	* Element	* Left OB	* Channel	*
Right OB *					
* Vel Head (ft)	* 1.96	* wt. n-val.	*	* 0.035	*
*					
* W.S. Elev (ft)	* 810.93	* Reach Len. (ft)	* 19.58	* 19.58	*
19.58 *					

```

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* Crit W.S. (ft) * 808.31 * Flow Area (sq ft) * * 458.90 *
* E.G. Slope (ft/ft) *0.003616 * Area (sq ft) * 6.87 * 534.95 *
19.69 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * * 5150.00 *
* Top Width (ft) * 94.23 * Top width (ft) * 13.87 * 67.22 *
13.14 *
* Vel Total (ft/s) * 11.22 * Avg. vel. (ft/s) * * 11.22 *
* Max Chl Dpth (ft) * 11.76 * Hydr. Depth (ft) * * 9.87 *
* Conv. Total (cfs) * 85645.3 * Conv. (cfs) * * 85645.3 *
* Length Wtd. (ft) * 19.58 * Wetted Per. (ft) * * 49.79 *
* Min Ch El (ft) * 799.17 * Shear (lb/sq ft) * * 2.08 *
* Alpha * 1.00 * Stream Power (lb/ft s) * 209.81 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.11 * Cum volume (acre-ft) * 77.46 * 39.51 *
64.03 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 20.67 * 3.37 *
13.75 *
*****
*****

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Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
This may indicate the need for additional cross sections.

BRIDGE

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 2460.04

INPUT

Description:  
Distance from Upstream XS = 19.58  
Deck/Roadway width = 30  
Weir Coefficient = 2.6  
Upstream Deck/Roadway Coordinates

num= 5				
Sta	Hi	Cord	Lo	Cord
-167.99	812	0	-50.53	812
42.47	812	810.5	99.43	812

Upstream Bridge Cross Section Data

Station Elevation Data num= 128									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-901.35	819.77	-898.9	819.68	-886.47	820.26	-886.18	820.24	-885.75	820.23
-841.45	821.6	-840.12	821.56	-806.37	822.34	-785.96	823.04	-779.51	823.39
-775.49	823.42	-732.63	822.97	-727.51	822.6	-683.4	819.64	-672.38	818.49
-645.13	814.72	-642.97	814.69	-637.35	814.47	-612.34	816.41	-601.72	817.34
-601.39	817.34	-600.17	817.07	-597.4	817.13	-597	817.19	-559.61	816.78
-549.11	816.72	-513.33	816.58	-509.48	816.55	-471.22	816.35	-468.12	816.36
-441.85	816.15	-401.4	815.76	-386.25	815.51	-373.26	815.48	-338.72	815.07
-334.28	815	-307.86	814.49	-304.35	814.41	-304.01	814.45	-292.77	814.29
-291.75	814.28	-289.24	814.25	-239.27	813.37	-229.33	813.16	-224.65	813.15
-224.32	813.11	-219.31	812.98	-213.16	812.98	-212.61	812.99	-211.09	813.02

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-185.27	813.13	-169.91	812.83	-165.7	812.79	-151.41	812.7	-129.64	812.5
-109.68	812.37	-109.31	812.37	-108.95	812.36	-108.22	812.36	-107.85	812.35
-106.76	812.35	-106.4	812.34	-105.67	812.34	-105.31	812.33	-104.59	812.33
-104.23	812.32	-103.15	812.32	-102.79	812.31	-102.08	812.31	-101.72	812.3
-101	812.3	-100.65	812.29	-99.58	812.29	-99.23	812.28	-98.52	812.28
-98.16	812.27	-97.11	812.27	-96.75	812.26	-96.05	812.26	-95.7	812.25
-95	812.25	-94.65	812.24	-93.6	812.24	-93.25	812.23	-92.56	812.23
-92.21	812.22	-91.87	812.22	-68.96	811.86	-68.67	811.86	-68.37	811.85
-67.77	811.85	-67.48	811.84	-66.88	811.84	-64.43	811.75	-59.97	811.56
-52.47	811.16	-40.27	810.34	-37.57	810.15	-35.22	809.68	-24.96	807.08
-20.95	804.26	-14.73	800.24	-13.47	800	-6.97	799.17	-.36	799.4
0	799.4	2.38	799.36	7.84	799.97	11.93	800.16	12.41	800.45
18.41	802.84	21.85	805.15	24.59	805.51	32	807.83	33.12	808.4
33.79	808.65	34.78	808.68	36.69	808.9	48.53	811.75	50.46	811.83
176.11	811.85	190.55	814.5	192.96	815	193.65	815.27	197.2	815.43
197.36	815.43	204.13	815.64	209.81	815.78				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-901.35	.05	-35.22	.035	32	.05

Bank Sta: Left Right Coeff Contr. Expan.

-35.22	32	.1	.3
--------	----	----	----

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-901.35	-25.4	812	T
21.09	209.81	812	T

Downstream Deck/Roadway Coordinates num= 7

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-420	816	0	-276	814	0	-24.02	812	810.5	
42.47	812	810.5	46.81	812	810.5	99.43	812	0	
164.68	812	0							

Downstream Bridge Cross Section Data Station Elevation Data num= 169

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-477.653854	2.372	-473.324851	9.143	-471.675851	20.64	-464.877848	19.76	-457.401844	22.89
-384.668809	2.395	-384.262809	0.895	-383.41	809.07	-378.05	808.85	-362.6	808.46
-337.2	807.25	-336.84	807.26	-334.9	807.26	-334.48	807.27	-333.18	807.27
-332.72	807.28	-330.79	807.28	-326.17	807.36	-325.5	807.37	-323.36	807.43
-320.98	807.49	-319.25	807.53	-318.33	807.56	-317.38	807.58	-316.39	807.61
-315.36	807.63	-312	807.72	-309.5	807.78	-308.17	807.82	-306.77	807.85
-303.76	807.93	-300.44	808.01	-296.75	808.11	-294.75	808.16	-294.61	808.16
-291.67	808.2	-291.57	808.2	-288.52	808.25	-288.31	808.25	-285.37	808.29
-285.05	808.29	-282.23	808.33	-281.79	808.34	-279.09	808.37	-278.53	808.38
-275.96	808.41	-275.27	808.42	-269.71	808.49	-268.76	808.5	-266.59	808.53
-263.48	808.56	-262.25	808.57	-260.37	808.6	-257	808.64	-254.17	808.7
-251.68	808.76	-250.54	808.79	-248.46	808.83	-247.5	808.86	-246.15	808.86
-245.27	808.88	-243.84	808.89	-243.04	808.91	-241.53	808.92	-240.81	808.93
-239.21	808.94	-238.58	808.95	-236.88	808.96	-236.35	808.97	-234.55	808.98
-234.11	808.99	-232.22	808.99	-231.87	809	-229.88	809	-229.63	809.01
-224.18	809.01	-222.72	809	-220.7	808.98	-217.89	808.96	-216.87	808.95
-216.02	808.94	-215.31	808.94	-214.7	808.93	-214.17	808.93	-213.71	808.92
-212.62	808.92	-212.33	808.91	-211.41	808.91	-211.22	808.9	-209.11	808.9
-208.41	808.91	-206.39	808.91	-205.65	808.92	-125.39	811.11	-124.94	811.11
-124.48	811.13	-124.02	811.12	-123.56	811.14	-123.11	811.13	-122.65	811.15
-122.19	811.16	-121.73	811.16	-121.27	811.17	-119.9	811.17	-119.43	811.16
-117.53	811.16	-117.06	811.15	-113.73	811.15	-113.26	811.14	-109.94	811.14

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-109.46	811.13	-106.14	811.13	-105.65	811.12	-102.34	811.12	-101.85	811.11
-99.49	811.11	-99	811.1	-95.69	811.1	-95.2	811.09	-92.84	811.09
-92.34	811.08	-89.04	811.08	-88.54	811.07	-86.19	811.07	-85.69	811.06
-83.35	811.06	-82.83	811.05	-80.5	811.05	-79.98	811.04	-76.7	811.04
-76.17	811.03	-73.85	811.03	-73.32	811.02	-72.37	811.02	-72.05	810.91
-53.17	810.86	-48.44	810.69	-37.84	809.07	-30	808.33	-25.59	807.53
-22.23	806.22	-16.85	802.25	-15.05	800.91	-13.8	799.95	-13.33	799.82
-8.16	798.5	-6.82	798.57	-.39	798.8	0	798.79	1.29	798.75
6.69	799.12	8.2	799.53	13.28	800.39	15.02	801.97	21.15	805.17
21.66	805.28	26.21	805.85	26.67	805.91	30.12	807.2	37.5	809.93
37.87	810.04	38.14	810.11	39	810.16	69.62	812.05	85.89	812.92
93.96	813.4	98.67	813.65	100.06	813.69	126.28	814.65		

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -477.653 .05 -22.23 .035 21.15 .05

Bank Sta: Left Right Coeff Contr. Expan.  
 -22.23 21.15 .1 .3  
 Ineffective Flow num= 3  
 Sta L Sta R Elev Permanent  
 -394.24 -126.25 812.82 F  
 -50 -27 811.25 T  
 25 50 811.25 T

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

Number of Bridge Coefficient Sets = 1

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

High Flow Method  
 Energy Only

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

BRIDGE OUTPUT Profile #100-Year

\*\*\*\*\*  
 \* E.G. US. (ft) \* 812.89 \* Element \*Inside BR US  
 \*Inside BR DS \*  
 \* W.S. US. (ft) \* 810.93 \* E.G. Elev (ft) \* 812.75 \*  
 812.52 \*  
 \* Q Total (cfs) \* 5150.00 \* w.s. Elev (ft) \* 810.51 \*  
 810.39 \*  
 \* Q Bridge (cfs) \* 5150.00 \* Crit w.s. (ft) \* 808.28 \*  
 808.24 \*  
 \* Q Weir (cfs) \* \* Max Chl Dpth (ft) \* 11.34 \*  
 11.89 \*

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* Weir Sta Lft (ft) * * * * * 12.00 *
11.39 *
* Weir Sta Rgt (ft) * * * * * 429.04 *
452.16 *
* Weir Submerg * * * * * 0.63 *
0.60 *
* Weir Max Depth (ft) * * * * * 4077.16 *
4111.13 *
* Min El Weir Flow (ft) * * * * * 812.01 *
9.22 *
* Min El Prs (ft) * * * * * 810.50 *
57.29 *
* Delta EG (ft) * * * * * 0.48 *
79917.5 *
* Delta WS (ft) * * * * * 0.66 *
66.81 *
* BR Open Area (sq ft) * * * * * 429.04 *
0.11 *
* BR Open Vel (ft/s) * * * * * 12.00 *
0.00 *
* Coef of Q * * * * * 3.03 *
2.05 *
* Br Sel Method * * * * * Energy only *
-477.65 *

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

This may indicate the need for additional cross sections.

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

CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 2417.85

INPUT

Description: V

Station Elevation Data		num= 169									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-477.65	3854.23	72-473.32	4851.91	43-471.67	5851.20	64-464.87	7848.19	76-457.40	1844.22	89	
-384.66	809.23	95-384.26	2809.08	95-383.41	809.07	-378.05	808.85	-362.6	808.46		
-337.2	807.25	-336.84	807.26	-334.9	807.26	-334.48	807.27	-333.18	807.27		
-332.72	807.28	-330.79	807.28	-326.17	807.36	-325.5	807.37	-323.36	807.43		
-320.98	807.49	-319.25	807.53	-318.33	807.56	-317.38	807.58	-316.39	807.61		
-315.36	807.63	-312	807.72	-309.5	807.78	-308.17	807.82	-306.77	807.85		
-303.76	807.93	-300.44	808.01	-296.75	808.11	-294.75	808.16	-294.61	808.16		
-291.67	808.2	-291.57	808.2	-288.52	808.25	-288.31	808.25	-285.37	808.29		
-285.05	808.29	-282.23	808.33	-281.79	808.34	-279.09	808.37	-278.53	808.38		
-275.96	808.41	-275.27	808.42	-269.71	808.49	-268.76	808.5	-266.59	808.53		
-263.48	808.56	-262.25	808.57	-260.37	808.6	-257	808.64	-254.17	808.7		
-251.68	808.76	-250.54	808.79	-248.46	808.83	-247.5	808.86	-246.15	808.86		
-245.27	808.88	-243.84	808.89	-243.04	808.91	-241.53	808.92	-240.81	808.93		
-239.21	808.94	-238.58	808.95	-236.88	808.96	-236.35	808.97	-234.55	808.98		
-234.11	808.99	-232.22	808.99	-231.87	809	-229.88	809	-229.63	809.01		
-224.18	809.01	-222.72	809	-220.7	808.98	-217.89	808.96	-216.87	808.95		
-216.02	808.94	-215.31	808.94	-214.7	808.93	-214.17	808.93	-213.71	808.92		
-212.62	808.92	-212.33	808.91	-211.41	808.91	-211.22	808.9	-209.11	808.9		
-208.41	808.91	-206.39	808.91	-205.65	808.92	-125.39	811.11	-124.94	811.11		



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-124.48	811.13	-124.02	811.12	-123.56	811.14	-123.11	811.13	-122.65	811.15
-122.19	811.16	-121.73	811.16	-121.27	811.17	-119.9	811.17	-119.43	811.16
-117.53	811.16	-117.06	811.15	-113.73	811.15	-113.26	811.14	-109.94	811.14
-109.46	811.13	-106.14	811.13	-105.65	811.12	-102.34	811.12	-101.85	811.11
-99.49	811.11	-99	811.1	-95.69	811.1	-95.2	811.09	-92.84	811.09
-92.34	811.08	-89.04	811.08	-88.54	811.07	-86.19	811.07	-85.69	811.06
-83.35	811.06	-82.83	811.05	-80.5	811.05	-79.98	811.04	-76.7	811.04
-76.17	811.03	-73.85	811.03	-73.32	811.02	-72.37	811.02	-72.05	810.91
-53.17	810.86	-48.44	810.69	-37.84	809.07	-30	808.33	-25.59	807.53
-22.23	806.22	-16.85	802.25	-15.05	800.91	-13.8	799.95	-13.33	799.82
-8.16	798.5	-6.82	798.57	-.39	798.8	0	798.79	1.29	798.75
6.69	799.12	8.2	799.53	13.28	800.39	15.02	801.97	21.15	805.17
21.66	805.28	26.21	805.85	26.67	805.91	30.12	807.2	37.5	809.93
37.87	810.04	38.14	810.11	39	810.16	69.62	812.05	85.89	812.92
93.96	813.4	98.67	813.65	100.06	813.69	126.28	814.65		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-477.653	.05	-22.23	.035	21.15	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-22.23	21.15		91 63.32	62	.1	.3
Ineffective Flow			num=	3			
Sta L	Sta R	Elev	Permanent				
-394.24	-126.25	812.82	F				
-50	-27	811.25	T				
25	50	811.25	T				

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 812.41	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 2.14	* wt. n-Val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 810.27	* Reach Len. (ft)	* 91.00	* 63.32
62.00				
* Crit w.s. (ft)	* 808.31	* Flow Area (sq ft)	* 15.09	* 419.25
18.54				
* E.G. Slope (ft/ft)	* 0.004266	* Area (sq ft)	* 419.76	* 419.25
51.77				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 60.84	* 4987.20
101.95				
* Top width (ft)	* 317.09	* Top width (ft)	* 254.08	* 43.38
19.63				
* Vel Total (ft/s)	* 11.37	* Avg. vel. (ft/s)	* 4.03	* 11.90
5.50				
* Max Chl Dpth (ft)	* 11.77	* Hydr. Depth (ft)	* 3.16	* 9.66
4.82				
* Conv. Total (cfs)	* 78852.5	* Conv. (cfs)	* 931.6	* 76359.9
1561.0				
* Length wtd. (ft)	* 67.86	* wetted Per. (ft)	* 5.04	* 47.18
3.89				
* Min Ch El (ft)	* 798.50	* Shear (lb/sq ft)	* 0.80	* 2.37
1.27				
* Alpha	* 1.07	* Stream Power (lb/ft s)	* 126.28	* 0.00
0.00				
* Frctn Loss (ft)	* 0.11	* Cum volume (acre-ft)	* 77.33	* 38.71
63.96				
* C & E Loss (ft)	* 0.55	* Cum SA (acres)	* 20.58	* 3.32
13.73				

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Warning: Divided flow computed for this cross-section.  
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.  
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2354.53

INPUT

Description: W

Station Elevation Data		num= 268									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-500.98	866.21	08-483.88	485.7.66	48-473.86	8858.15	84-373.45	5807.96	08-373.39	7 807.94	3 807.94	3
-372.59	807.93	-360.28	807.95	-359.42	807.95	-358.55	807.96	-357.68	807.96	807.96	
-356.8	807.97	-355.93	807.97	-355.05	807.98	-354.16	807.98	-353.27	807.99	807.99	
-352.39	807.99	-351.49	808	-350.6	808	-349.7	808.01	-348.79	808.01	808.01	
-347.89	808.02	-346.98	808.02	-346.07	808.03	-345.15	808.03	-344.24	808.04	808.04	
-343.31	808.04	-342.39	808.05	-341.46	808.05	-340.53	808.06	-339.59	808.06	808.06	
-338.66	808.07	-337.71	808.07	-336.77	808.08	-335.82	808.08	-334.87	808.09	808.09	
-333.91	808.09	-332.96	808.1	-331.99	808.1	-331.03	808.11	-330.06	808.11	808.11	
-328.11	808.13	-327.13	808.13	-326.15	808.14	-325.16	808.14	-324.17	808.15	808.15	
-323.17	808.15	-322.18	808.16	-321.18	808.16	-319.16	808.18	-318.15	808.18	808.18	
-317.13	808.19	-316.11	808.19	-315.09	808.2	-314.06	808.2	-311.99	808.22	808.22	
-310.95	808.22	-309.91	808.23	-308.86	808.23	-307.81	808.24	-306.75	808.24	808.24	
-304.63	808.26	-303.56	808.26	-302.49	808.27	-301.41	808.27	-299.25	808.29	808.29	
-298.16	808.29	-295.97	808.31	-294.87	808.31	-293.77	808.32	-292.66	808.32	808.32	
-290.42	808.34	-289.3	808.34	-288.17	808.35	-287.04	808.35	-284.76	808.37	808.37	
-283.62	808.37	-281.32	808.39	-280.16	808.39	-277.83	808.41	-276.65	808.41	808.41	
-274.29	808.43	-273.11	808.43	-270.72	808.45	-269.52	808.45	-267.1	808.47	808.47	
-265.89	808.47	-262.33	808.5	-261.12	808.5	-256.41	808.54	-255.17	808.54	808.54	
-254.04	808.55	-253.97	808.55	-252.85	808.56	-252.78	808.56	-251.67	808.57	808.57	
-251.59	808.57	-250.48	808.58	-249.3	808.58	-249.21	808.59	-248.02	808.59	808.59	
-246.93	808.6	-246.82	808.6	-245.75	808.61	-245.63	808.61	-244.57	808.62	808.62	
-243.51	808.62	-242.47	808.63	-242.34	808.63	-241.3	808.64	-241.16	808.64	808.64	
-240.14	808.65	-239.98	808.65	-238.97	808.66	-237.62	808.66	-236.64	808.67	808.67	
-236.45	808.67	-235.47	808.68	-235.27	808.68	-234.3	808.69	-233.14	808.69	808.69	
-232.91	808.7	-231.73	808.7	-230.81	808.71	-230.56	808.71	-229.65	808.72	808.72	
-229.38	808.72	-228.49	808.73	-227.33	808.73	-227.02	808.74	-225.84	808.74	808.74	
-225.01	808.75	-224.67	808.75	-223.85	808.76	-223.49	808.76	-222.69	808.77	808.77	
-221.54	808.77	-221.13	808.78	-219.96	808.78	-219.23	808.79	-218.78	808.79	808.79	
-218.08	808.8	-216.93	808.8	-216.42	808.81	-215.78	808.81	-215.24	808.82	808.82	
-214.07	808.82	-213.5	808.83	-212.89	808.83	-212.36	808.84	-211.22	808.84	808.84	
-210.53	808.85	-210.09	808.85	-209.35	808.86	-208.18	808.86	-207.84	808.87	808.87	
-206.72	808.87	-205.82	808.88	-205.62	808.88	-204.64	808.89	-204.51	808.89	808.89	
-203.46	808.9	-201.16	808.9	-200.9	808.91	-198.19	808.91	-198.07	808.92	808.92	
-196.33	808.92	-196.11	808.93	-194.44	808.93	-194.08	808.94	-192.3	808.94	808.94	
-191.74	808.95	-190.43	808.95	-189.66	808.96	-189.04	808.96	-187.97	808.97	808.97	
-187.81	808.97	-186.47	808.98	-186.13	808.98	-184.95	808.99	-184.44	808.99	808.99	
-183.41	809	-182.76	809	-181.85	809.01	-181.07	809.01	-180.28	809.02	809.02	
-179.38	809.02	-178.69	809.03	-177.7	809.03	-177.1	809.04	-176.01	809.04	809.04	
-175.49	809.05	-174.33	809.05	-173.88	809.06	-172.64	809.07	-172.26	809.07	809.07	
-170.96	809.08	-170.64	809.08	-169.27	809.09	-169.01	809.09	-167.59	809.1	809.1	
-167.37	809.1	-165.9	809.11	-165.74	809.11	-164.22	809.12	-164.1	809.12	809.12	

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-162.53	809.13	-162.45	809.13	-159.16	809.15	-158.92	809.15	-158.11	809.16
-157.18	809.16	-156.25	809.17	-155.32	809.17	-153.5	809.19	-152.59	809.19
-151.7	809.2	-150.81	809.2	-149.92	809.21	-143.84	809.14	-140.97	809.14
-139.56	809.13	-131.4	809.13	-130.09	809.12	-122.5	809.12	-121.28	809.11
-113.06	809.11	-111.93	809.1	-103.26	809.1	-102.22	809.09	-94.24	809.09
-93.28	809.08	-72.9	809.08	-53.64	808.83	-53.3	808.83	-42.92	808.79
-36.84	808.13	-23.47	806.92	-19.51	804.16	-12.79	800.05	-10.78	799.14
-7.5	798.07	-3.16	797.95	-.23	798.13	0	798.16	7.77	799.04
12.76	799.53	14.53	799.99	19.12	802.85	22.1	804.84	29.43	805.45
40.13	805.82	47.52	806.56	48.05	806.59	49.68	806.84	53.14	806.92
59.06	807.23	74.02	807.96	88.07	809.49	111.46	811.68	126.83	812.75
130.88	812.86	132.22	812.98	148.01	813.9	183.36	815.24	188.34	815.39
189.8	815.43	195.35	815.57	196.04	814.68				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-500.98	.05	-23.47	.035	22.1	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-23.47	22.1		144	48.15	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.75	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.30	* wt. n-val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 811.45	* Reach Len. (ft)	* 144.00	* 48.15
69.00				
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 993.72	* 502.85
315.93				
* E.G. Slope (ft/ft)	*0.000813	* Area (sq ft)	* 993.72	* 502.85
315.93				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 1663.70	* 2854.76
631.55				
* Top Width (ft)	* 489.46	* Top Width (ft)	* 356.97	* 45.57
86.92				
* Vel Total (ft/s)	* 2.84	* Avg. vel. (ft/s)	* 1.67	* 5.68
2.00				
* Max Chl Dpth (ft)	* 13.50	* Hydr. Depth (ft)	* 2.78	* 11.03
3.63				
* Conv. Total (cfs)	*180589.3	* Conv. (cfs)	* 58338.9	*100104.5
22145.8				
* Length wtd. (ft)	* 84.88	* Wetted Per. (ft)	* 357.90	* 49.52
87.21				
* Min Ch El (ft)	* 797.95	* Shear (lb/sq ft)	* 0.14	* 0.52
0.18				
* Alpha	* 2.39	* Stream Power (lb/ft s)	* 196.04	* 0.00
0.00				
* Frctn Loss (ft)	* 0.06	* Cum Volume (acre-ft)	* 75.85	* 38.04
63.70				
* C & E Loss (ft)	* 0.03	* Cum SA (acres)	* 19.94	* 3.25
13.65				

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek

RS: 2306.38

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INPUT

Description: X

Station Elevation Data

num= 197

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-600.845	4.904	-594.298	844.910	-594.126	844.896	-593.996	844.886	-592.842	844.779
-583.609	844.076	-582.998	844.046	-581.879	843.971	-572.557	843.503	-572.393	843.495
-572.338	843.493	-572.285	843.491	-571.525	843.463	-570.978	843.437	-535.735	842.111
-534.076	842.037	-526.823	841.620	-525.101	841.499	-523.349	841.332	-515.978	840.534
-514.092	840.307	-512.159	840.026	-504.567	838.828	-503.551	838.662	-503.064	838.578
-502.565	838.489	-502.053	838.395	-501.528	838.296	-500.989	838.191	-500.438	838.080
-492.338	836.413	-491.518	836.243	-490.652	836.055	-489.796	835.862	-488.948	835.665
-488.106	835.463	-487.356	835.278	-479.543	833.313	-479.488	833.299	-478.577	833.070
-477.664	832.836	-476.753	832.596	-475.843	832.351	-474.932	832.100	-474.273	831.915
-473.628	831.731	-472.995	831.548	-472.454	831.389	-463.539	828.763	-462.318	828.400
-461.799	828.243	-461.278	828.083	-460.754	827.922	-460.228	827.759	-459.699	827.593
-459.094	827.402	-458.806	827.310	-457.373	826.848	-456.534	826.573	-455.685	826.291
-445.727	822.960	-445.629	822.928	-443.832	822.320	-442.882	821.994	-437.096	819.939
-436.405	819.685	-435.078	819.197	-424.204	815.163	-419.526	813.401	-414.449	811.430
-413.836	811.183	-409.039	809.273	-406.638	808.304	-404	808.13	-396.13	807.99
-392.09	807.99	-391.95	808	-390.23	808	-390.08	808.01	-388.39	808.01
-388.23	808.02	-386.4	808.02	-386.23	808.03	-384.64	808.03	-384.45	808.04
-382.75	808.04	-382.56	808.05	-380.95	808.05	-380.74	808.06	-379.03	808.06
-378.81	808.07	-376.99	808.07	-376.75	808.08	-375.31	808.08	-375.06	808.09
-373.27	808.09	-373.01	808.1	-371.39	808.1	-371.11	808.11	-369.69	808.11
-369.4	808.12	-270.12	808.39	-269.44	808.39	-268.76	808.4	-268.07	808.4
-267.39	808.41	-266.7	808.41	-266	808.42	-265.31	808.42	-264.61	808.43
-263.21	808.43	-262.51	808.44	-261.8	808.44	-261.09	808.45	-260.38	808.45
-259.66	808.46	-258.94	808.46	-258.22	808.47	-257.5	808.47	-256.77	808.48
-256.04	808.48	-255.31	808.49	-254.57	808.49	-253.84	808.5	-252.35	808.5
-251.61	808.51	-250.86	808.51	-250.1	808.52	-249.35	808.52	-248.59	808.53
-247.83	808.53	-247.07	808.54	-246.3	808.54	-245.53	808.55	-244.76	808.55
-243.98	808.56	-243.2	808.56	-242.42	808.57	-241.63	808.57	-240.85	808.58
-240.05	808.58	-239.26	808.59	-238.46	808.59	-237.66	808.6	-221.08	808.63
-194.05	808.39	-190.81	808.4	-189.5	808.43	-176.68	808.62	-165.82	808.85
-165.44	808.85	-165.05	808.86	-163.92	808.86	-163.54	808.87	-162.06	808.87
-161.7	808.88	-160.61	808.88	-67.79	807.94	-61.68	807.94	-61.46	807.95
-55.48	807.95	-55.3	807.96	-53.7	807.96	-46.53	807.87	-42.07	807.83
-25.4	807	-23.53	805.77	-14.98	799.89	-14.31	799.59	-10.39	798.34
-9.53	798.4	-4.34	798.44	0	798.76	2.37	798.93	3.33	799.04
3.92	799.19	9.66	800.26	13.12	802.38	17.84	805.01	36.45	805.24
44.58	806.39	58.79	806.64	63.08	806.74	90.19	807.54	99.16	807.86
114.68	808.3	122.11	808.58	141.52	810.58	154.18	811.63	158.79	812.07
163.4	812.37	166.83	812.49	196.42	813.78	204.95	814.18	207.15	814.28
209.93	814.36	240.28	815.28						

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-600	.05	-25.4	.035	17.84	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-25.4	17.84		90	51.84	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.66	* Element	* Left OB	* Channel
Right OB	* 0.19	* wt. n-val.	* 0.050	* 0.035
* Vel Head (ft)	* 0.050			
* W.S. Elev (ft)	* 811.47	* Reach Len. (ft)	* 90.00	* 51.84

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42.00 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 1220.91 * 463.59 *
522.91 *
* E.G. Slope (ft/ft) *0.000622 * Area (sq ft) * 1220.91 * 463.59 *
522.91 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 1937.75 * 2254.52 *
957.73 *
* Top Width (ft) * 566.82 * Top width (ft) * 389.15 * 43.24 *
134.42 *
* Vel Total (ft/s) * 2.33 * Avg. vel. (ft/s) * 1.59 * 4.86 *
1.83 *
* Max Chl Dpth (ft) * 13.13 * Hydr. Depth (ft) * 3.14 * 10.72 *
3.89 *
* Conv. Total (cfs) *206429.8 * Conv. (cfs) * 77671.5 * 90369.1 *
38389.2 *
* Length Wtd. (ft) * 65.30 * Wetted Per. (ft) * 389.81 * 47.12 *
134.68 *
* Min Ch El (ft) * 798.34 * Shear (lb/sq ft) * 0.12 * 0.38 *
0.15 *
* Alpha * 2.19 * Stream Power (lb/ft s) * 240.28 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.03 * Cum volume (acre-ft) * 72.19 * 37.51 *
63.04 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 18.71 * 3.20 *
13.47 *

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2254.54

INPUT

Description: Y

Station Elevation Data		num= 196									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-710.797837	3.363	-707.927836	6.724	-700.883835	9.2368	-700.656835	12.1871	-700.12	15.835	835.068	
-699.569834	9.431	-699.132834	12.8424	-698.959834	15.8021	-628.117817	18.4882	-627.961817	21.4502		
-626.838817	18.49	-624.28816	21.5884	-614.48814	24.3833	-609.955813	27.4326	-609.651813	30.3761		
-609.481813	34.19	-602.201811	37.9873	-600.736811	41.7505	-600.632	44.811	-594.74810	47.7801		
-593.686	47.636	-593.628810	51.6271	-587.515	55.809	-582.77809	59.2636	-582.25	62.809	809.27	
-579.5	51.809	-579.19	55.809	-578.43	59.809	-578.14	63.809	-577.37	67.809	809.4	
-577.08	55.809	-576.3	59.809	-576	63.809	-575.19	67.809	-574.91	71.809	809.47	
-574.09	59.809	-573.57	63.809	-572.68	67.809	-572.44	71.809	-571.59	75.809	809.57	
-571.36	63.809	-570.49	67.809	-570.28	71.809	-569.39	75.809	-569.2	79.809	809.64	
-568.29	67.809	-568.11	71.809	-567.18	75.809	-567.02	79.809	-566.07	83.809	809.73	
-565.93	71.809	-564.96	75.809	-564.84	79.809	-563.85	83.809	-563.74	87.809	809.8	
-562.74	75.809	-562.65	79.809	-561.62	83.809	-561.55	87.809	-560.51	91.809	809.89	
-560.45	79.809	-559.39	83.809	-558.26	87.809	-558.14	91.809	-557.05	95.809	809.99	
-556.82	83.809	-556	87.809	-554.99	91.809	-553.02	95.809	-552.06	99.809	810.02	
-551.11	87.809	-543.84	91.809	-501.31	95.809	-501.07	99.809	-499.91	103.809	809.97	
-498.78	91.809	-497.68	95.809	-496.71	99.809	-495.76	103.809	-494.82	107.809	809.85	
-494.24	95.809	-493.22	99.809	-493.12	103.809	-492.13	107.809	-491.86	111.809	809.78	
-490.87	99.809	-489.9	103.809	-488.97	107.809	-488.8	111.809	-487.94	115.809	809.67	
-487.75	103.809	-486.9	107.809	-486.7	111.809	-485.87	115.809	-485.65	119.809	809.62	
-484.82	107.809	-484.59	111.809	-483.78	115.809	-483.54	119.809	-482.73	123.809	809.55	
-482.48	111.809	-481.69	115.809	-481.41	119.809	-480.63	123.809	-480.55	127.809	809.5	
-480.26	115.809	-479.63	119.809	-479.33	123.809	-478.73	127.809	-478.42	131.809	809.47	
-477.54	119.809	-477.22	123.809	-476.36	127.809	-476.02	131.809	-475.18	135.809	809.39	
-474.82	123.809	-474	127.809	-473.62	131.809	-472.82	135.809	-472.36	139.809	809.33	

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-470.39	809.28	-469.96	809.28	-469.2	809.26	-468.76	809.25	-468.02	809.23
-467.57	809.23	-446.83	808.86	-445.12	808.82	-443.57	808.78	-442.84	808.76
-442.78	808.76	-423.48	808.33	-423.16	808.32	-422.85	808.32	-422.26	808.3
-421.99	808.3	-411.23	808	-355.26	808	-305.73	808.14	-305.47	808.15
-304.16	808.15	-303.9	808.16	-302.55	808.16	-302.28	808.17	-301.17	808.17
-300.89	808.18	-299.47	808.18	-299.19	808.19	-298.02	808.19	-297.73	808.2
-296.54	808.2	-296.23	808.21	-295.01	808.21	-294.7	808.22	-293.45	808.22
-293.13	808.23	-252.94	808.31	-239.24	808.19	-207.69	808.26	-176.3	808.43
-167.71	808.62	-50.35	807.51	-26.21	806.95	-22.65	804.84	-15.41	799.87
-12.68	798.81	-11.48	798.53	-7.82	799.05	-5.45	799.34	-.27	799.85
0	799.86	1.79	799.91	8.44	800.17	10.39	800.27	12.02	801.53
18.58	804.69	33.45	805.08	33.64	805.09	33.75	805.11	41.59	806.49
61.29	806.74	63.84	806.78	69.72	806.8	99.43	807.45	99.94	807.47
126.43	807.87	140.95	808.4	142.39	808.43	163.62	809.25	175.01	810.36
176.19	810.47	193.42	812.18	221.23	813.76	226.1	814.12	234.24	814.56
253.92	815.17								

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -710.797 .05 -26.21 .035 18.58 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -26.21 18.58 90 50 45 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \* E.G. Elev (ft) \* 811.60 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.12 \* Wt. n-Val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 811.48 \* Reach Len. (ft) \* 90.00 \* 50.00 \*  
 45.00 \*  
 \* Crit W.S. (ft) \* \* Flow Area (sq ft) \* 1681.13 \* 465.77 \*  
 647.21 \*  
 \* E.G. Slope (ft/ft) \*0.000464 \* Area (sq ft) \* 1681.13 \* 465.77 \*  
 647.21 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 2204.99 \* 1927.32 \*  
 1017.69 \*  
 \* Top width (ft) \* 785.48 \* Top Width (ft) \* 572.88 \* 44.79 \*  
 167.81 \*  
 \* Vel Total (ft/s) \* 1.84 \* Avg. Vel. (ft/s) \* 1.31 \* 4.14 \*  
 1.57 \*  
 \* Max Chl Dpth (ft) \* 12.95 \* Hydr. Depth (ft) \* 2.93 \* 10.40 \*  
 3.86 \*  
 \* Conv. Total (cfs) \*239118.7 \* Conv. (cfs) \*102379.6 \* 89487.2 \*  
 47252.0 \*  
 \* Length wtd. (ft) \* 68.76 \* Wetted Per. (ft) \* 573.08 \* 48.38 \*  
 168.08 \*  
 \* Min Ch El (ft) \* 798.53 \* Shear (lb/sq ft) \* 0.08 \* 0.28 \*  
 0.11 \*  
 \* Alpha \* 2.25 \* Stream Power (lb/ft s) \* 253.92 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.02 \* Cum Volume (acre-ft) \* 69.19 \* 36.95 \*  
 62.47 \*  
 \* C & E Loss (ft) \* 0.02 \* Cum SA (acres) \* 17.72 \* 3.15 \*  
 13.33 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

CROSS SECTION

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RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 2204.54

INPUT

Description: Z

Station Elevation Data

num= 163

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-920.1	820.14	-896.19	814.15	-895.12	814.33	-893.31	813.88	-892.86	813.34
-892.27	813.3	-892.03	813.32	-876.99	813.58	-876.65	813.55	-876.47	813.56
-876.24	813.54	-872.18	813.51	-870.87	813.28	-869.03	813.08	-868.31	812.86
-855.14	813.35	-849.65	813.23	-812.3	812.37	-806.56	812.06	-779.56	810.8
-766.96	810.5	-766.64	810.49	-765.57	810.49	-765.2	810.48	-764.43	810.48
-764.03	810.47	-763.26	810.47	-762.89	810.46	-761.51	810.46	-758.71	810.45
-757.65	810.45	-757.1	810.44	-756.54	810.44	-755.96	810.43	-755.35	810.43
-736.34	810.09	-727.76	810	-724.67	810	-723.11	809.93	-722.72	809.9
-720.45	809.79	-720.19	809.78	-715.71	809.55	-715.15	809.52	-713.35	809.43
-711	809.3	-710.14	809.25	-708.66	809.18	-707.65	809.11	-706.33	809.05
-705.16	808.97	-704.01	808.91	-702.67	808.83	-701.7	808.78	-700.2	808.68
-699.4	808.64	-695.15	808.37	-694.71	808.35	-690.13	808.04	-689.45	808
-685.9	807.81	-682.12	807.6	-679.11	807.44	-677.88	807.38	-671.69	807.04
-669.67	806.94	-668.04	806.85	-665.59	806.72	-664.32	806.65	-661.42	806.5
-657.4	806.28	-657.06	806.27	-656.63	806.24	-652.82	806.04	-652.75	806.04
-652.03	806	-593.71	806	-593.13	806.02	-588.37	806.2	-584.4	806.36
-581.06	806.48	-573.44	806.78	-573.35	806.78	-572.14	806.82	-570.81	806.86
-569.34	806.9	-567.72	806.95	-565.91	807	-558.99	807.21	-557.23	807.27
-555.81	807.33	-554.58	807.37	-553.51	807.41	-552.56	807.45	-551.72	807.48
-550.97	807.51	-550.3	807.53	-550.16	807.53	-549.52	807.56	-548.94	807.58
-548.41	807.6	-547.93	807.62	-547.49	807.63	-547.14	807.65	-546.81	807.66
-546.51	807.67	-546.19	807.68	-545.62	807.7	-545.36	807.71	-536.11	808
-297.24	808	-281.9	808.03	-280.46	808.02	-277.08	808.03	-262.39	808.11
-202.84	808.29	-173.64	807.9	-170.7	807.89	-159.9	807.7	-148.14	807.54
-117.32	807.28	-93.7	807.48	-78.23	807.81	-46.46	808.15	-36.05	807.73
-24.39	806.89	-16.87	802.56	-12.29	799.9	-10.83	799.57	-3.6	798.81
-.66	799.18	0	799.22	5.47	799.58	7.65	799.65	9.47	799.75
15.49	800.09	17.16	801.36	19.95	804.35	25.2	804.7	29.78	804.99
36.45	806.08	39.89	806.63	55.27	806.92	59.82	806.89	85.88	806.81
100.95	807.11	118.08	807.56	134.44	807.79	136.61	807.85	149.16	807.76
170.32	807.81	189.32	808.47	190.53	808.49	191.3	808.57	191.95	808.65
200.96	809.38	215.3	810.83	226.77	812.05	229.06	812.33	231.06	812.53
233.55	812.84	257.98	814.32	265.36	814.85				

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-920.1	.05	-24.39	.035	19.95	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-24.39	19.95		74	50	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.56	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.05	* wt. n-val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 811.51	* Reach Len. (ft)	* 74.00	* 50.00
44.00				
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 2738.02	* 474.83
792.59				
* E.G. slope (ft/ft)	*0.000228	* Area (sq ft)	* 2738.02	* 474.83

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792.59 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 2862.63 * 1402.23 *
885.14 *
* Top width (ft) * 1016.43 * Top width (ft) * 770.36 * 44.34 *
201.73 *
* Vel Total (ft/s) * 1.29 * Avg. Vel. (ft/s) * 1.05 * 2.95 *
1.12 *
* Max Chl Dpth (ft) * 12.70 * Hydr. Depth (ft) * 3.55 * 10.71 *
3.93 *
* Conv. Total (cfs) *340863.5 * Conv. (cfs) *189469.4 * 92809.4 *
58584.7 *
* Length wtd. (ft) * 60.42 * Wetted Per. (ft) * 770.58 * 48.07 *
202.06 *
* Min Ch El (ft) * 798.81 * Shear (lb/sq ft) * 0.05 * 0.14 *
0.06 *
* Alpha * 1.93 * Stream Power (lb/ft s) * 265.36 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.01 * Cum Volume (acre-ft) * 64.63 * 36.41 *
61.73 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 16.33 * 3.10 *
13.14 *

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CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 2154.54

INPUT

Description: AA

Station Elevation Data num= 248

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-1050.25	820.63	-1046.01	819.69	-1013.47	813.55	-1012.08	813.09	-1010.95	813.03
-1007.66	812.6	-1006.09	811.8	-1005.58	811.43	-1004.49	811.76	-1001.75	812.04
-989.06	811.69	-985.15	811.91	-983.65	811.94	-979.51	811.82	-939.59	810.5564
-929.48	813.52	-926.76	814.25	-924.35	814.85	-921.70	815.42	-919.22	815.8696
-916.88	816.19	-914.62	816.42	-912.43	816.56	-910.27	816.60	-908.11	816.568
-905.92	816.43	-903.68	816.21	-901.37	815.89	-898.94	815.47	-896.35	814.9228
-893.53	814.22	-890.44	813.35	-886.99	812.27	-883.05	810.93	-880.28	809.8798
-877.57	809.89	-877.45	809.89	-874.23	809.92	-873.47	809.93	-872.44	809.95
-870.94	809.97	-868.31	810	-868.11	810	-866.76	809.98	-862.23	809.89
-861.9	809.89	-860.39	809.86	-840.5	809.5	-840.11	809.5	-839.76	809.49
-839.4	809.49	-839.03	809.48	-838.65	809.48	-838.27	809.47	-837.88	809.47
-837.48	809.46	-837.07	809.46	-836.64	809.45	-836.21	809.45	-835.29	809.43
-834.8	809.43	-834.3	809.42	-791.76	808.77	-791.35	808.77	-790.71	808.76
-790.31	808.76	-789.67	808.75	-789.27	808.75	-788.62	808.74	-788.23	808.74
-787.57	808.73	-787.19	808.73	-786.53	808.72	-786.15	808.72	-785.48	808.71
-785.12	808.71	-784.44	808.7	-784.08	808.7	-783.41	808.69	-782.8	808.69
-782.12	808.68	-781.77	808.68	-781.08	808.67	-780.73	808.67	-780.03	808.66
-779.69	808.66	-778.99	808.65	-778.65	808.65	-777.94	808.64	-777.61	808.64
-776.89	808.63	-776.56	808.63	-775.85	808.62	-775.52	808.62	-774.8	808.61
-774.49	808.61	-773.76	808.6	-773.45	808.59	-772.71	808.58	-772.41	808.58
-771.67	808.57	-771.38	808.57	-770.63	808.56	-770.34	808.56	-769.59	808.55
-769.3	808.55	-768.54	808.54	-768.27	808.54	-755.87	808.33	-754.97	808.31
-754.81	808.31	-753.89	808.29	-753.74	808.29	-752.82	808.27	-752.67	808.27
-751.74	808.25	-751.61	808.25	-750.66	808.23	-750.54	808.23	-749.59	808.21
-749.47	808.21	-748.51	808.19	-748.41	808.18	-747.01	808.18	-746.94	808.17
-745.76	808.17	-745.04	808.16	-744.9	808.16	-737.16	808	-726.817	808
-616.32	835.08	-616.16	835.12	-615.78	835.22	-615.60	835.26	-615.23	835.34
-615.05	835.39	-614.68	835.47	-614.28	835.56	-614.08	835.61	-613.65	835.70



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-613.432835	.7575	-613.203835	.8072	-611.081836	.2454	-610.813836	.2977	-610.511836	.3557
-610.241836	.4069	-609.949836	.4614	-608.544836	.7098	-608.303836	.7466	-608.016836	.7877
-607.767836	.8225	-607.47836	.8632	-607.23836	.8953	-606.924836	.9355	-606.693	.836
-606.377837	.0045	-604.125837	.2535	-603.665837	.2971	-603.456837	.3162	-603.027837	.3536
-602.832837	.3699	-602.384837	.4057	-602.204837	.4194	-601.735837	.4533	-601.571837	.4646
-600.991837	.5017	-600.845837	.5105	-600.23837	.5444	-599.562	.837	-598.829837	.6045
-598.014837	.6284	-597.155837	.6449	-596.588837	.6508	-596.126837	.6527	-596.006837	.6527
-595.069837	.6471	-594.268837	.6338	-593.516837	.6141	-592.855837	.5911	-592.261837	.5659
-591.721837	.5393	-591.228837	.5119	-590.837837	.4881	-590.471837	.4642	-590.126837	.4402
-589.762837	.4132	-589.419837	.3865	-589.095837	.3599	-588.789837	.3337	-586.593837	.1135
-584.333836	.8298	-581.999836	.4783	-579.575836	.0533	-577.039835	.5473	-574.366834	.9506
-571.529834	.2511	-568.492833	.4335	-497.481813	.5379	-497.425813	.5219	-477.716	.808
-182.12	.808	-177.95	.807	-177.84	.807	-139.2	.807	-77.02	.808
-43.93	.808	-37.15	.807	-21.68	.806	-11.01	.799	-10.69	.799
-10.59	.799	-5.56	.798	-5.29	.798	3.35	.798	3.54	.798
12.36	.799	12.69	.799	17.23	.800	17.56	.800	18.08	.800
22.06	.801	28.84	.804	30.21	.804	31.01	.804	38.21	.806
53.53	.806	56.01	.806	83.27	.805	90.16	.805	97.72	.805
98.09	.805	98.41	.805	119.58	.805	134.35	.805	139.08	.805
140.47	.805	142.84	.805	145.72	.805	173.74	.807	185.9	.807
200.7	.808	219.31	.808	227.19	.809	230.22	.809	238.42	.810
255.45	.812	266.7	.813	275.06	.814				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-1050.25	.05	-21.68	.035	38.21	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-21.68	38.21		63	48.8	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.54	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.06	* wt. n-val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 811.48	* Reach Len. (ft)	* 63.00	* 48.80
47.00				
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 2075.97	* 604.53
932.84				
* E.G. Slope (ft/ft)	*0.000247	* Area (sq ft)	* 2075.97	* 604.53
932.84				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 2130.31	* 1822.94
1196.75				
* Top width (ft)	* 937.71	* Top width (ft)	* 673.08	* 59.89
204.74				
* Vel Total (ft/s)	* 1.43	* Avg. vel. (ft/s)	* 1.03	* 3.02
1.28				
* Max Chl Dpth (ft)	* 12.88	* Hydr. Depth (ft)	* 3.08	* 10.09
4.56				
* Conv. Total (cfs)	*327492.4	* Conv. (cfs)	*135467.7	*115922.4
76102.3				
* Length wtd. (ft)	* 54.27	* Wetted Per. (ft)	* 674.52	* 62.98
205.10				
* Min Ch E1 (ft)	* 798.60	* Shear (lb/sq ft)	* 0.05	* 0.15
0.07				
* Alpha	* 1.99	* Stream Power (lb/ft s)	* 275.06	* 0.00
0.00				
* Frctn Loss (ft)	* 0.01	* Cum Volume (acre-ft)	* 60.54	* 35.79
60.86				
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 15.10	* 3.04

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12.93 \*

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Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 2105.74

INPUT

Description: BB

Station Elevation Data		num= 282									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-1284.71	828.4	-1282.86	828.11	-1219.82	814.31	-1214.67	813.19	-1214.58	813.16		
-1209.12	812.01	-1208.22	811.82	-1203.86	812.08	-1198.67	812.41	-1197.04	812.52		
-1193.48	812.29	-1188.29	811.99	-1183.18	811.70	-1177.91	811.43	-1176.57	811.36		
-1174.05	811.25	-1172.72	811.18	-1170.11	811.06	-1169.15	811.02	-1167.53	810.94		
-1162.34	810.73	-1157.15	810.53	-1154.43	810.49	-1151.96	810.41	-1149.18	810.32		
-1146.77	810.29	-1144.62	810.27	-1141.58	810.17	-1139.71	810.16	-1136.39	810.06		
-1134.81	810.06	-1131.19	809.96	-1129.98	809.96	-1126.80	809.86	-1125.80	809.86		
-1120.81	809.77	-1120.29	809.77	-1110.66	809.59	-1110.43	809.59	-1107.63	809.54		
-1102.85	809.11	-1094.7	808.94	-1092.67	808.85	-1081.42	809.01	-1072.17	808.98		
-1068.38	810.72	-1064.36	812.45	-1061.06	813.85	-1057.57	815.27	-1054.61	816.42		
-1052.05	817.36	-1049.79	818.13	-1047.24	818.93	-1045.81	819.56	-966.52	840.00		
-952.78	840.00	-892.91	881.20	-892.86	881.20	-886.92	840.27	-885.48	809.25		
-884.53	809.24	-883.95	809.23	-883.02	809.21	-882.41	809.2	-881.5	809.19		
-880.88	809.18	-867.82	808.94	-866.93	808.93	-865.98	808.91	-865.12	808.9		
-864.15	808.88	-863.32	808.86	-862.31	808.84	-861.52	808.83	-860.39	808.81		
-859.63	808.8	-858.47	808.77	-857.74	808.76	-856.55	808.74	-855.85	808.73		
-854.63	808.7	-853.97	808.69	-852.7	808.66	-852.56	808.66	-850.64	808.63		
-849.3	808.6	-848.72	808.59	-847.34	808.56	-846.81	808.55	-843.44	808.48		
-842.97	808.48	-841.48	808.45	-841.06	808.44	-840.69	808.43	-840.29	808.42		
-839.89	808.42	-839.51	808.41	-839.14	808.41	-838.43	808.39	-838.09	808.39		
-837.76	808.38	-837.69	808.38	-832.66	808.3	-831.42	808.27	-827.51	808.21		
-826.14	808.18	-823.27	808.14	-823.16	808.13	-821.7	808.11	-821.62	808.11		
-820.13	808.08	-820.07	808.08	-818.57	808.06	-815.34	808.09	-809.65	808		
-804.45	810.43	-799.97	812.50	-795.84	814.41	-792.01	816.15	-788.45	817.76		
-786.76	818.52	-785.14	819.25	-778.35	822.24	-776.85	822.90	-775.76	823.37		
-774.52	823.90	-773.53	824.33	-772.27	824.87	-771.05	825.38	-769.87	825.88		
-768.72	826.36	-767.61	826.82	-766.53	827.27	-765.48	827.70	-765.43	827.72		
-761.94	829.13	-758.77	830.38	-755.86	831.49	-753.17	832.49	-752.98	832.56		
-752.34	832.79	-751.71	833.01	-751.10	833.23	-750.50	833.44	-749.91	833.65		
-749.34	833.85	-748.77	834.04	-748.22	834.23	-747.66	834.42	-747.11	834.61		
-746.57	834.79	-746.04	834.96	-745.49	835.14	-744.95	835.31	-744.42	835.48		
-743.15	835.88	-742.59	836.05	-742.04	836.22	-741.49	836.38	-740.94	836.54		
-740.43	836.69	-739.98	836.84	-739.41	836.98	-738.89	837.12	-738.72	837.17		
-738.25	837.29	-737.72	837.42	-737.27	837.55	-736.82	837.67	-736.34	837.79		
-735.90	837.90	-735.45	838.01	-735.01	838.12	-734.57	838.23	-734.14	838.33		
-733.71	838.42	-733.28	838.52	-732.85	838.62	-732.45	838.70	-732.04	838.76		
-518.79	824.51	-518.74	824.51	-510.58	824.73	-510.52	824.72	-502.62	840.42		
-500.91	839.92	-499.10	839.35	-497.17	838.72	-495.10	838.01	-494.56	837.82		
-494.28	837.72	-494.18	837.69	-491.69	836.78	-491.13	836.57	-490.56	836.36		
-489.99	836.15	-489.42	835.93	-488.85	835.71	-488.26	834.71	-483.43	833.58		
-480.30	832.29	-476.83	830.83	-472.94	829.16	-468.53	827.23	-463.48	824.97		
-457.63	822.31	-445.19	816.54	-427.86	808.32	-427.18	808	-143.09	808		
-135.89	807.88	-134.92	807.87	-134.16	807.85	-134.09	807.85	-127.27	807.75		
-115.54	807.75	-111.92	807.81	-109.05	807.88	-107.52	807.88	-106.87	807.89		
-105.45	807.89	-104.68	807.9	-103.86	807.9	-102.99	807.91	-101.07	807.91		
-90.85	807.94	-89.1	807.94	-77.29	807.99	-69.47	807.99	-68.7	808		

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-60.94	808	-60.01	807.99	-57.27	807.99	-55.07	807.82	-38.23	806.81
-35.2	806.61	-34.55	806.6	-34.29	806.56	-33.82	806.54	-19.98	805.6
-19	805.03	-11.8	800.15	-7.71	799.5	-5.17	799.19	0	799.12
1.4	799.11	4.01	798.92	10.22	798.03	12.53	797.84	16.97	798.1
18.46	798.17	19.54	798.4	23.6	799.5	26.39	801.64	29.68	803.93
34.42	805.9	38.23	806.07	42.74	806.3	47.09	806.22	62.78	806.13
63.27	806.12	63.62	806.12	64.44	806.15	83.44	806.15	91.23	806.63
94.72	806.8	100.52	806.83	132.42	807.25	132.77	807.26	132.86	807.26
133.05	807.27	173.39	808.66	193.45	809.45	210.92	809.38	236.84	810.04
248.49	810.08	253.06	810.27	259.03	810.45	272.22	811.95	279.37	812.68
292.07	813.79	296.17	814.12						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -1284.71 .05 -19.98 .035 34.42 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -19.98 34.42 190 202.35 215 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 811.53 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.09 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 811.43 * Reach Len. (ft) * 190.00 * 202.35 *
215.00 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 1872.73 * 606.77 *
783.89 *
* E.G. slope (ft/ft) *0.000303 * Area (sq ft) * 1872.73 * 606.77 *
783.89 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 2103.33 * 2137.92 *
908.76 *
* Top width (ft) * 902.57 * Top width (ft) * 614.91 * 54.40 *
233.26 *
* Vel Total (ft/s) * 1.58 * Avg. vel. (ft/s) * 1.12 * 3.52 *
1.16 *
* Max Chl Dpth (ft) * 13.59 * Hydr. Depth (ft) * 3.05 * 11.15 *
3.36 *
* Conv. Total (cfs) *296081.2 * Conv. (cfs) *120923.5 *122912.0 *
52245.7 *
* Length wtd. (ft) * 199.14 * wetted Per. (ft) * 617.60 * 58.22 *
233.40 *
* Min Ch El (ft) * 797.84 * Shear (lb/sq ft) * 0.06 * 0.20 *
0.06 *
* Alpha * 2.37 * Stream Power (lb/ft s) * 296.17 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.04 * Cum volume (acre-ft) * 57.68 * 35.12 *
59.93 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 14.17 * 2.97 *
12.70 *
*****
*****
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Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 1903.41

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INPUT

Description: CC

Station Elevation Data num= 296

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-1413.08	816.72	-1407.17	816.44	-1397.75	816.01	-1388.84	815.67	-1377.66	815.3
-1366.03	814.77	-1359.93	814.45	-1351.29	814.1	-1337.98813	813.4828	-1334.21814	814.6611
-1306.67810	7719	-1306.25810	9021	-1305.82810	4131	-1305.07809	8777	-1302.09	807.29
-1301.39	807.14	-1295.3	807.3	-1292.12	807.21	-1288.74	807.57	-1286.35	807.86
-1281.48	808.5	-1273.69	809.7	-1271.01	810.13	-1270.85	810.19	-1265.96	810.47
-1263.08	810.63	-1261.7810	6897	-1118.04850	3184	-1083.93838	6245	-1083.88838	6044
-1055.56828	8954	-1054.04	828.362	-1052.37827	7453	-1049.73826	7247	-1047.44825	7883
-1044.6824	6012	-1041.24823	1562	-1037.16821	3334	-1032.09819	0139	-1025.56815	9772
-1019.45813	0876	-1009.65808	3797	-1007.2807	1852	-1002.08	807.01	-988.32	806.88
-983.24	806.72	-979.96	806.54	-962.01	805.21	-957.69	804.98	-957.01	805.11
-947.73	806.94	-947.71	807.06	-945.84	807.99	-944.47	807.48	-858.15	808
-799.47	808	-755.563807	3942	-749.239809	5739	-743.083811	5835	-737.411813	3271
-732.142814	8429	-727.208816	1615	-722.555	817.307	-563.272854	7989	-563.033854	8535
-562.801854	9029	-562.576854	9473	-562.357854	9872	-562.291854	9985	-562.228	855.009
-562.174855	0178	-562.099855	0297	-562.006855	0438	-561.924855	0556	-561.832855	0683
-561.568855	1009	-561.356	855.123	-561.147855	1411	-560.94855	1553	-560.735855	1658
-560.53855	1726	-560.327855	1756	-560.123	855.175	-559.971855	1722	-559.745855	1642
-559.517855	1516	-559.294855	1349	-559.083855	1153	-558.833855	0873	-558.623855	0598
-558.409855	0282	-558.19854	9924	-557.966	854.952	-557.735854	9068	-557.497854	8564
-557.251854	8005	-557.135854	7728	-557.08854	7594	-557.016854	7435	-556.941854	7249
-556.864854	7052	-556.493854	6059	-556.143854	5058	-556.066854	4829	-555.986854	4588
-555.902854	4334	-555.808854	4046	-555.711854	3742	-555.608854	3418	-555.555854	3249
-555.286854	2374	-555.233854	2199	-555.179	854.202	-555.068854	1643	-554.998854	1408
-554.879	854.1	-554.756854	0572	-554.692	854.035	-554.258853	8796	-554.124853	8305
-553.346853	5366	-553.255853	5015	-549.783852	1412	-549.73852	1202	-544.611850	1145
-544.547850	0893	-477.6	823.856	-477.526	823.827	-471.677	821.535	-471.619821	5122
-468.818820	4147	-468.765820	3939	-463.101818	1747	-463.039818	1502	-454.74814	8971
-453.557814	4296	-452.35813	9497	-451.12813	4573	-449.866812	9519	-448.711812	4843
-447.536812	0057	-446.34811	5159	-446.164811	4438	-444.941810	9398	-443.51810	3472
-443.327810	2711	-440.688809	1692	-439.124808	5108	-437.713	807.914	-436.271807	3013
-434.638806	6038	-433.768806	2303	-431.15	806.17	-427.32	806.09	-425.27	806.04
-423.45	806	-374	806	-373.56	806.01	-372.23	806.02	-370.93	806.04
-369.65	806.05	-368.39	806.07	-367.15	806.08	-365.72	806.1	-365.57	806.1
-358.39	806.22	-357.27	806.23	-354.06	806.29	-342.7	806.44	-335.04	806.52
-334.69	806.53	-333.81	806.54	-333.44	806.55	-332.57	806.57	-332.19	806.57
-331.34	806.59	-330.94	806.59	-330.1	806.61	-329.69	806.61	-328.43	806.64
-327.61	806.65	-327.35	806.66	-326.9	806.66	-326.02	806.68	-325.56	806.68
-324.69	806.7	-324.22	806.71	-323.37	806.72	-322.88	806.73	-322.04	806.74
-321.54	806.75	-320.71	806.77	-320.2	806.77	-319.39	806.79	-319.27	806.79
-318.73	806.8	-317.94	806.81	-317.39	806.82	-316.6	806.83	-316.04	806.84
-315.27	806.86	-314.69	806.86	-313.94	806.88	-292.28	807.29	-291.62	807.31
-290.98	807.32	-290.48	807.33	-290	807.33	-287.07	807.39	-286.61	807.4
-286.15	807.4	-285.72	807.41	-284.96	807.43	-261.22	807.95	-261.14	807.96
-260.71	807.96	-259.22	807.99	-258.97	808	-191.55	808	-160.29	808.57
-159.61	808.57	-158.94	808.58	-154.42	808.58	-153.85	808.59	-138.43	808.58
-137.74	808.57	-135.64	808.57	-134.94	808.56	-132.25	808.56	-131.6	808.55
-129.06	808.55	-128.42	808.54	-125.81	808.54	-125.15	808.53	-122.41	808.53
-103.56	808	-61.32	808	-61.14	807.99	-60.4	808	-59.58	808
-57.87	807.98	-57.25	807.68	-56.22	807.71	-40.74	807.96	-40.56	807.88
-39.48	807.93	-39.31	807.9	-38.39	807.84	-31.6	806.91	-23.04	804.62
-18.39	802.72	-15.31	799.68	-13.61	799.14	-11.15	798.59	-8.71	798.6
-4.88	798.82	-2.24	798.91	0	799.21	2.77	799.59	5.36	799.74
15.86	800.78	19.21	801.07	25.98	801.39	28.13	801.7	34.86	801.78
40.98	802.22	64.91	803.69	67.69	803.76	85.92	804.31	102.91	804.36
107.15	804.41	109.56	804.63	123.37	806.87	124.99	806.92	138.39	807.04
154.02	807.98	175.38	808.83	193.46	809.77	211.27	810.13	232.8	810.02
248.61	809.84	261.98	809.75	286.4	809.66	312.77	809.79	322.37	809.86

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329.27 809.78 332.46 809.82 341.59 809.72 361.96 809.56 373.32 809.63  
 394.07 809.51 398.94 809.45 403.05 809.94 422.39 812.19 432.81 813.02  
 439.57 813.46

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -1413.08 .05 -18.39 .035 28.13 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -18.39 28.13 512 298.87 86 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \*\*\*\*\*  
 \* E.G. Elev (ft) \* 811.47 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.04 \* wt. n-val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 811.43 \* Reach Len. (ft) \* 512.00 \* 298.87 \*  
 86.00 \*  
 \* Crit w.s. (ft) \* \* Flow Area (sq ft) \* 2878.87 \* 530.24 \*  
 1315.08 \*  
 \* E.G. Slope (ft/ft) \*0.000158 \* Area (sq ft) \* 2878.87 \* 530.24 \*  
 1315.08 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 2637.78 \* 1403.27 \*  
 1108.95 \*  
 \* Top width (ft) \* 1186.69 \* Top Width (ft) \* 752.46 \* 46.52 \*  
 387.71 \*  
 \* Vel Total (ft/s) \* 1.09 \* Avg. Vel. (ft/s) \* 0.92 \* 2.65 \*  
 0.84 \*  
 \* Max Chl Dpth (ft) \* 12.84 \* Hydr. Depth (ft) \* 3.83 \* 11.40 \*  
 3.39 \*  
 \* Conv. Total (cfs) \*409415.5 \* Conv. (cfs) \*209699.0 \*111557.4 \*  
 88159.1 \*  
 \* Length wtd. (ft) \* 360.86 \* Wetted Per. (ft) \* 758.45 \* 48.06 \*  
 388.16 \*  
 \* Min Ch El (ft) \* 798.59 \* Shear (lb/sq ft) \* 0.04 \* 0.11 \*  
 0.03 \*  
 \* Alpha \* 2.10 \* Stream Power (lb/ft s) \* 439.57 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.06 \* Cum Volume (acre-ft) \* 47.32 \* 32.48 \*  
 54.75 \*  
 \* C & E Loss (ft) \* 0.00 \* Cum SA (acres) \* 11.19 \* 2.74 \*  
 11.16 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 1604.54

INPUT

Description: DD  
 Station Elevation Data num= 120  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 \*\*\*\*\*  
 -254.5 820.31 -253.81 820 -249.36 818.13 -249.04 818 -248.71 817.86  
 -244.27 816 -241.75 814.97 -239.41 814 -235.77 812.52 -234.46 812

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-232.56	811.25	-229.43	810	-228.2	809.57	-224.74	808.38	-223.94	808.1
-223.65	808	-223.48	808	-221.86	808	-221.07	808	-220.61	808.01
-220.31	808.01	-220.09	808.01	-219.93	808.01	-219.8	808.01	-219.7	808.01
-219.62	808.01	-219.56	808.01	-219.5	808.01	-219.45	808.01	-219.42	808.01
-219.4	808.01	-219.38	808.01	-219.31	808.01	-219.29	808.01	-219.27	808.01
-219.26	808.01	-219.22	808.01	-219.21	808.01	-219.2	808.01	-219.19	808.01
-219.18	808.01	-219.17	808.01	-219.17	808.05	-218.46	808.05	-218.07	808.25
-208.9	807.97	-202.66	807.8	-202.47	807.73	-199.15	806.81	-197.39	806.65
-185.15	805.67	-168.49	805.12	-165.13	805.01	-163.48	805.02	-161.69	805.03
-150.76	805.17	-148.36	804.05	-144.6	801.99	-144.14	801.94	-143.94	801.8
-140.03	799.92	-137.84	799.77	-137.23	799.58	-137.01	799.73	-134.93	801.41
-134.51	801.43	-126.72	801.94	-117.53	801.92	-102.19	801.63	-88	801.53
-78.33	801.45	-66.67	801.3	-53.5	801.47	-51.58	801.47	-36.89	801.33
-18.11	800.66	-15.8	800.56	-15.31	800.44	-11.66	798.9	-2.59	797.82
-2.27	797.8	-1.95	797.77	0	797.54	4.56	797	9.86	796.53
9.89	796.53	14.62	798.12	14.69	798.14	14.81	798.26	20.33	807.16
23.78	807.16	38.24	807.17	53.5	807.14	57.16	807.14	70.39	807.14
74	807.13	112.25	806.72	127.42	806.39	151.27	806.51	160.35	807.08
183.69	807.64	190.99	807.66	210.11	808.16	216.56	808.05	241.85	807.55
242.96	807.5	249.5	807.18	265.56	806.74	289.15	808.84	301.45	809.04
322.56	809.76	342.42	809.63	360.59	809.45	381.97	809.41	400.9	809.43
411.27	809.32	419.05	810.3	430.18	811.75	441.82	812.55	451.46	813.19

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-254.5	.05	-15.8	.035	20.33	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-15.8	20.33		149 184.82	41	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.40	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.05	* wt. n-val.	* 0.050	* 0.035
0.050				
* w.s. Elev (ft)	* 811.35	* Reach Len. (ft)	* 149.00	* 184.82
41.00				
* Crit w.s. (ft)	*	* Flow Area (sq ft)	* 1713.42	* 459.70
1358.78				
* E.G. Slope (ft/ft)	*0.000177	* Area (sq ft)	* 1713.42	* 459.70
1358.78				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 2665.06	* 1284.07
1200.87				
* Top width (ft)	* 659.94	* Top Width (ft)	* 217.02	* 36.13
406.80				
* Vel Total (ft/s)	* 1.46	* Avg. Vel. (ft/s)	* 1.56	* 2.79
0.88				
* Max Chl Dpth (ft)	* 14.82	* Hydr. Depth (ft)	* 7.90	* 12.72
3.34				
* Conv. Total (cfs)	*386773.2	* Conv. (cfs)	*200150.6	* 96435.3
90187.4				
* Length wtd. (ft)	* 128.00	* Wetted Per. (ft)	* 219.87	* 41.85
407.09				
* Min Ch El (ft)	* 796.53	* Shear (lb/sq ft)	* 0.09	* 0.12
0.04				
* Alpha	* 1.59	* Stream Power (lb/ft s)	* 451.46	* 0.00
0.00				
* Frctn Loss (ft)	* 0.02	* Cum Volume (acre-ft)	* 20.33	* 29.08
52.11				
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 5.49	* 2.46

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10.38 \*

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CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 1419.72

INPUT

Description: EE

Station Elevation Data		num= 82		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-133.24	824.56	-130.81	824	-124.37	822.44	-122.58	822	-118.66	821.04
-114.37	820	-112.36	819.49	-106.45	818	-101.64	816.16	-98.65	815.34
-97.21	814.61	-89.43	814.27	-83.42	814	-82.62	813.97	-80.92	813.88
-75.91	810	-75.9	810	-72.82	810.28	-72.74	810.29	-71.16	810.43
-60.51	809.88	-58.71	809.82	-58.63	809.84	-57.68	809.87	-55.63	809.3
-52.04	808.3	-48.95	808.06	-43.9	807.61	-33.31	807.36	-29.68	807.31
-18.8	797.35	-18.51	797.15	-18.37	797.12	-9.34	796.76	-8.3	796.83
-1.89	796.37	-.01	796.51	0	796.51	5.24	797.45	10.42	797.23
15.88	797.82	25.35	798.02	28.91	797.99	35.53	800.94	37.02	801.47
37.8	801.6	46.24	803.46	74.68	805.31	77.76	805.47	79.29	805.55
80.95	805.57	112.25	806.16	129.82	806.8	146.42	807.27	181.61	807.14
183.67	807.12	193.95	807.06	228.2	806.84	237.5	806.83	265.27	806.79
281.86	806.66	304.04	806.21	331.38	805.94	344.68	806.3	350.86	806.46
385.2	806.66	387.18	806.61	399.69	807.42	427.18	809.24	432.84	809.27
465.47	809.54	480.67	809.4	493.5	809.13	509.05	808.96	518.95	808.89
532.2	808.89	549.9	809.02	555.9	809.02	563.05	809.83	577.38	811.63
584.8	812.16	599.7	813.15						

Manning's n Values		num= 3		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
-133.24	.05	-29.68	.035	46.24	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-29.68	46.24		173	185.67		.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.38	* Element	* Left OB	* Channel
Right OB				
* Vel Head (ft)	* 0.09	* Wt. n-Val.	* 0.050	* 0.035
0.050				
* W.S. Elev (ft)	* 811.29	* Reach Len. (ft)	* 173.00	* 185.67
44.00				
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 116.41	* 941.47
2092.18				
* E.G. Slope (ft/ft)	*0.000197	* Area (sq ft)	* 116.41	* 941.47
2092.18				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 86.90	* 2879.95
2183.15				
* Top Width (ft)	* 652.23	* Top Width (ft)	* 47.89	* 75.92
528.42				
* Vel Total (ft/s)	* 1.63	* Avg. vel. (ft/s)	* 0.75	* 3.06
1.04				
* Max Chl Dpth (ft)	* 14.92	* Hydr. Depth (ft)	* 2.43	* 12.40
3.96				
* Conv. Total (cfs)	*366923.6	* Conv. (cfs)	* 6191.5	*205188.9

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*155543.3 *
* Length Wtd. (ft) * 125.81 * Wetted Per. (ft) * 48.62 * 80.94 *
  528.76 *
* Min Ch El (ft) * 796.37 * Shear (lb/sq ft) * 0.03 * 0.14 *
  0.05 *
* Alpha * 2.13 * Stream Power (lb/ft s) * 599.70 * 0.00 *
  0.00 *
* Frctn Loss (ft) * 0.02 * Cum volume (acre-ft) * 17.20 * 26.11 *
  50.49 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 5.04 * 2.22 *
  9.94 *
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CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 1234.05

INPUT

Description: FF

Station Elevation Data num= 125

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-206.29	819.46	-200.65	818	-197.84	817.3	-192.78	816	-189.46	815.12
-185.16	814	-177.52	812.02	-177.45	812	-177.24	811.95	-169.56	810
-163.3	808.42	-161.62	808	-160.3	807.77	-150.98	806	-149.55	805.99
-141.69	805.98	-141.5	805.98	-140.88	805.98	-133.89	805.95	-130.64	805.94
-129.27	805.94	-125.41	805.92	-125.27	805.92	-119.66	805.91	-119.47	805.91
-113.88	805.9	-113.72	805.9	-113.55	805.9	-109.15	805.89	-108.89	805.89
-108.61	805.89	-79.16	805.07	-45.36	804.14	-44.53	804.12	-43.45	804.1
-40.44	804.07	-38.68	804.06	-38.54	804.07	-38.37	804.07	-37.77	804.01
-37.24	804.01	-37.19	804	-30.78	802.5	-29.84	802	-26.29	800.22
-25.87	800	-25.24	799.69	-24.32	799.25	-21.9	798	-21.56	798
-18.9	798	-18.8	798	-18.64	798	-17.59	798	-6.79	798
-.56	798	0	798	12.11	798	12.88	798	16.74	798
19.43	799.16	21.39	800	22.15	800.53	22.62	800.82	24.24	801.82
24.53	802	24.55	802.01	24.8	802.16	25.01	802.28	25.19	802.38
25.35	802.48	25.49	802.56	25.62	802.63	25.72	802.69	25.82	802.75
25.91	802.8	25.99	802.85	26.06	802.9	26.13	802.94	26.19	802.97
26.24	803.01	26.29	803.04	26.34	803.07	26.39	803.09	26.43	803.12
26.47	803.14	26.5	803.16	26.54	803.18	26.57	803.2	26.6	803.22
26.63	803.24	26.66	803.24	54.23	804.14	56.94	804.2	74.1	806.44
77.21	806.52	80.14	806.6	85.51	806.59	126.38	806.77	130.45	806.77
167.98	806.63	179.11	806.59	180.44	806.58	215.96	806.5	220.86	806.45
248.62	806.24	255.71	806.16	256.04	806.17	276.79	805.61	282.15	805.6
287.71	805.65	319.14	806.74	339.94	807.72	355.88	808.41	377.43	808.5
408.02	808.34	427.41	808.18	441.89	808.29	466.55	808.44	473.08	808.48
487.87	810.16	499.3	811.52	507.36	812.1	507.64	812.12	523.13	813.21

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-206.29	.05	-37.19	.035	26.66	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
-37.19 26.66 117 131.34 192.99 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

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\*\*\*\*\*  
\* E.G. Elev (ft) \* 811.35 \* Element \* Left OB \* Channel \*



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Right OB *
* Vel Head (ft) * 0.06 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 811.28 * Reach Len. (ft) * 117.00 * 131.34 *
192.99 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 748.73 * 770.55 *
2034.00 *
* E.G. Slope (ft/ft) *0.000169 * Area (sq ft) * 748.73 * 770.55 *
2034.00 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 891.95 * 2176.63 *
2081.42 *
* Top Width (ft) * 671.93 * Top Width (ft) * 137.42 * 63.85 *
470.65 *
* Vel Total (ft/s) * 1.45 * Avg. vel. (ft/s) * 1.19 * 2.82 *
1.02 *
* Max Chl Dpth (ft) * 13.28 * Hydr. Depth (ft) * 5.45 * 12.07 *
4.32 *
* Conv. Total (cfs) *396595.9 * Conv. (cfs) * 68688.3 *167620.0
*160287.7 *
* Length wtd. (ft) * 151.19 * wetted Per. (ft) * 138.05 * 66.44 *
471.05 *
* Min Ch El (ft) * 798.00 * Shear (lb/sq ft) * 0.06 * 0.12 *
0.05 *
* Alpha * 1.92 * Stream Power (lb/ft s) * 523.13 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.03 * Cum Volume (acre-ft) * 15.48 * 22.46 *
48.40 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 4.67 * 1.92 *
9.44 *
*****
*****

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 1102.70

INPUT

Description: GG

Station Elevation Data			num=	117						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
-289.51	823.17	-284.72	822.19	-283.86	822	-283.27	821.86	-274.9	820	
-267.4	818.33	-265.91	818	-264.06	817.59	-257.15	816	-249.19	814.26	
-248.06	814	-239.53	812.19	-238.72	812	-237.74	811.8	-228.6	810	
-224.13	809.14	-217.49	808	-212.35	807.38	-210.24	807.28	-205.93	806.82	
-205.12	806.75	-199.07	806.63	-196.69	806.46	-195.3	806.37	-195.04	806.35	
-193.44	806.27	-192.41	806.23	-183.22	806.24	-178.07	806.21	-172.74	806.18	
-171.92	806.16	-171.25	806.15	-161.2	806.03	-158.18	806.03	-156.25	806.02	
-151.54	806.03	-151.43	806.03	-146.32	806.01	-146.26	806.01	-142.51	806	
-133.64	805.85	-132.12	805.82	-129.94	805.78	-114.43	805.52	-102.78	805.34	
-97.86	805.26	-93.46	805.2	-90.78	805.15	-87.77	805.1	-80.07	804.98	
-73.86	804.89	-67.18	804.76	-58.77	804.6	-42.37	804.25	-31.66	804.01	
-31.15	804.01	-29.92	804.01	-28.29	804	-27.99	804	-27.33	804	
-26.85	804	-25.69	803.66	-25.11	803.49	-22.2	802	-19.2	800.47	
-18.27	800	-17.41	799.56	-14.62	798	-7.66	798	0	798	
1.73	798	17.37	798	17.58	798	18.13	798	18.51	798.19	
22.22	800	24.75	801.24	26.32	802	28.22	802.93	31	804	
31.94	804	41.11	804.07	45.61	804.3	54.04	804.54	83.33	805.28	
91.06	805.49	94.01	805.59	95.91	805.61	132.94	806.3	136.29	806.33	
139.49	806.35	164.42	806.54	183.4	806.63	186.37	806.61	231.26	806.05	
238.05	806.05	275.37	806.2	280.92	806.2	282.25	806.21	307.77	807.46	

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324.8	809.33	330.91	809.81	335.5	810.13	336.15	810.18	372.12	812.23
372.24	812.18	373.78	812.33	375.76	812.44	382.54	812.44	392.23	812.55
401.64	812.64	414.95	812.72	417.44	812.75	433.14	812.79	442.12	812.72
464.37	812.83	472.75	812.9						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 \*\*\*\*\*  
 -289.51 .05 -25.69 .035 31 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -25.69 31 138.99 130.59 147.99 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \*\*\*\*\*  
 \* E.G. Elev (ft) \* 811.32 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.07 \* wt. n-val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 811.25 \* Reach Len. (ft) \* 138.99 \* 130.59 \*  
 147.99 \*  
 \* Crit W.S. (ft) \* \* Flow Area (sq ft) \* 1123.69 \* 678.76 \*  
 1543.08 \*  
 \* E.G. slope (ft/ft) \*0.000185 \* Area (sq ft) \* 1123.69 \* 678.76 \*  
 1543.08 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 1392.40 \* 1990.72 \*  
 1766.88 \*  
 \* Top width (ft) \* 589.97 \* Top width (ft) \* 209.28 \* 56.69 \*  
 324.00 \*  
 \* Vel Total (ft/s) \* 1.54 \* Avg. vel. (ft/s) \* 1.24 \* 2.93 \*  
 1.15 \*  
 \* Max Chl Dpth (ft) \* 13.25 \* Hydr. Depth (ft) \* 5.37 \* 11.97 \*  
 4.76 \*  
 \* Conv. Total (cfs) \*378186.5 \* Conv. (cfs) \*102249.7 \*146187.4  
 \*129749.4 \*  
 \* Length wtd. (ft) \* 138.17 \* Wetted Per. (ft) \* 209.73 \* 59.40 \*  
 324.23 \*  
 \* Min Ch El (ft) \* 798.00 \* Shear (lb/sq ft) \* 0.06 \* 0.13 \*  
 0.06 \*  
 \* Alpha \* 1.77 \* Stream Power (lb/ft s) \* 472.75 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* 0.03 \* Cum volume (acre-ft) \* 12.97 \* 20.27 \*  
 40.48 \*  
 \* C & E Loss (ft) \* 0.00 \* Cum SA (acres) \* 4.21 \* 1.74 \*  
 7.67 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 972.12

INPUT

Description: HH  
 Station Elevation Data num= 163  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 \*\*\*\*\*  
 -326.96 813.78 -325.06 813.78 -324.62 813.77 -312.1 813.79 -311.71 813.79  
 -311.3 813.78 -310.79 813.77 -310.71 813.77 -310.04 813.76 -309.09 813.74  
 -299.86 813.58 -299.5 813.58 -299.13 813.57 -296.5 813.51 -289.07 813.22

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-281.87	812.99	-279.84	812.9	-276.56	812.81	-272.63	812.68	-270.91	812.59
-269.58	812.52	-264.51	812.38	-258.25	812.17	-257.11	812.12	-253.96	812.01
-252.79	812	-247.85	811.77	-247.06	811.74	-246.01	811.7	-235.69	811.04
-234.51	810.98	-230.45	810.9	-224.77	810.76	-217.17	810.53	-213.54	810.36
-203.45	810	-201.81	809.91	-179	808.59	-178.36	808.56	-174.95	808.41
-168.88	808	-168.86	807.99	-167.73	807.99	-167.72	807.99	-166.02	807.98
-162.03	807.97	-158.82	807.97	-157.81	807.96	-156.68	807.96	-153.18	807.93
-152.17	807.93	-147.01	807.71	-124.98	806.82	-98.36	806.05	-98.02	806.03
-96.39	806	-96.31	806	-91.58	805.99	-90.9	805.99	-90.29	805.98
-88.68	805.98	-87.34	805.98	-85.9	805.97	-82.63	805.96	-80.47	805.95
-78.95	805.94	-77.59	805.94	-55.94	805.33	-51.01	805.29	-46.29	805.27
-42.91	805.22	-39.87	805.19	-36.91	805.19	-33.31	804.55	-30.41	804.02
-30.31	804.02	-30.21	804	-28.09	802.54	-27.19	802	-25.5	801.1
-22.96	800	-18.37	797.56	-17.49	797.56	-17.43	797.56	-17.42	797.56
-13.96	797.56	0	797.56	1.22	797.56	14.24	797.56	17.93	797.56
20.45	798	26.11	799.94	26.31	800	32.11	801.03	32.83	802
49.01	803.35	49.44	803.36	55.53	803.3	55.72	803.39	56.74	803.46
60.16	803.53	85.01	805.01	113.83	805.2	119.81	805.24	126.8	805.29
131.99	805.27	139.45	805.25	147.43	805.3	150.86	805.04	162.7	804.62
166.24	804.54	176.45	805.43	177.27	805.48	179.3	805.58	201.26	806.42
208.15	807.25	223.45	808.52	236.82	809.7	252.78	811.09	252.86	811.07
252.99	811.08	255.67	811.11	272.38	811.61	292.88	811.69	300.43	811.78
310.06	811.68	312.5	811.63	314.79	811.65	317.61	811.73	317.72	811.84
317.8	811.83	320.16	811.81	334.73	811.83	341.58	811.8	343.41	811.9
345.47	811.78	346.96	811.81	348.55	811.78	352.07	811.8	367.83	811.79
370.45	811.82	383.76	811.8	383.94	811.82	395.49	811.86	398.25	811.88
398.32	812.08	398.42	811.98	398.86	812.41	408.62	812.42	418.24	812.27
427.48	812.07	437.72	811.84	443.56	811.77	454.65	811.84	466.98	811.99
475.86	812.18	480.39	812.38	482.7	812.57	490.96	812.47	496.51	812.45
496.72	812.45	505.62	812.64	511.92	812.78				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-326.96	.05	-30.21	.035	32.83	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-30.21	32.83		168	161.32		.1	.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.29	* Element	* Left OB	* Channel
Right OB *				
* Vel Head (ft)	* 0.10	* wt. n-val.	* 0.050	* 0.035
0.050 *				
* W.S. Elev (ft)	* 811.18	* Reach Len. (ft)	* 168.00	* 161.32
108.00 *				
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 764.22	* 793.48
1203.93 *				
* E.G. Slope (ft/ft)	* 0.000228	* Area (sq ft)	* 764.22	* 793.48
1203.93 *				
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 817.49	* 2681.48
1651.03 *				
* Top Width (ft)	* 496.01	* Top width (ft)	* 207.71	* 63.04
225.26 *				
* Vel Total (ft/s)	* 1.86	* Avg. vel. (ft/s)	* 1.07	* 3.38
1.37 *				
* Max Chl Dpth (ft)	* 13.62	* Hydr. Depth (ft)	* 3.68	* 12.59
5.34 *				
* Conv. Total (cfs)	* 340731.2	* Conv. (cfs)	* 54086.5	* 177410.4
* 109234.3 *				
* Length Wtd. (ft)	* 140.95	* wetted Per. (ft)	* 207.94	* 65.65

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225.68 *										
* Min Ch El (ft)	*	797.56	* Shear (lb/sq ft)	*	0.05	*	0.17	*		
0.08 *										
* Alpha	*	1.94	* Stream Power (lb/ft s)	*	511.92	*	0.00	*		
0.00 *										
* Frctn Loss (ft)	*	0.04	* Cum volume (acre-ft)	*	9.96	*	18.07	*		
35.81 *										
* C & E Loss (ft)	*	0.00	* Cum SA (acres)	*	3.54	*	1.56	*		
6.74 *										
*****										
*****										

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek      RS: 810.82

INPUT

Description: II

Station Elevation Data		num= 159									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
*****											
-216.91	814	-209.47	814	-201.74	814	-195.8	813.64	-188.84	813.23		
-185.45	813.15	-179.25	812.94	-152.13	813.27	-151.81	813.26	-149.47	813.17		
-146.37	813.02	-146.36	813.01	-146.32	813.02	-140.6	812.84	-136.23	812.99		
-129.02	812.75	-127.18	812.76	-123.2	812.8	-119.29	812.67	-118.82	812.66		
-111.87	812.43	-109.55	812.36	-100.54	812.03	-99.84	812	-98.62	811.93		
-97.8	811.89	-83.42	811.14	-76.85	810.72	-74.41	810.56	-73.74	810.51		
-71.49	810.36	-66.78	810	-61.45	809.65	-58.64	809.44	-52.08	808.96		
-50.37	808.85	-41.46	808	-38.34	807.75	-37.59	807.68	-36.09	807.5		
-24.8	806	-20.35	804.6	-18.41	804	-18.33	803.94	-15.01	802		
-12.97	800.82	-11.05	800	-10.24	799.15	-8.85	797.3	0	797.3		
3.17	797.3	10.08	797.3	17.92	797.3	24.85	797.3	27.53	798		
27.87	801.86	28.46	802.53	32.36	803.16	42.61	804.76	59.3	804.95		
77.03	805.06	103.24	805.26	119.26	805.35	128.03	805.42	149.59	805.57		
160.78	805.68	192.07	805.53	197.51	805.48	238.72	804.72	239.38	804.7		
240.47	804.67	256.38	804.26	262.57	804.13	266.56	804.18	293.85	808.49		
296.89	808.94	300.24	809.22	329.56	811.43	333.28	811.66	333.32	811.67		
333.59	811.64	340.57	811.73	344.49	811.76	350.15	811.95	362.33	812.32		
365.48	812.39	381.25	812.44	388.26	812.42	396.23	812.36	413.4	812.25		
424.49	812.31	455.96	812.46	456.15	812.5	459.79	812.5	467.99	812.4		
475.02	812.37	475.36	812.37	475.71	812.37	476.06	812.37	486.93	812.37		
487.23	812.37	487.54	812.37	487.85	812.37	488.18	812.37	488.5	812.37		
488.83	812.37	489.17	812.37	489.52	812.38	497.79	812.49	497.9	812.49		
498.02	812.49	498.14	812.49	498.28	812.49	498.41	812.49	498.56	812.48		
498.71	812.48	498.87	812.48	499.04	812.48	499.21	812.48	499.39	812.48		
499.57	812.48	499.76	812.48	499.96	812.48	500.17	812.48	500.38	812.49		
500.59	812.49	500.81	812.49	501.04	812.49	501.11	812.49	501.27	812.49		
501.51	812.49	501.75	812.49	501.99	812.49	502.24	812.49	502.49	812.49		
502.74	812.49	503	812.49	503.25	812.49	503.51	812.49	503.76	812.49		
504.02	812.49	504.27	812.5	504.52	812.5	504.78	812.5	505.02	812.5		
505.27	812.5	505.51	812.5	505.75	812.51	505.98	812.51	506.21	812.51		
506.43	812.51	506.65	812.52	506.86	812.52	507.07	812.52	507.27	812.52		
507.46	812.53	507.64	812.53	507.82	812.53	524.88	812.93				

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
*****					
-216.91	.05	-20.35	.035	42.61	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
-20.35	42.61	200	178.48	258	.1	.3	

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CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft)          * 811.25 * Element           * Left OB * Channel *
Right OB *
* Vel Head (ft)         * 0.12  * wt. n-Val.       * 0.050  * 0.035  *
0.050 *
* W.S. Elev (ft)       * 811.13 * Reach Len. (ft)  * 200.00 * 178.48 *
258.00 *
* Crit W.S. (ft)      *      * Flow Area (sq ft) * 154.26 * 725.62 *
1505.53 *
* E.G. Slope (ft/ft)   *0.000312 * Area (sq ft)     * 154.26 * 725.62 *
1505.53 *
* Q Total (cfs)        * 5150.00 * Flow (cfs)       * 146.49 * 2598.76 *
2404.74 *
* Top Width (ft)       * 408.81 * Top width (ft)   * 62.89  * 62.96  *
282.95 *
* Vel Total (ft/s)     * 2.16  * Avg. vel. (ft/s) * 0.95   * 3.58   *
1.60 *
* Max Chl Dpth (ft)    * 13.83 * Hydr. Depth (ft) * 2.45   * 11.53  *
5.32 *
* Conv. Total (cfs)    *291710.3 * Conv. (cfs)      * 8297.8 *147201.3
*136211.3 *
* Length Wtd. (ft)    * 218.44 * Wetted Per. (ft) * 63.35  * 69.47  *
283.43 *
* Min Ch El (ft)      * 797.30 * Shear (lb/sq ft) * 0.05   * 0.20   *
0.10 *
* Alpha                * 1.65  * Stream Power (lb/ft s) * 524.88 * 0.00   *
0.00 *
* Frctn Loss (ft)     * 0.05  * Cum volume (acre-ft) * 8.18   * 15.25  *
32.46 *
* C & E Loss (ft)     * 0.02  * Cum SA (acres)    * 3.02   * 1.33   *
6.11 *
*****
*****

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 632.35

INPUT

Description: JJ

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Station Elevation Data num= 135
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
-233.17 814 -232.97 814 -232.29 814 -231.37 814 -229.74 814
-227.54 813.99 -224.26 813.99 -217.08 813.99 -215.69 813.99 -206.84 813.98
-205.84 813.98 -204.78 813.98 -194.69 813.99 -163.17 813.97 -158.17 813.97
-152.63 813.96 -146.75 813.97 -144.86 813.97 -139.53 813.97 -138.59 813.97
-138.16 813.97 -136.9 813.97 -134.88 813.97 -127.78 813.97 -125.89 813.97
-121.27 813.96 -116.23 813.98 -115.18 813.97 -115.16 813.97 -113.57 813.97
-103.05 813.98 -102.55 813.98 -96.44 814 -96.4 814 -96.31 814
-96.25 814 -92.59 813.97 -89.12 813.99 -89.1 813.99 -88.87 813.99
-88.46 813.99 -77.63 814 -76.17 814.02 -76.04 814.02 -75.04 814
-72.8 813.99 -71.53 814 -68.29 814.02 -67.62 814.01 -67.06 814
-63.13 813.78 -62.61 813.72 -62.43 813.69 -57.74 813.21 -57.27 813.17
-52.18 812.77 -48.03 812 -43.2 810.5 -41.72 810 -40.18 809.46
-37.42 808 -35.59 807.07 -33.62 806 -31.7 804.92 -29.9 804
-27.7 802.73 -26.29 802 -22.66 800.11 -22.45 800 -22.1 799.82
-21.65 799.6 -20.99 799.31 -19.21 798.49 -18.32 796.97 -6.82 796.97

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-2.66	796.97	0	796.97	.16	796.97	11.62	796.97	15.58	798
15.79	798.01	16.67	798.01	16.75	798.07	16.96	798.08	20.03	798.26
21.03	798.28	27.17	798.57	31.86	800.77	32.51	802.17	32.91	802.6
36.36	804.21	36.53	804.25	37.02	804.34	47.09	805.42	47.49	805.46
49.7	805.63	55.05	805.93	68.74	806.02	86.07	805.93	99.48	805.93
103.38	805.75	123.57	805.98	131.93	806.3	155.1	806.45	176.93	806.19
200.24	806.3	221.51	806.49	244.67	806.72	265.49	806.59	289.74	806.31
312.41	806.09	337.11	806.03	356.2	805.86	381.78	805.86	408.47	805.68
427.73	805.75	446.84	805.64	455	805.63	460.39	805.71	465.48	805.94
478.6	806.16	486.66	806.62	496.58	808.09	504.39	809.32	521.17	811.33
528.01	812.14	528.42	812.31	528.56	812.35	529.4	812.29	529.44	812.28
529.77	812.28	529.97	812.27	537.83	812.44	544.99	812.58	545.64	812.59

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-233.17	.05	-52.18	.035	37.02	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-52.18	37.02		239 198.36	80	.1	.3

CROSS SECTION OUTPUT Profile #100-Year

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*****
*****
* E.G. Elev (ft) * 811.18 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.07 * wt. n-val. * * 0.035 *
0.050 *
* W.S. Elev (ft) * 811.11 * Reach Len. (ft) * 239.00 * 198.36 *
80.00 *
* Crit W.S. (ft) * * Flow Area (sq ft) * * 888.20 *
2336.33 *
* E.G. Slope (ft/ft) *0.000189 * Area (sq ft) * * 888.20 *
2336.33 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * * 2418.72 *
2731.28 *
* Top Width (ft) * 564.55 * Top width (ft) * * 82.20 *
482.35 *
* Vel Total (ft/s) * 1.60 * Avg. vel. (ft/s) * * 2.72 *
1.17 *
* Max Chl Dpth (ft) * 14.14 * Hydr. Depth (ft) * * 10.81 *
4.84 *
* Conv. Total (cfs) *374563.3 * Conv. (cfs) * *175915.6
*198647.7 *
* Length wtd. (ft) * 136.17 * Wetted Per. (ft) * * 88.15 *
482.78 *
* Min Ch El (ft) * 796.97 * Shear (lb/sq ft) * * 0.12 *
0.06 *
* Alpha * 1.65 * Stream Power (lb/ft s) * 545.64 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.02 * Cum Volume (acre-ft) * 7.83 * 11.95 *
21.08 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 2.87 * 1.03 *
3.85 *
*****
*****

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 433.99

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INPUT

Description: KK

Station Elevation Data		num= 97		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-229.28	815.19	-223.93	814	-216.01	812.28	-214.67	812	-213.65	811.85		
-199.66	810	-199.48	810	-199.29	810	-197.88	809.99	-194.25	809.96		
-194.23	809.96	-190.38	809.95	-185.59	809.93	-178.39	809.93	-174.76	809.91		
-173.86	809.91	-173.11	809.91	-135.76	808.85	-130.79	808.72	-124.61	808.57		
-120.21	808.48	-106.09	808.19	-104.62	808.16	-97.07	808.01	-96.21	808		
-91.4	808	-90.61	808	-79.64	807.53	-70.25	807.22	-64	807.02		
-57.82	806.79	-47.76	806.4	-45.29	806.3	-42.52	806.21	-41.03	806.16		
-37.62	806.01	-36.96	806.01	-36.96	806	-33.53	804.27	-32.99	804		
-30.1	802.54	-28.88	802	-28.63	801.88	-24.46	800	-22.46	799.07		
-20.14	796.7	-12.23	796.7	-4.22	796.7	-1.01	796.7	0	796.7		
12.22	796.7	14.57	799.05	16.69	800	17.49	800.3	22.91	802		
23.15	802	25.9	802.22	28.38	802.57	34	802.72	35.29	802.76		
46.96	803	49.07	803.48	55.32	804.73	65.63	804.46	75.14	804.3		
82.19	804.93	83.76	805.01	94.64	805.48	107.93	805.05	115.02	805.14		
115.99	805.19	132.95	805.87	140.41	806.12	179.17	805.81	186.1	805.75		
218.99	805.95	229.65	806.12	243.46	805.89	273.03	805.79	295.71	805.5		
315.95	805.54	342.46	805.87	360.5	806.18	374.77	806.1	406.56	805.76		
412.8	805.7	423.66	805.74	441.5	805.56	452.35	805.52	466.16	806.57		
471.85	806.85	475.67	807.36	490.39	809.41	494.83	809.91	511.44	811.92		
511.84	812.08	511.9	812.12								

Manning's n Values		num= 3		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
-229.28	.05	-36.96	.035	28.38	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-36.96	28.38		150.99	144.27	75.99	.1
							.3

CROSS SECTION OUTPUT Profile #100-Year

* E.G. Elev (ft)	* 811.15	* Element	* Left OB	* Channel	*
Right OB	*	*	*	*	*
* Vel Head (ft)	* 0.05	* wt. n-Val.	* 0.050	* 0.035	*
0.050	*	*	*	*	*
* W.S. Elev (ft)	* 811.10	* Reach Len. (ft)	* 150.99	* 144.27	*
75.99	*	*	*	*	*
* Crit w.s. (ft)	*	* Flow Area (sq ft)	* 444.32	* 788.87	*
2529.67	*	*	*	*	*
* E.G. Slope (ft/ft)	*0.000148	* Area (sq ft)	* 444.32	* 788.87	*
2529.67	*	*	*	*	*
* Q Total (cfs)	* 5150.00	* Flow (cfs)	* 303.77	* 2061.26	*
2784.97	*	*	*	*	*
* Top width (ft)	* 712.65	* Top Width (ft)	* 171.02	* 65.34	*
476.29	*	*	*	*	*
* Vel Total (ft/s)	* 1.37	* Avg. Vel. (ft/s)	* 0.68	* 2.61	*
1.10	*	*	*	*	*
* Max Chl Dpth (ft)	* 14.40	* Hydr. Depth (ft)	* 2.60	* 12.07	*
5.31	*	*	*	*	*
* Conv. Total (cfs)	*422843.5	* Conv. (cfs)	* 24941.4	*169240.6	*
*228661.6	*	*	*	*	*
* Length wtd. (ft)	* 108.76	* Wetted Per. (ft)	* 171.16	* 69.45	*
476.88	*	*	*	*	*
* Min Ch El (ft)	* 796.70	* Shear (lb/sq ft)	* 0.02	* 0.11	*
0.05	*	*	*	*	*
* Alpha	* 1.82	* Stream Power (lb/ft s)	* 511.90	* 0.00	*
0.00	*	*	*	*	*

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\* Frctn Loss (ft) \* 0.02 \* Cum Volume (acre-ft) \* 6.61 \* 8.13 \*  
 16.61 \*  
 \* C & E Loss (ft) \* 0.00 \* Cum SA (acres) \* 2.41 \* 0.69 \*  
 2.97 \*

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CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 289.71

INPUT

Description: LL

Station Elevation Data

num= 117

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-348.33	816.57	-348.24	816.54	-347.81	816.44	-345.95	816	-342.84	815.36
-339.64	814.72	-336.02	814	-328.13	813.43	-322.18	813.05	-305.65	812
-302.14	811.76	-298.26	811.43	-280.91	810	-279.28	809.93	-246.45	808.55
-235.55	808	-235.47	808	-231.89	808	-230.12	808	-225.75	808
-220.81	808	-220.77	808	-216.44	808	-211.33	808	-195.52	808
-194.47	808	-194.45	808	-184.64	808	-182.43	808	-178.88	808.05
-178.72	808.05	-178.43	808.06	-178.1	808.06	-172.71	808.2	-168.02	808.31
-160.86	808.55	-144.31	808.1	-141.52	808.02	-137.87	808.02	-133.47	808.03
-127.35	808.03	-116.67	808.04	-91.7	808.03	-68.94	808.02	-63.03	808.02
-59.01	808.02	-55.88	808.02	-55.76	808.02	-55.73	808.02	-53.31	808.01
-52.54	808.01	-49.34	808.01	-47.14	808.01	-46.11	808.01	-43.69	808.01
-42.03	808.01	-41.16	808	-36.46	808	-36.18	807.96	-34.84	807.82
-34.01	807.45	-33.88	807.41	-30.5	806	-28.59	805.2	-25.72	804
-24.06	803.13	-22.27	802	-20.72	801.07	-18.75	800	-17.18	799.08
-15.4	796.46	-1.4	796.46	0	796.46	1.93	796.46	6.13	796.46
16.91	796.46	18.38	798	18.87	798	19.47	798	19.95	798.46
21.23	799.6	21.7	799.87	24.37	800.38	35.61	802.38	50.22	802.63
53.88	802.69	63.02	802.91	78.8	802.53	78.99	802.53	82.81	802.65
94.02	803.02	100.69	804.05	109.95	805.3	112.56	805.37	144.08	805.37
153.1	805.31	186.57	805.2	205.42	805.47	226.33	805.61	253.41	805.45
264.38	805.23	289.6	805.11	294.8	805.28	315.35	805.29	333.93	805.43
339.25	805.41	361.21	806.06	367.63	805.99	382.77	805.65	385.82	805.7
412.49	806.66	414.12	806.72	415.41	806.89	435.44	809.42	453.47	811.42
458.91	812.07	459.37	812.2						

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-348.33	.05	-34.84	.035	35.61	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -34.84 35.61 142 180.45 179 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

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\* E.G. Elev (ft) \* 811.14 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.05 \* wt. n-val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 811.09 \* Reach Len. (ft) \* 142.00 \* 180.45 \*  
 179.00 \*  
 \* Crit w.s. (ft) \* \* Flow Area (sq ft) \* 707.26 \* 825.10 \*  
 2378.05 \*  
 \* E.G. Slope (ft/ft) \*0.000137 \* Area (sq ft) \* 707.26 \* 825.10 \*



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2378.05 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 480.47 * 2020.46 *
2649.07 *
* Top width (ft) * 744.61 * Top width (ft) * 259.28 * 70.45 *
414.88 *
* Vel Total (ft/s) * 1.32 * Avg. vel. (ft/s) * 0.68 * 2.45 *
1.11 *
* Max Chl Dpth (ft) * 14.63 * Hydr. Depth (ft) * 2.73 * 11.71 *
5.73 *
* Conv. Total (cfs) *439699.1 * Conv. (cfs) * 41021.7 *172504.1
*226173.4 *
* Length wtd. (ft) * 174.95 * Wetted Per. (ft) * 259.40 * 75.50 *
415.36 *
* Min Ch El (ft) * 796.46 * Shear (lb/sq ft) * 0.02 * 0.09 *
0.05 *
* Alpha * 1.75 * Stream Power (lb/ft s) * 459.37 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.03 * Cum volume (acre-ft) * 4.62 * 5.46 *
12.33 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 1.66 * 0.47 *
2.19 *

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CROSS SECTION

RIVER: Buckeye Creek  
REACH: Buckeye Creek RS: 109.26

INPUT

Description: MM

Station Elevation Data num= 85

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-420.57	814.39	-419.2	814	-407.77	813.42	-407.7	813.42	-379.04	812
-378.22	811.99	-334.8	811.11	-302.12	810.46	-279.5	810	-278.77	810
-199.19	808.01	-198.67	808	-196.73	808	-196.71	808	-160.16	807.18
-150.67	806.97	-143.98	806.83	-123.71	806.44	-101.58	806	-100.78	806
-92.21	805.99	-80.49	805.97	-77.36	805.97	-69.5	805.98	-53.95	806
-46.87	806	-41.13	806	-38.95	806	-35.79	806	-33.95	804.99
-32.14	804	-29.75	802.69	-28.49	802	-26.52	800.92	-25.03	800
-24.55	799.7	-20.63	798	-13.87	796.17	-7.1	796.17	-6.45	796.17
-5.34	796.17	-3.06	796.17	0	796.17	9.83	796.17	10.32	798
11.65	798	12.28	798	15.39	799.59	16.21	800	18.42	801.13
20.26	802	23.7	803.6	24.16	803.84	24.46	804	25.31	804.27
25.55	804.34	26.05	804.45	33.05	806	33.29	806	34.24	806
36.49	805.83	40.87	805.6	49.87	805.76	78.79	805.59	114.93	804.96
121.77	804.87	141.12	804.61	165.89	804.29	192.3	804.3	201.03	804.39
211.75	804.67	229.66	805	247.1	805.46	263.63	805.77	272.64	805.95
279.01	806.31	286.81	806.72	289.32	807.18	307.42	809.78	309.29	809.95
325.74	811.48	328.02	811.69	328.25	811.72	328.26	811.72	328.83	811.89

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-420.57	.05	-35.79	.035	33.05	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
-35.79 33.05 105.99 109.26 120 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

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*****
* E.G. Elev (ft) * 811.10 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.07 * wt. n-val. * 0.050 * 0.035 *
0.050 *
* W.S. Elev (ft) * 811.03 * Reach Len. (ft) * 105.99 * 109.26 *
120.00 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 914.88 * 791.16 *
1564.78 *
* E.G. Slope (ft/ft) *0.000200 * Area (sq ft) * 914.88 * 791.16 *
1564.78 *
* Q Total (cfs) * 5150.00 * Flow (cfs) * 817.04 * 2302.15 *
2030.81 *
* Top Width (ft) * 651.91 * Top width (ft) * 295.18 * 68.84 *
287.89 *
* Vel Total (ft/s) * 1.57 * Avg. vel. (ft/s) * 0.89 * 2.91 *
1.30 *
* Max Chl Dpth (ft) * 14.86 * Hydr. Depth (ft) * 3.10 * 11.49 *
5.44 *
* Conv. Total (cfs) *364262.0 * Conv. (cfs) * 57789.4 *162832.3
*143640.3 *
* Length wtd. (ft) * 113.08 * wetted Per. (ft) * 295.24 * 74.12 *
288.24 *
* Min Ch El (ft) * 796.17 * Shear (lb/sq ft) * 0.04 * 0.13 *
0.07 *
* Alpha * 1.85 * Stream Power (lb/ft s) * 328.83 * 0.00 *
0.00 *
* Frctn Loss (ft) * 0.02 * Cum volume (acre-ft) * 1.97 * 2.11 *
4.23 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 0.76 * 0.18 *
0.74 *
*****
*****

```

CROSS SECTION

RIVER: Buckeye Creek  
 REACH: Buckeye Creek RS: 0

INPUT

Description: NN

Station Elevation Data		num= 115	
Sta	Elev	Sta	Elev
-417.03	813.82	-412.45	812.94
-395.28	811.74	-380.91	811.39
-355.34	810.77	-345.4	810.64
-312.35	810.19	-297.14	810.01
-285.2	809.91	-274.56	809.84
-262.55	809.73	-253.03	809.67
-232.98	809.51	-230.33	809.49
-208.38	809.22	-174.4	808.34
-158.48	808.19	-156.58	808.18
-141.47	808.1	-141.45	808.1
-134.24	808.08	-131.11	808.06
-118.39	808.01	-117.91	808.01
-106.61	807.86	-105.72	807.84
-99.96	807.71	-94.79	807.56
-32.64	804.46	-31.48	804
-24.71	800.57	-23.51	800
-.12	796	-.06	796
22.64	798.89	25.23	800

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30.21	802.61	33.02	804	35.92	804.98	37.94	804.98	38.95	804.98
39.77	804.98	55.66	804.9	86.81	804.9	121.46	804.49	134.69	804.4
178.19	803.99	181.7	803.96	182	803.96	184.59	803.99	228.44	804.47
248.69	805.15	255.51	805.29	257.89	805.39	258.14	805.47	259.94	805.87
277.19	809.69	294.63	811.77	300.3	812.2	300.82	812.43	300.99	812.54

Manning's n Values num= 3  
 Sta n Val sta n val Sta n Val  
 \*\*\*\*\*  
 -417.03 .05 -38.69 .035 35.92 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 -38.69 35.92 0 0 0 .1 .3

CROSS SECTION OUTPUT Profile #100-Year

\*\*\*\*\*  
 \* E.G. Elev (ft) \* 811.08 \* Element \* Left OB \* Channel \*  
 Right OB \*  
 \* Vel Head (ft) \* 0.08 \* wt. n-val. \* 0.050 \* 0.035 \*  
 0.050 \*  
 \* W.S. Elev (ft) \* 811.00 \* Reach Len. (ft) \* \* \*  
 \*  
 \* Crit W.S. (ft) \* 803.91 \* Flow Area (sq ft) \* 705.56 \* 889.77 \*  
 1504.49 \*  
 \* E.G. Slope (ft/ft) \*0.000191 \* Area (sq ft) \* 705.56 \* 889.77 \*  
 1504.49 \*  
 \* Q Total (cfs) \* 5150.00 \* Flow (cfs) \* 484.14 \* 2637.88 \*  
 2027.98 \*  
 \* Top width (ft) \* 653.27 \* Top width (ft) \* 326.41 \* 74.61 \*  
 252.25 \*  
 \* Vel Total (ft/s) \* 1.66 \* Avg. vel. (ft/s) \* 0.69 \* 2.96 \*  
 1.35 \*  
 \* Max Chl Dpth (ft) \* 15.00 \* Hydr. Depth (ft) \* 2.16 \* 11.93 \*  
 5.96 \*  
 \* Conv. Total (cfs) \*372848.1 \* Conv. (cfs) \* 35050.7 \*190976.4  
 \*146821.0 \*  
 \* Length wtd. (ft) \* \* Wetted Per. (ft) \* 326.46 \* 78.27 \*  
 252.83 \*  
 \* Min Ch El (ft) \* 796.00 \* Shear (lb/sq ft) \* 0.03 \* 0.14 \*  
 0.07 \*  
 \* Alpha \* 1.91 \* Stream Power (lb/ft s) \* 300.99 \* 0.00 \*  
 0.00 \*  
 \* Frctn Loss (ft) \* \* Cum volume (acre-ft) \* \* \*  
 \*  
 \* C & E Loss (ft) \* \* Cum SA (acres) \* \* \*  
 \*  
 \*\*\*\*\*  
 \*\*\*\*\*

\*\*\*\*\*

SUMMARY OF MANNING'S N VALUES

River: Buckeye Creek

\*\*\*\*\*

Reach	River Sta.	n1	n2	n3
*Buckeye Creek	* 3504.54	* .05*	* .035*	* .05*
*Buckeye Creek	* 3454.54	* .05*	* .035*	* .05*
*Buckeye Creek	* 3404.54	* .05*	* .035*	* .05*
*Buckeye Creek	* 3354.54	* .05*	* .035*	* .05*
*Buckeye Creek	* 3304.54	* .05*	* .035*	* .05*

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*Buckeye Creek	*	3254.54	*	.05*	.035*	.05*
*Buckeye Creek	*	3204.54	*	.05*	.035*	.05*
*Buckeye Creek	*	3154.54	*	.05*	.035*	.05*
*Buckeye Creek	*	3104.54	*	.05*	.035*	.05*
*Buckeye Creek	*	3054.54	*	.05*	.035*	.05*
*Buckeye Creek	*	3004.54	*	.05*	.035*	.05*
*Buckeye Creek	*	2954.54	*	.05*	.035*	.05*
*Buckeye Creek	*	2904.54	*	.05*	.035*	.05*
*Buckeye Creek	*	2854.58	*	.05*	.035*	.05*
*Buckeye Creek	*	2804.54	*	.05*	.035*	.05*
*Buckeye Creek	*	2754.54	*	.05*	.035*	.05*
*Buckeye Creek	*	2704.54	*	.05*	.035*	.05*
*Buckeye Creek	*	2661.29	*	.05*	.035*	.05*
*Buckeye Creek	*	2603.43	*	.05*	.035*	.05*
*Buckeye Creek	*	2554.54	*	.05*	.035*	.05*
*Buckeye Creek	*	2494.62	*	.05*	.035*	.05*
*Buckeye Creek	*	2460.04	*Bridge	*	*	*
*Buckeye Creek	*	2417.85	*	.05*	.035*	.05*
*Buckeye Creek	*	2354.53	*	.05*	.035*	.05*
*Buckeye Creek	*	2306.38	*	.05*	.035*	.05*
*Buckeye Creek	*	2254.54	*	.05*	.035*	.05*
*Buckeye Creek	*	2204.54	*	.05*	.035*	.05*
*Buckeye Creek	*	2154.54	*	.05*	.035*	.05*
*Buckeye Creek	*	2105.74	*	.05*	.035*	.05*
*Buckeye Creek	*	1903.41	*	.05*	.035*	.05*
*Buckeye Creek	*	1604.54	*	.05*	.035*	.05*
*Buckeye Creek	*	1419.72	*	.05*	.035*	.05*
*Buckeye Creek	*	1234.05	*	.05*	.035*	.05*
*Buckeye Creek	*	1102.70	*	.05*	.035*	.05*
*Buckeye Creek	*	972.12	*	.05*	.035*	.05*
*Buckeye Creek	*	810.82	*	.05*	.035*	.05*
*Buckeye Creek	*	632.35	*	.05*	.035*	.05*
*Buckeye Creek	*	433.99	*	.05*	.035*	.05*
*Buckeye Creek	*	289.71	*	.05*	.035*	.05*
*Buckeye Creek	*	109.26	*	.05*	.035*	.05*
*Buckeye Creek	*	0	*	.05*	.035*	.05*

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SUMMARY OF REACH LENGTHS

River: Buckeye Creek

* Reach	* River Sta.	* Left	* Channel	* Right
*Buckeye Creek	3504.54	50*	50*	50*
*Buckeye Creek	3454.54	52*	50*	50*
*Buckeye Creek	3404.54	55*	50*	50*
*Buckeye Creek	3354.54	35*	50*	50*
*Buckeye Creek	3304.54	55*	50*	47*
*Buckeye Creek	3254.54	43*	50*	52*
*Buckeye Creek	3204.54	44*	50*	51*
*Buckeye Creek	3154.54	48*	50*	52*
*Buckeye Creek	3104.54	22*	50*	48*
*Buckeye Creek	3054.54	23*	50*	53*
*Buckeye Creek	3004.54	36*	50*	48*
*Buckeye Creek	2954.54	36*	50*	48*
*Buckeye Creek	2904.54	42*	49.96*	51*
*Buckeye Creek	2854.58	40*	50.04*	52*
*Buckeye Creek	2804.54	50*	50*	60*
*Buckeye Creek	2754.54	51*	50*	58*
*Buckeye Creek	2704.54	51*	43.25*	43*

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*Buckeye Creek	*	2661.29	*	134*	57.86*	63*
*Buckeye Creek	*	2603.43	*	66*	48.89*	51*
*Buckeye Creek	*	2554.54	*	83*	59.92*	60*
*Buckeye Creek	*	2494.62	*	170*	76.77*	86*
*Buckeye Creek	*	2460.04	*	*Bridge	*	*
*Buckeye Creek	*	2417.85	*	91*	63.32*	62*
*Buckeye Creek	*	2354.53	*	144*	48.15*	69*
*Buckeye Creek	*	2306.38	*	90*	51.84*	42*
*Buckeye Creek	*	2254.54	*	90*	50*	45*
*Buckeye Creek	*	2204.54	*	74*	50*	44*
*Buckeye Creek	*	2154.54	*	63*	48.8*	47*
*Buckeye Creek	*	2105.74	*	190*	202.35*	215*
*Buckeye Creek	*	1903.41	*	512*	298.87*	86*
*Buckeye Creek	*	1604.54	*	149*	184.82*	41*
*Buckeye Creek	*	1419.72	*	173*	185.67*	44*
*Buckeye Creek	*	1234.05	*	117*	131.34*	192.99*
*Buckeye Creek	*	1102.70	*	138.99*	130.59*	147.99*
*Buckeye Creek	*	972.12	*	168*	161.32*	108*
*Buckeye Creek	*	810.82	*	200*	178.48*	258*
*Buckeye Creek	*	632.35	*	239*	198.36*	80*
*Buckeye Creek	*	433.99	*	150.99*	144.27*	75.99*
*Buckeye Creek	*	289.71	*	142*	180.45*	179*
*Buckeye Creek	*	109.26	*	105.99*	109.26*	120*
*Buckeye Creek	*	0	*	0*	0*	0*

\*\*\*\*\*

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS  
River: Buckeye Creek

* Reach	* River Sta.	* Contr.	* Expan.
*Buckeye Creek	3504.54	.1*	.3*
*Buckeye Creek	3454.54	.1*	.3*
*Buckeye Creek	3404.54	.1*	.3*
*Buckeye Creek	3354.54	.1*	.3*
*Buckeye Creek	3304.54	.1*	.3*
*Buckeye Creek	3254.54	.1*	.3*
*Buckeye Creek	3204.54	.1*	.3*
*Buckeye Creek	3154.54	.1*	.3*
*Buckeye Creek	3104.54	.1*	.3*
*Buckeye Creek	3054.54	.1*	.3*
*Buckeye Creek	3004.54	.1*	.3*
*Buckeye Creek	2954.54	.1*	.3*
*Buckeye Creek	2904.54	.1*	.3*
*Buckeye Creek	2854.58	.1*	.3*
*Buckeye Creek	2804.54	.1*	.3*
*Buckeye Creek	2754.54	.1*	.3*
*Buckeye Creek	2704.54	.1*	.3*
*Buckeye Creek	2661.29	.1*	.3*
*Buckeye Creek	2603.43	.1*	.3*
*Buckeye Creek	2554.54	.1*	.3*
*Buckeye Creek	2494.62	.1*	.3*
*Buckeye Creek	2460.04	*Bridge	*
*Buckeye Creek	2417.85	.1*	.3*
*Buckeye Creek	2354.53	.1*	.3*
*Buckeye Creek	2306.38	.1*	.3*
*Buckeye Creek	2254.54	.1*	.3*
*Buckeye Creek	2204.54	.1*	.3*
*Buckeye Creek	2154.54	.1*	.3*
*Buckeye Creek	2105.74	.1*	.3*

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*Buckeye Creek	*	1903.41	*	.1*	.3*
*Buckeye Creek	*	1604.54	*	.1*	.3*
*Buckeye Creek	*	1419.72	*	.1*	.3*
*Buckeye Creek	*	1234.05	*	.1*	.3*
*Buckeye Creek	*	1102.70	*	.1*	.3*
*Buckeye Creek	*	972.12	*	.1*	.3*
*Buckeye Creek	*	810.82	*	.1*	.3*
*Buckeye Creek	*	632.35	*	.1*	.3*
*Buckeye Creek	*	433.99	*	.1*	.3*
*Buckeye Creek	*	289.71	*	.1*	.3*
*Buckeye Creek	*	109.26	*	.1*	.3*
*Buckeye Creek	*	0	*	.1*	.3*

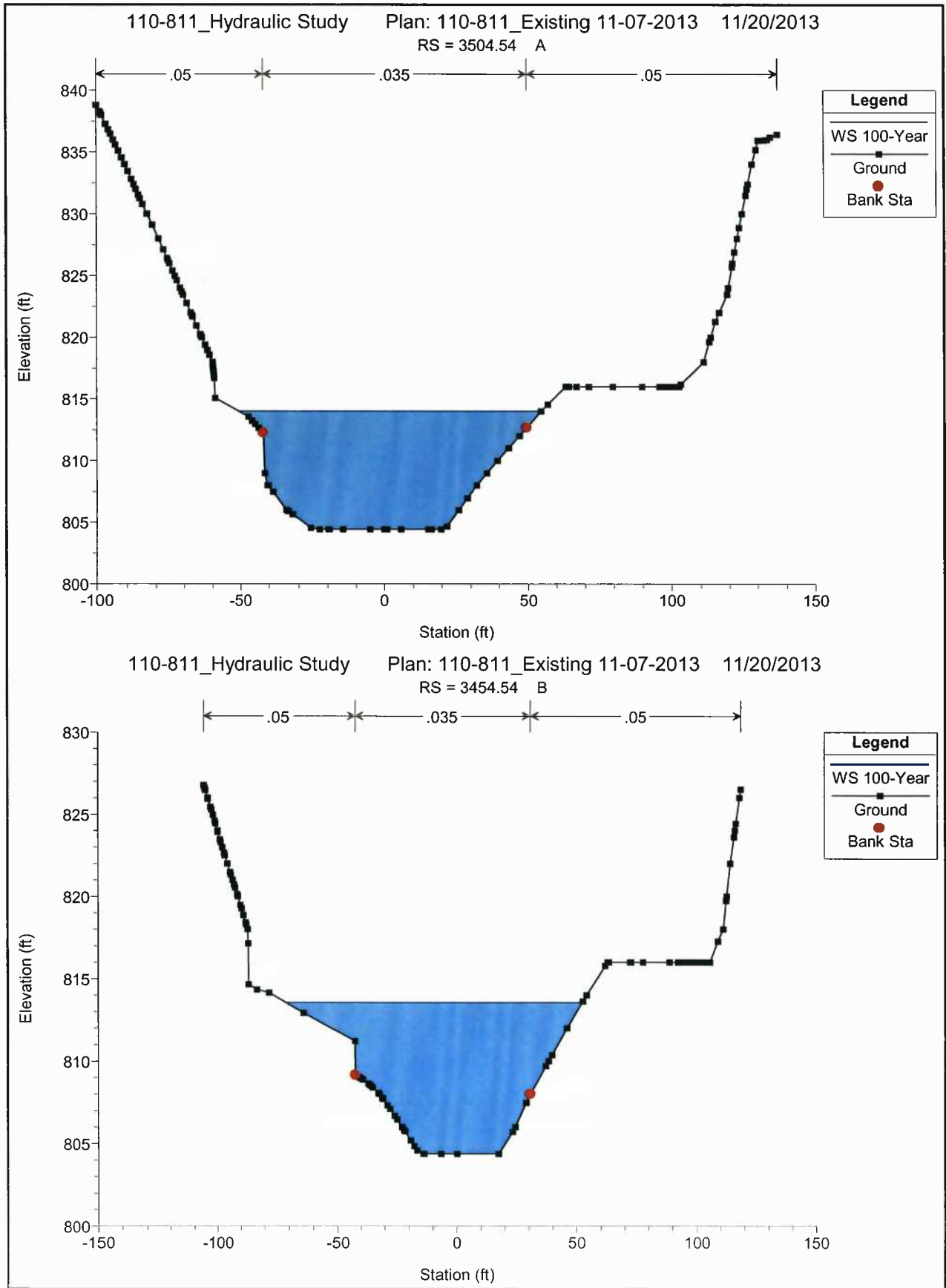
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**APPENDIX D**

**EXISTING AND PROPOSED FLOODWAY MAPS  
AND CROSS SECTION OUTPUT**

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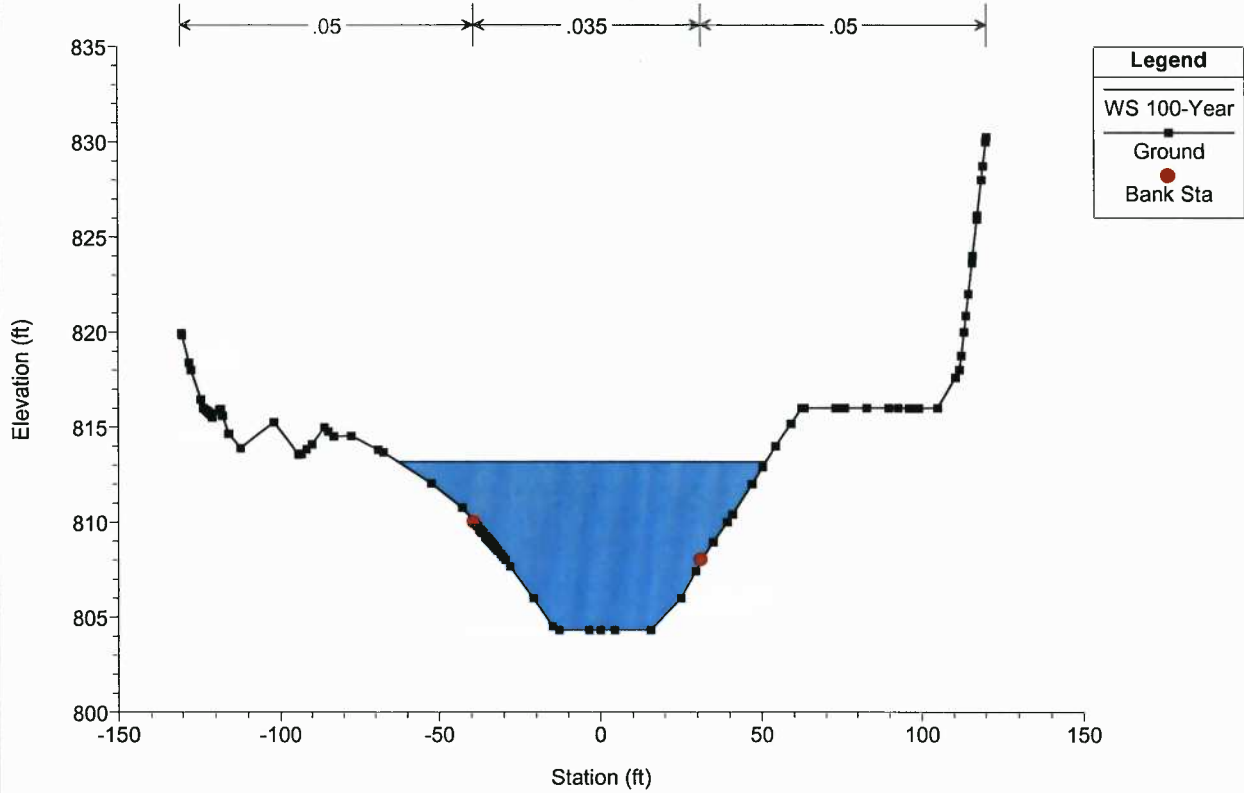


PREPARED BY: TGS  
CHECKED BY: ALG

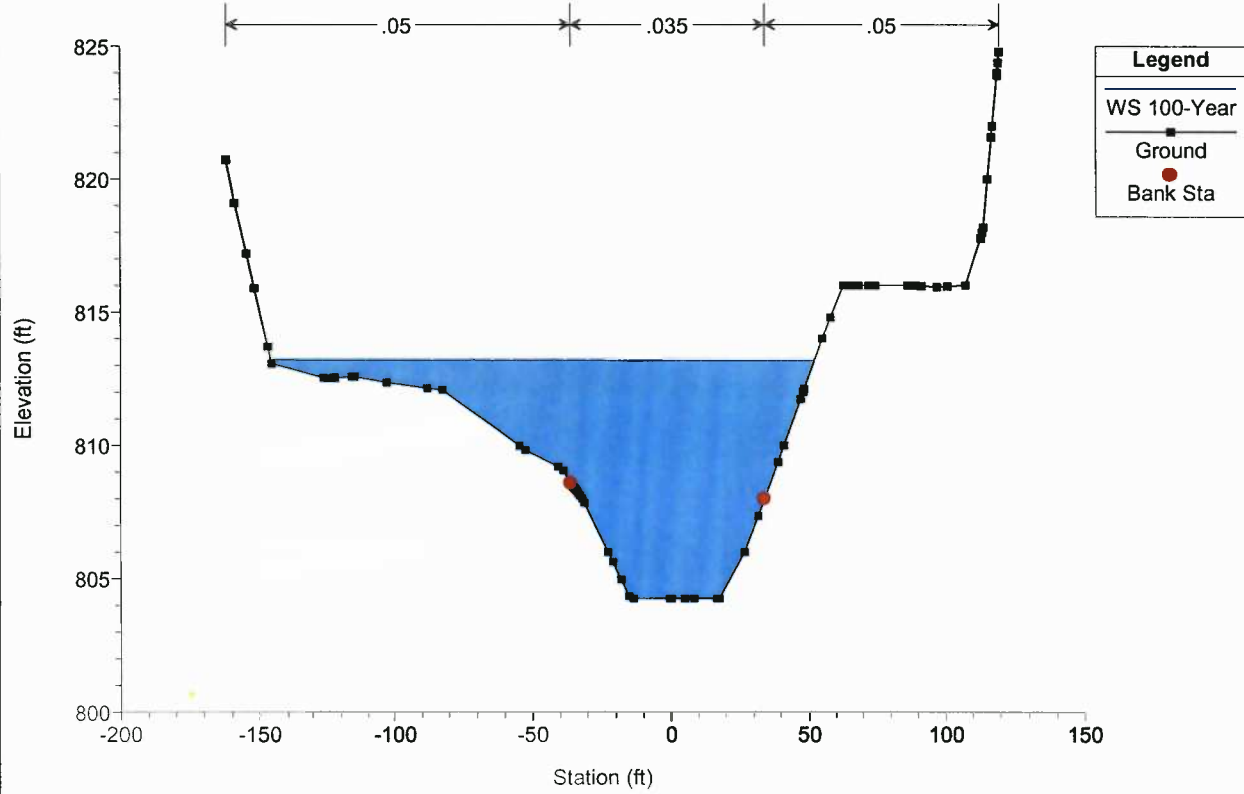
DATE: 11/20/13  
DATE: 02-06-2013



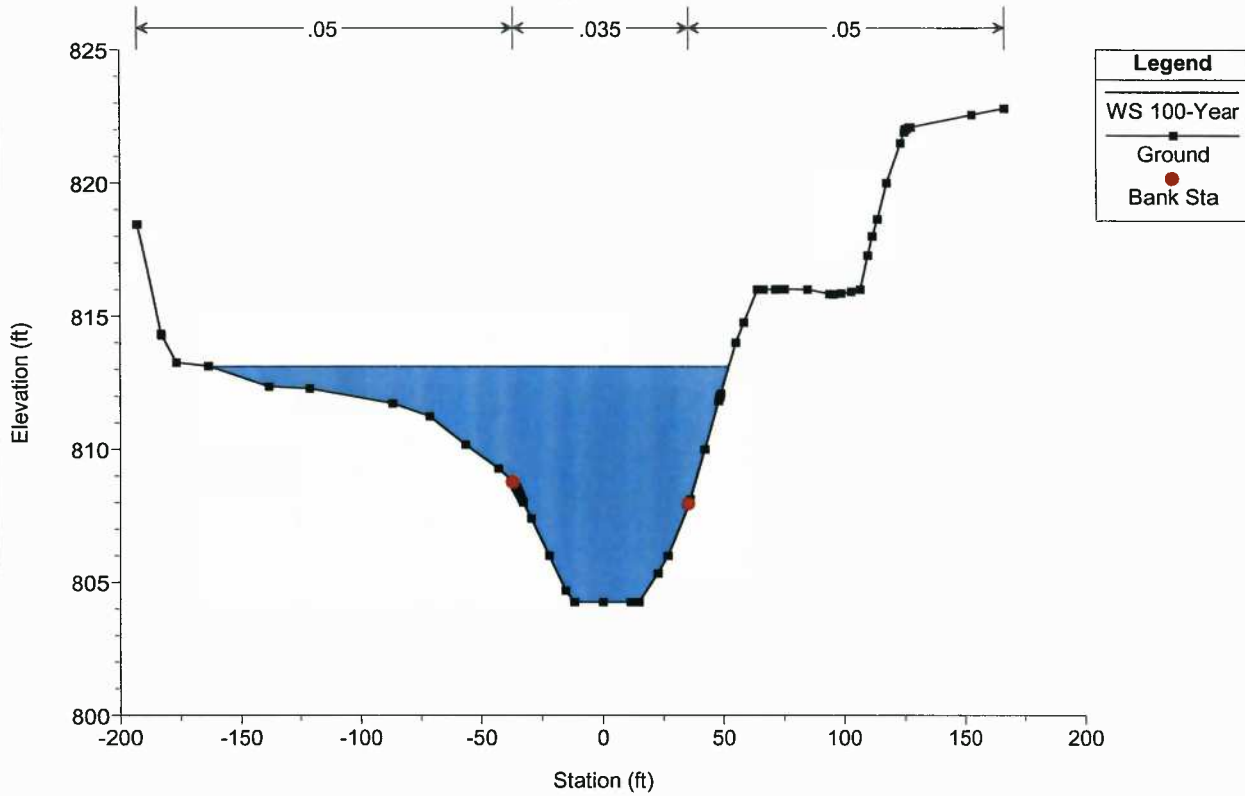
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 RS = 3404.54 C



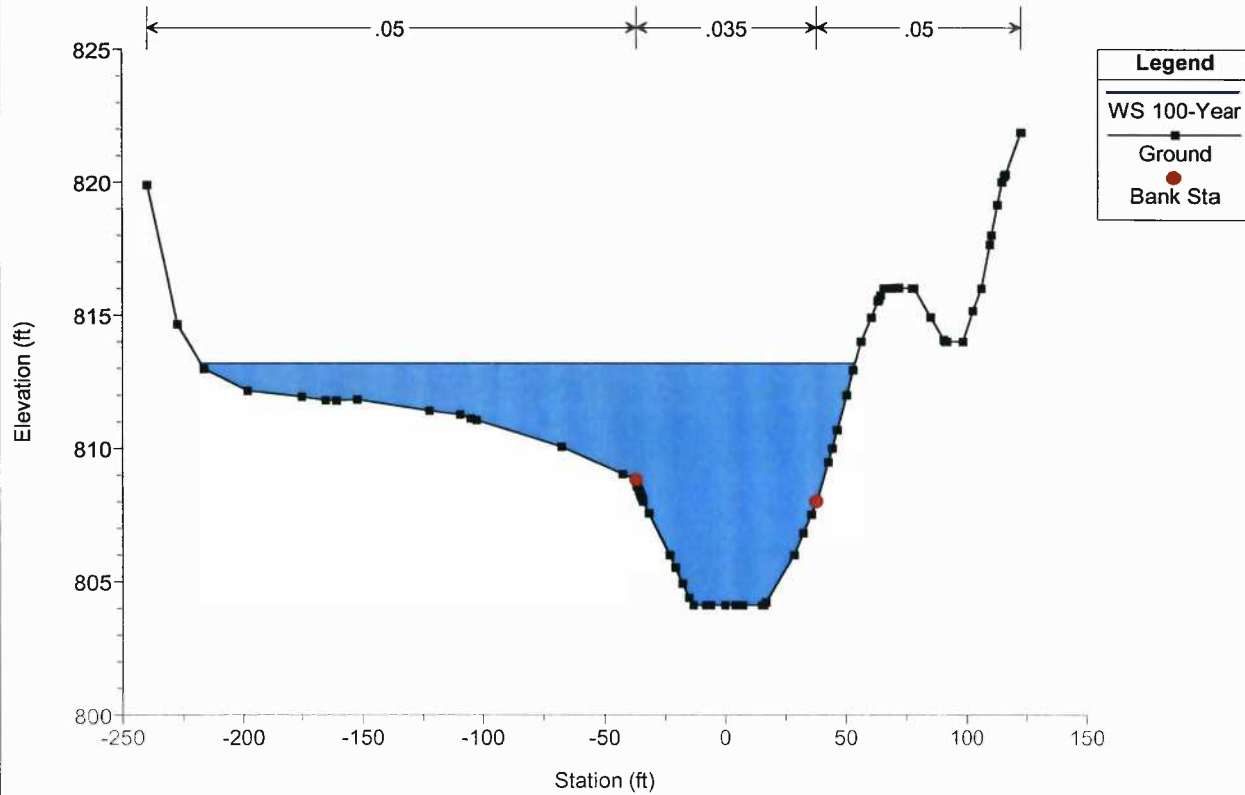
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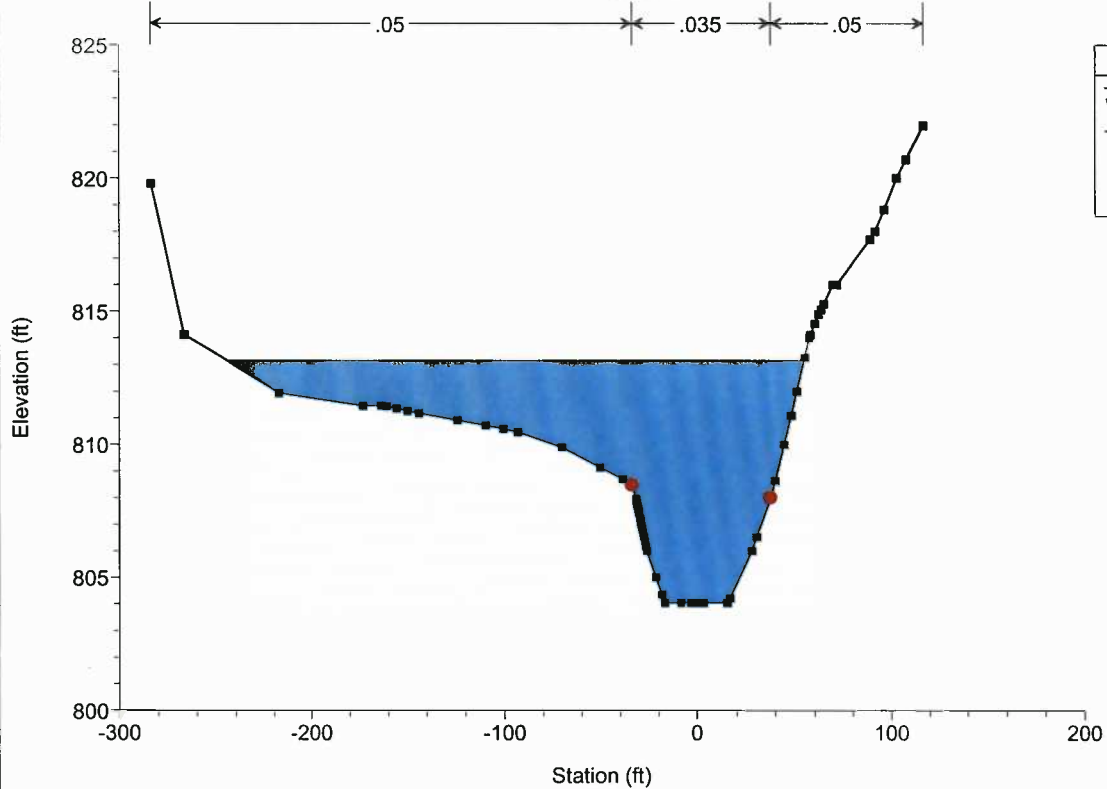
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110-811\_Hydraulic Study Plan: 110-811\_Existing 11-07-2013 11/20/2013  
RS = 3254.54 F

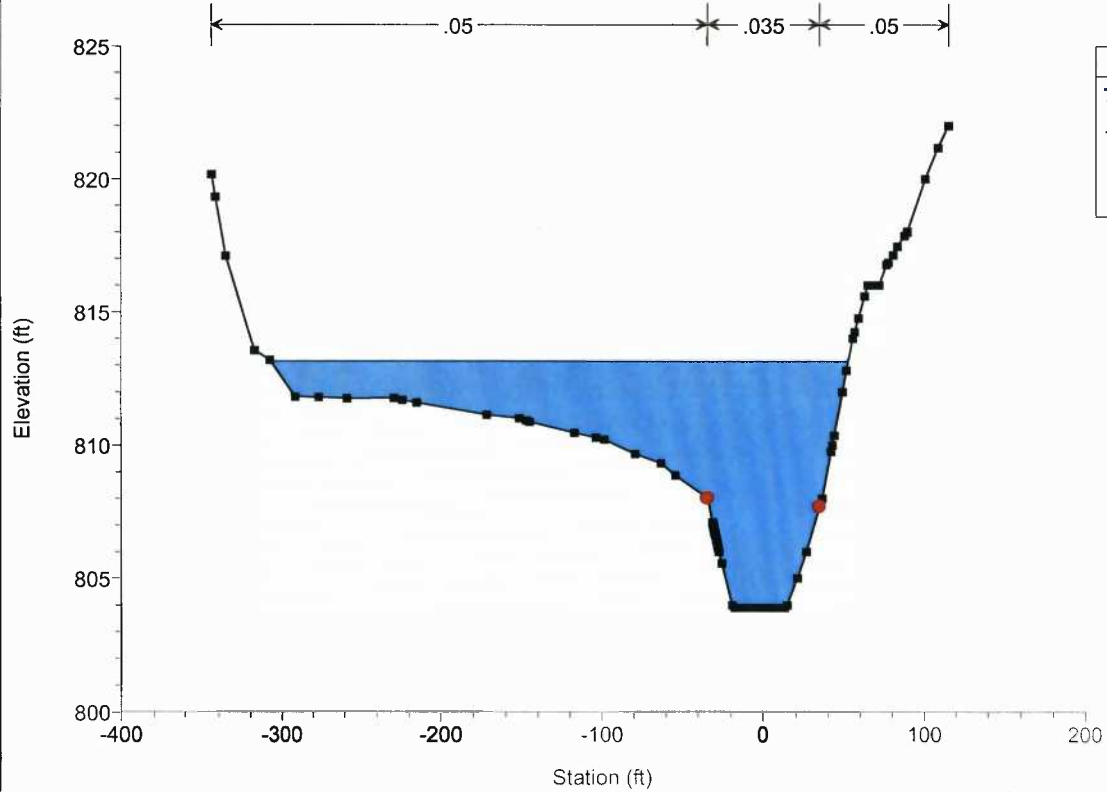


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RS = 3204.54 G



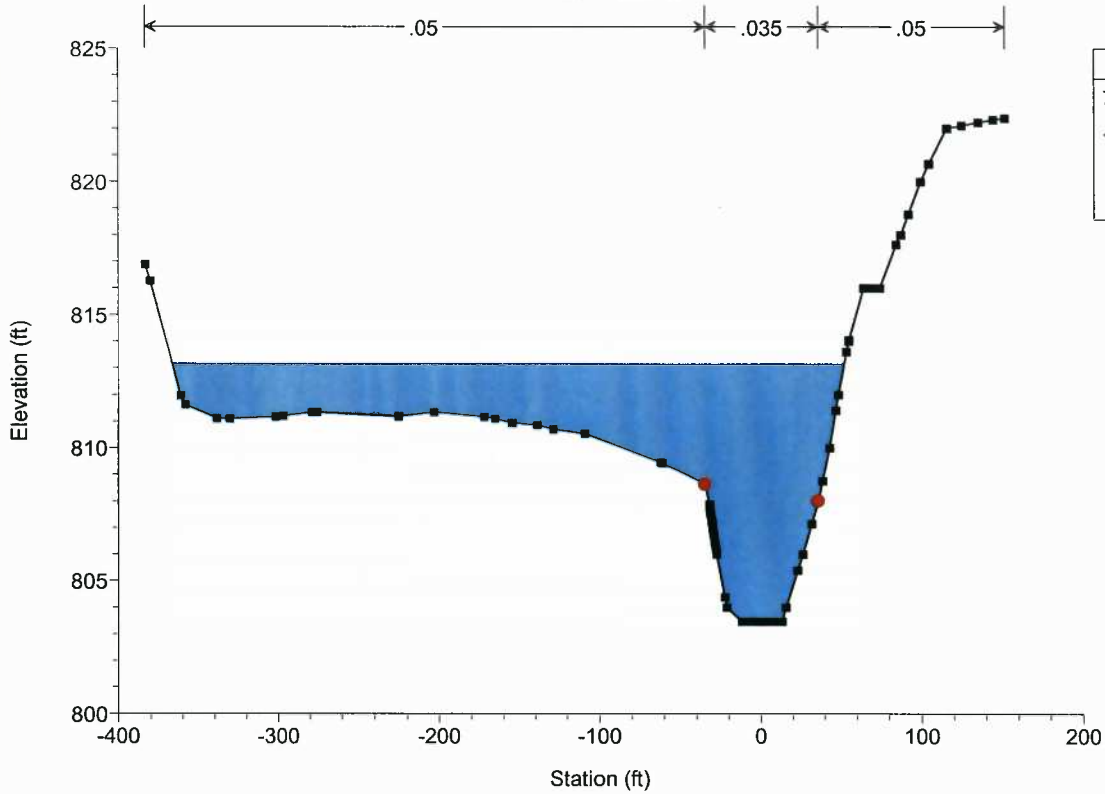
Legend	
—■—	WS 100-Year
- - -■-	Ground
●	Bank Sta

110-811\_Hydraulic Study Plan: 110-811\_Existing 11-07-2013 11/20/2013  
RS = 3154.54 H

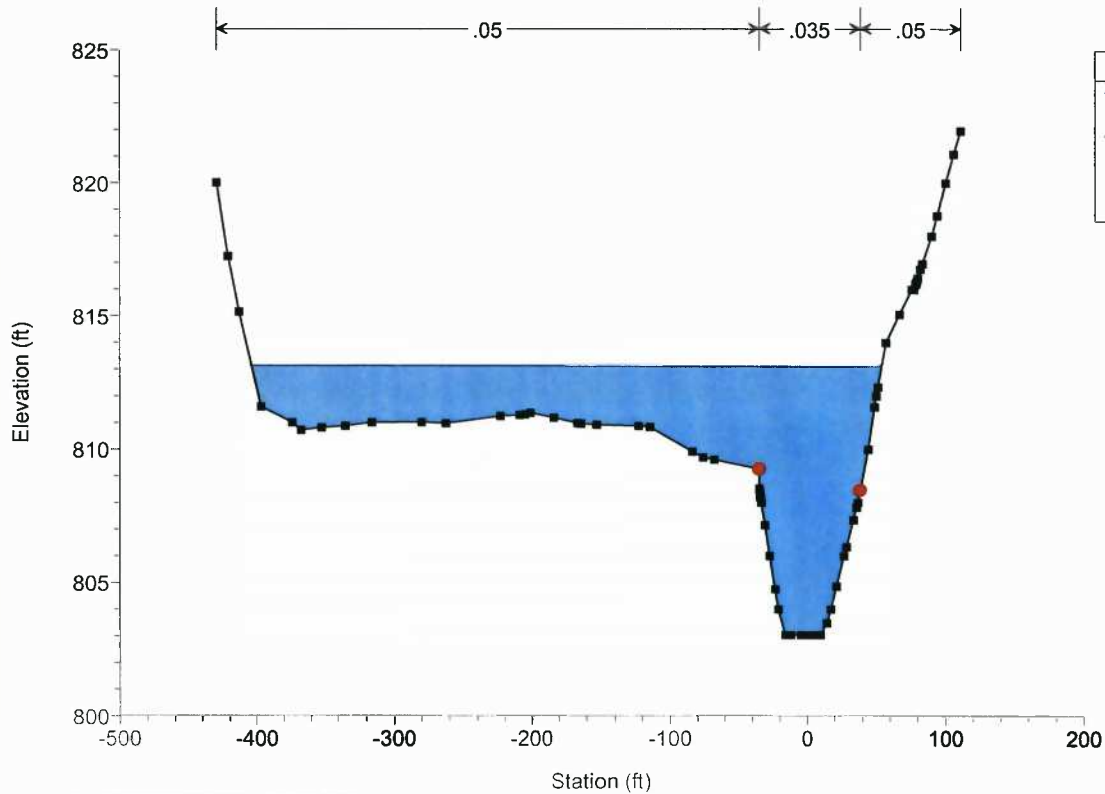


Legend	
—■—	WS 100-Year
- - -■-	Ground
●	Bank Sta

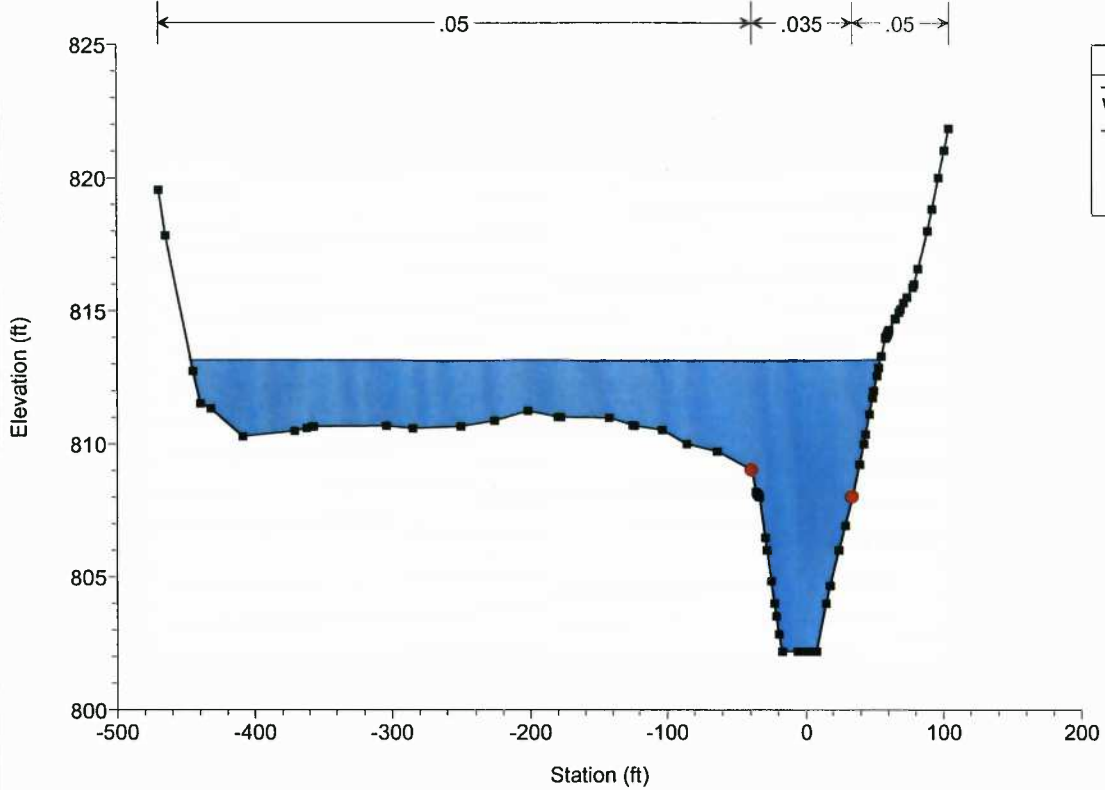
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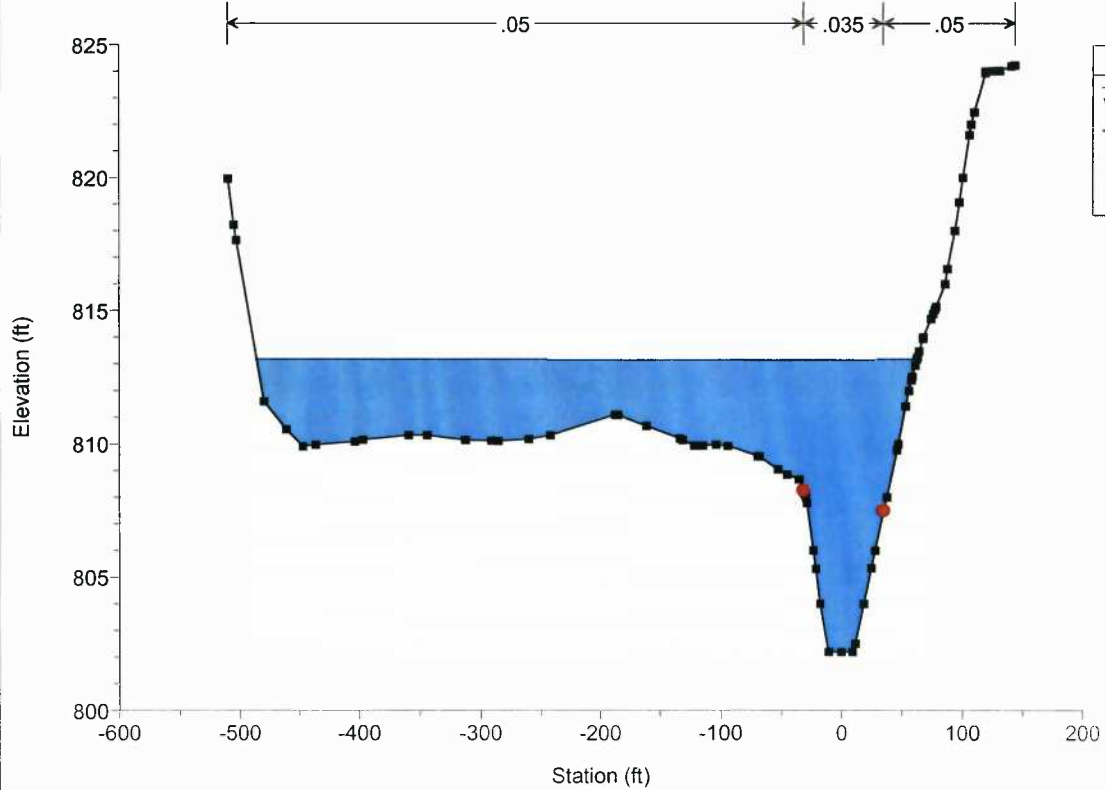
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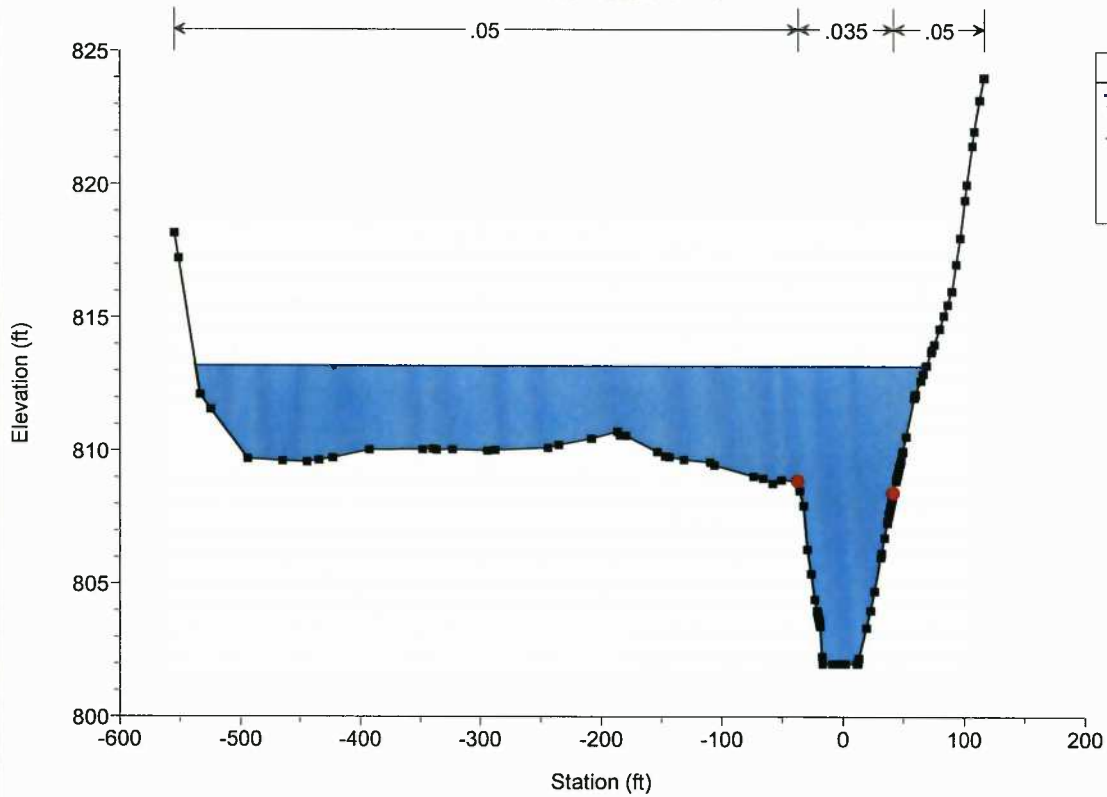
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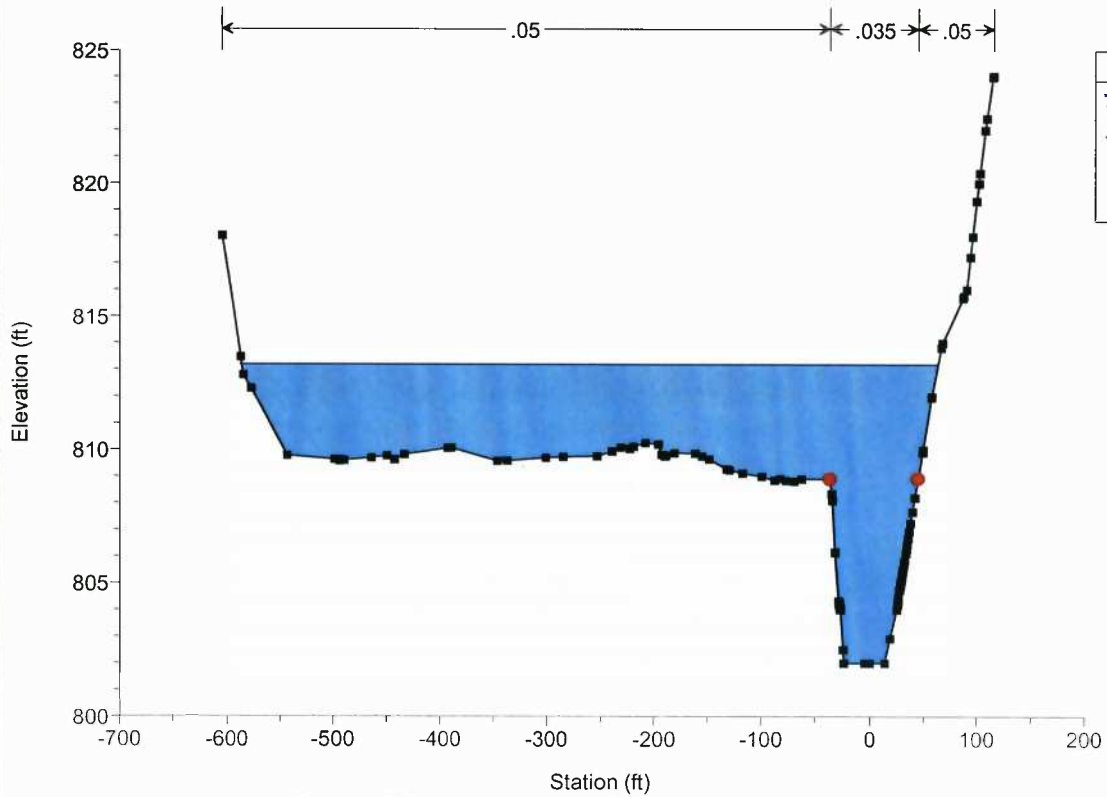
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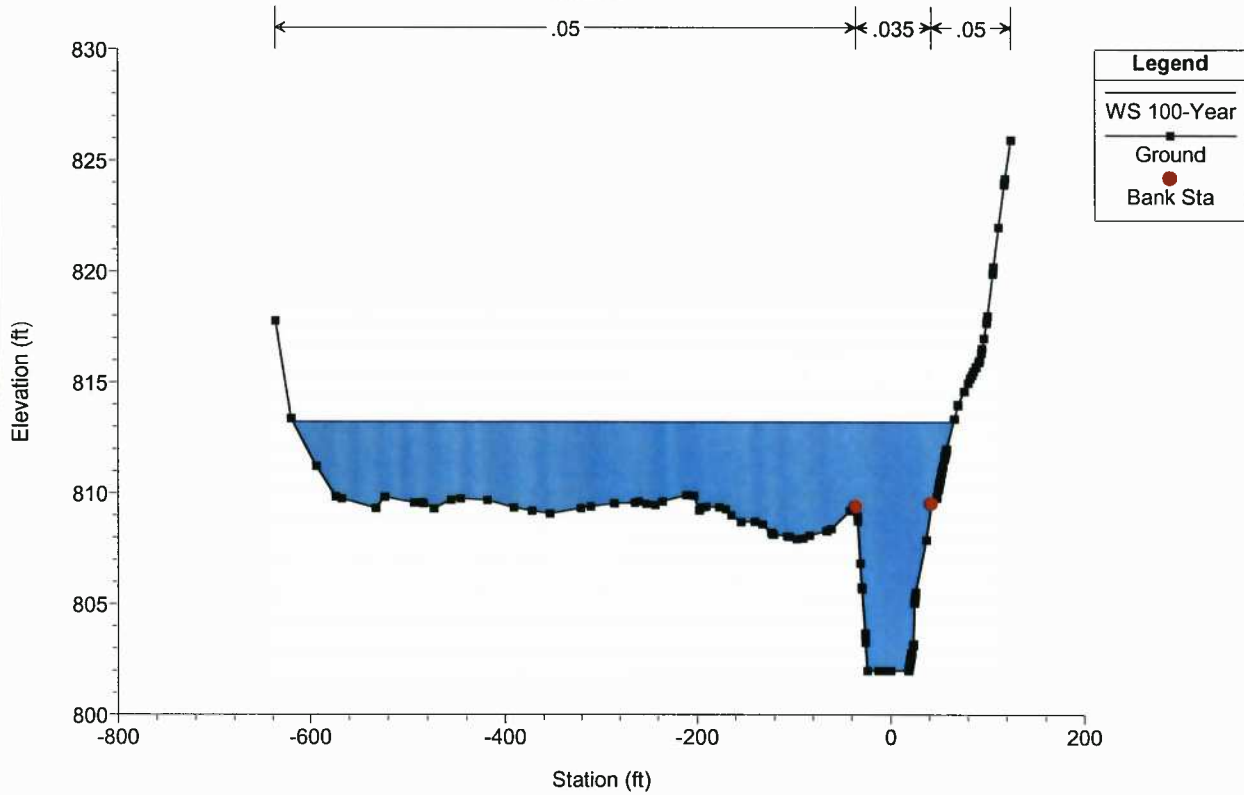
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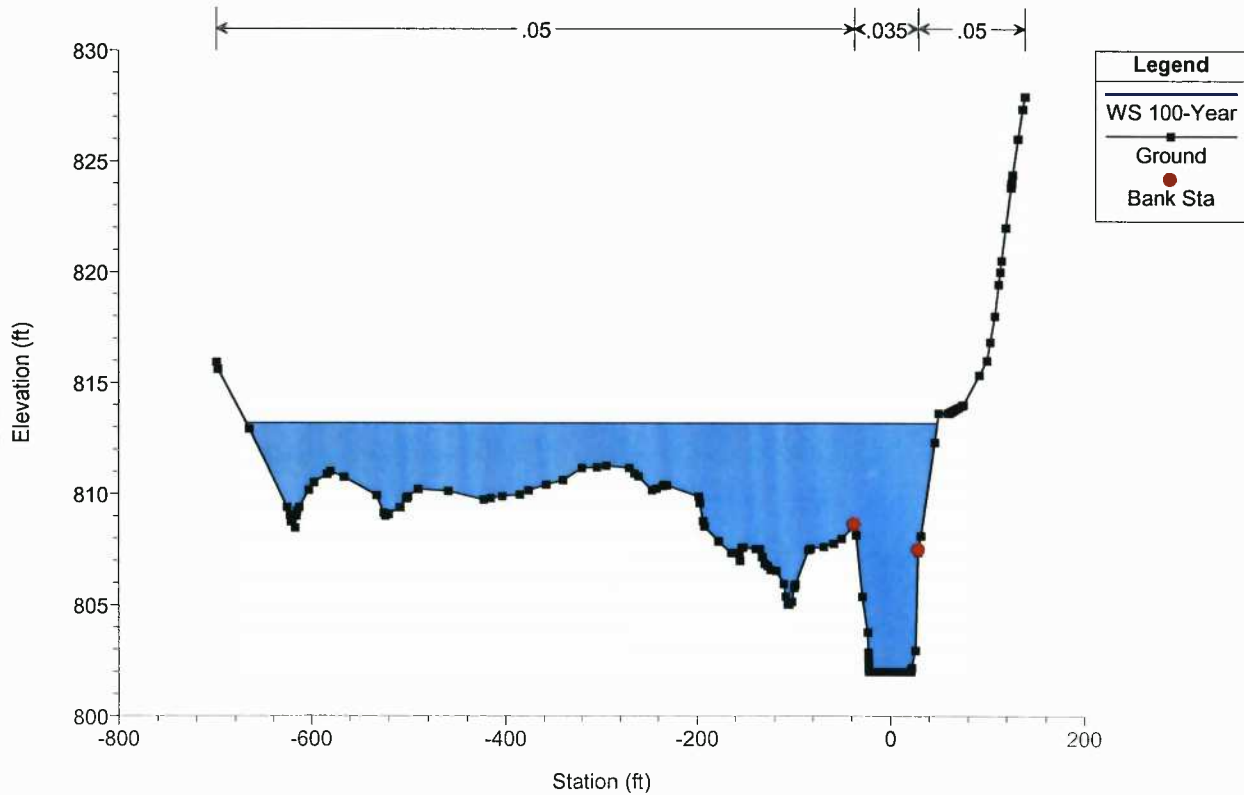
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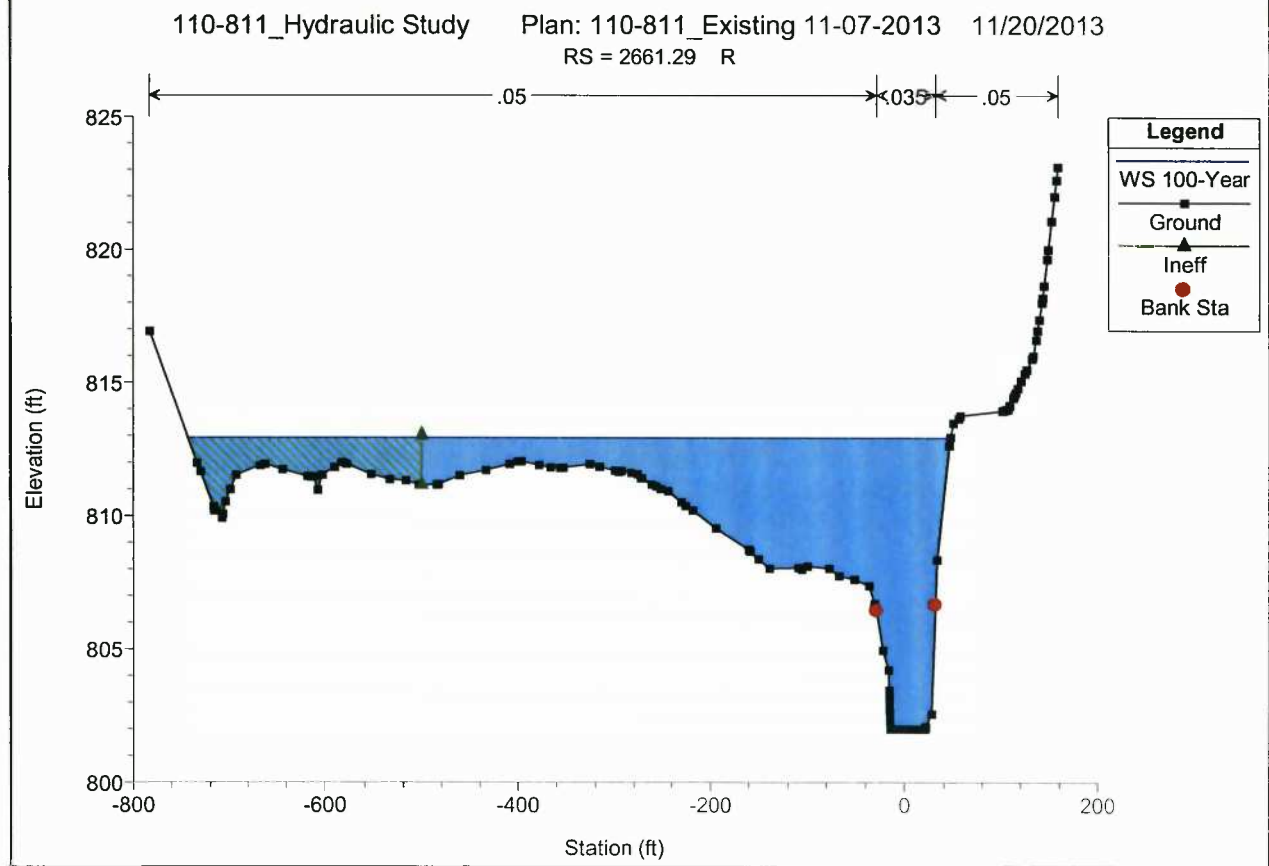
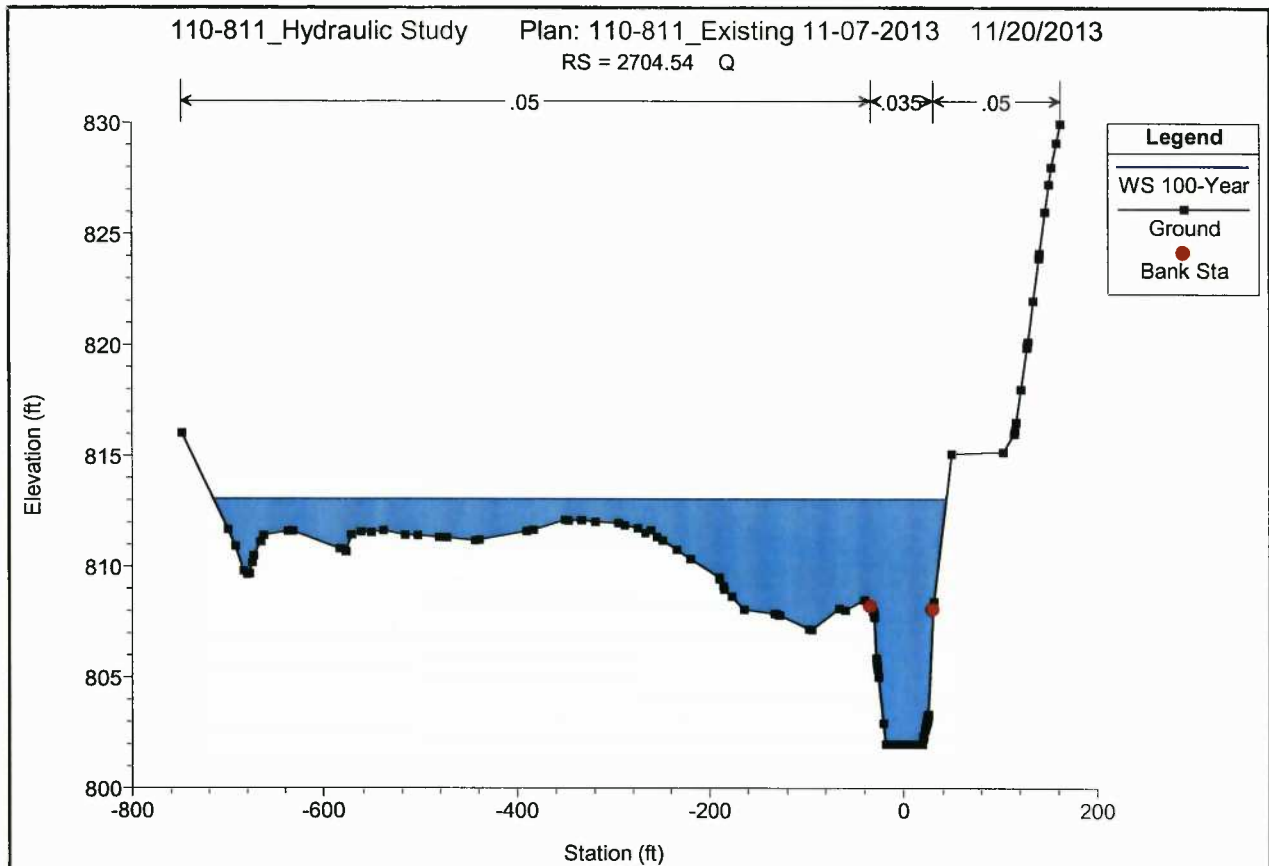


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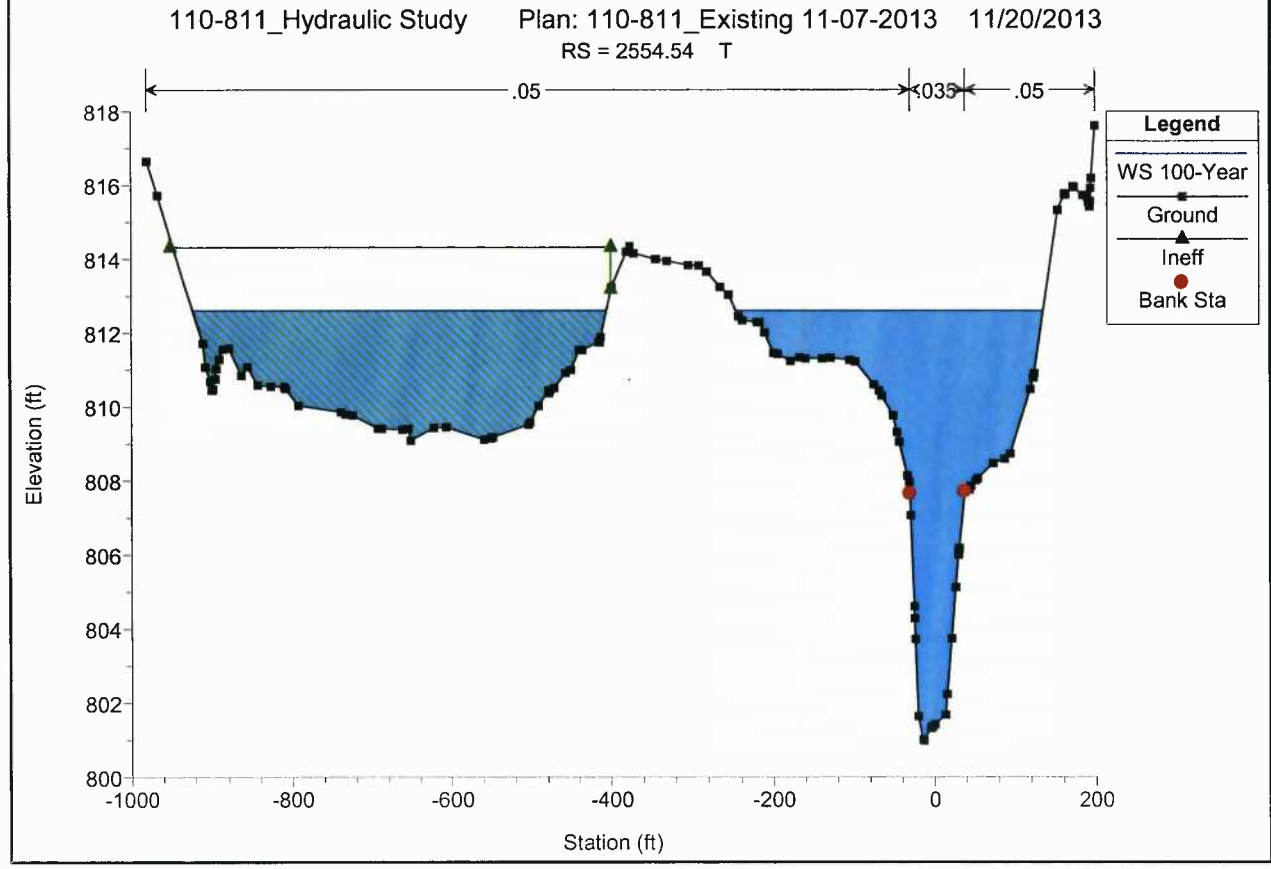
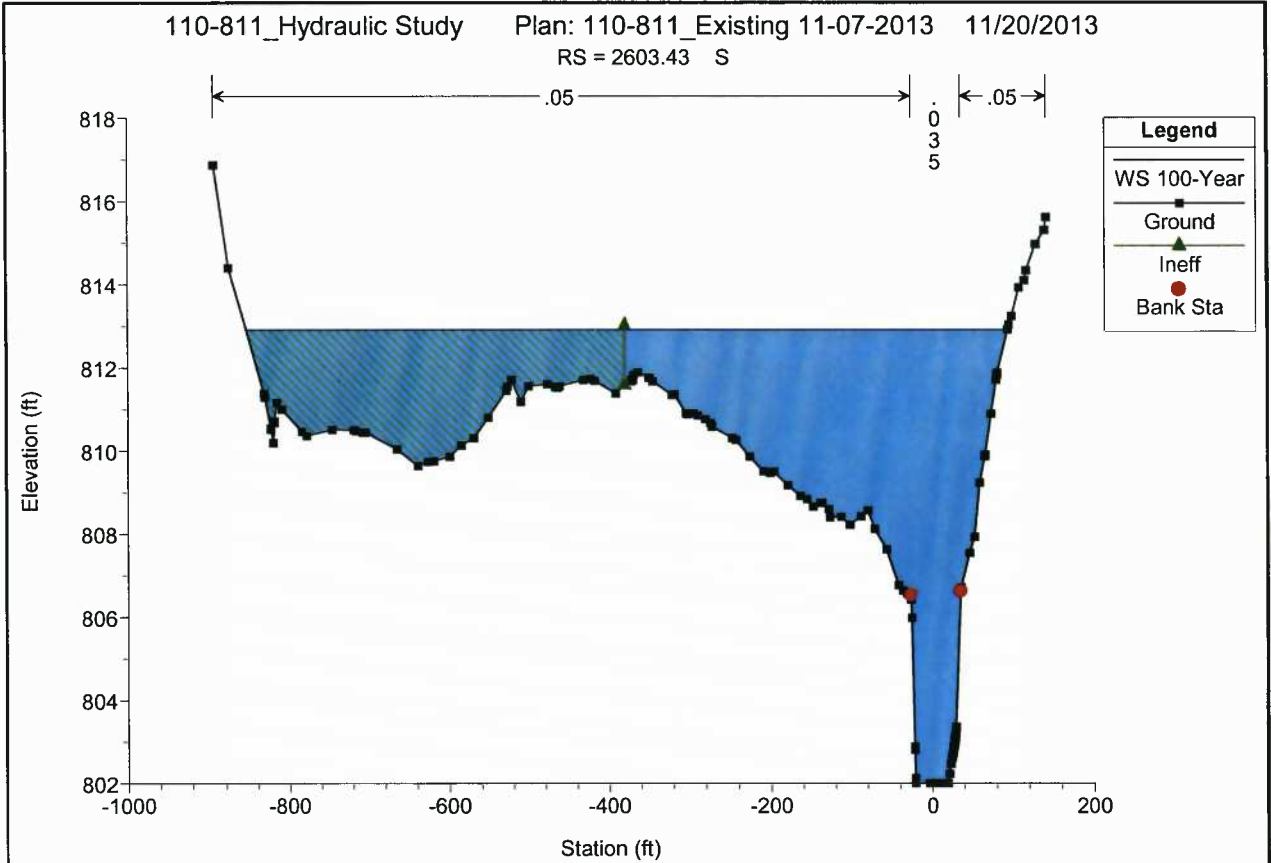


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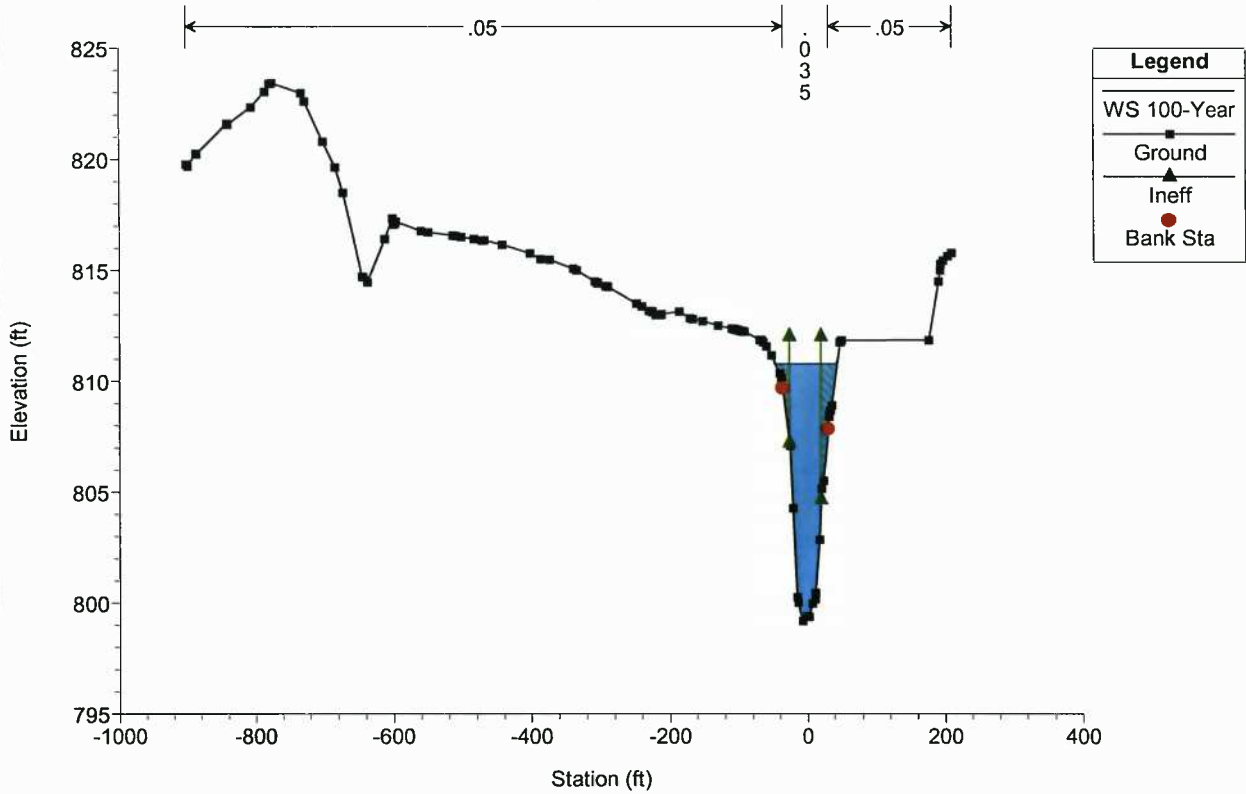




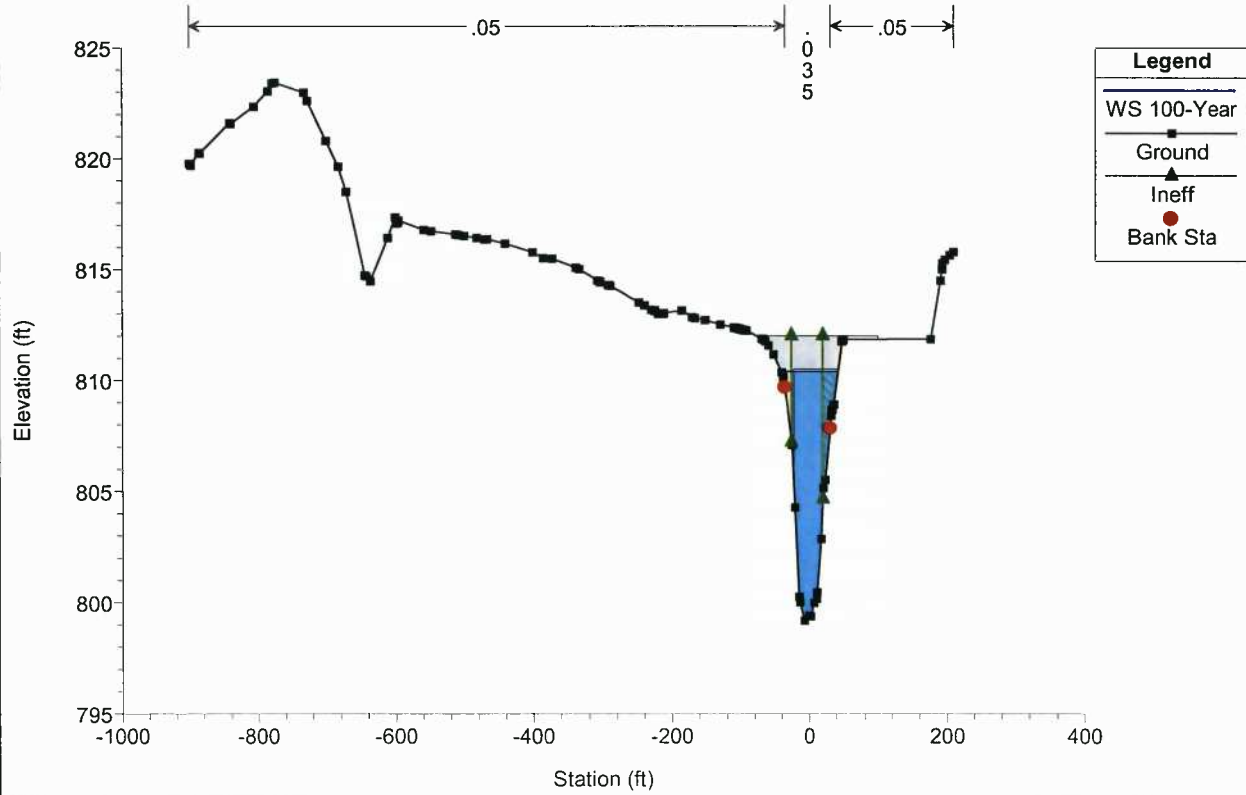




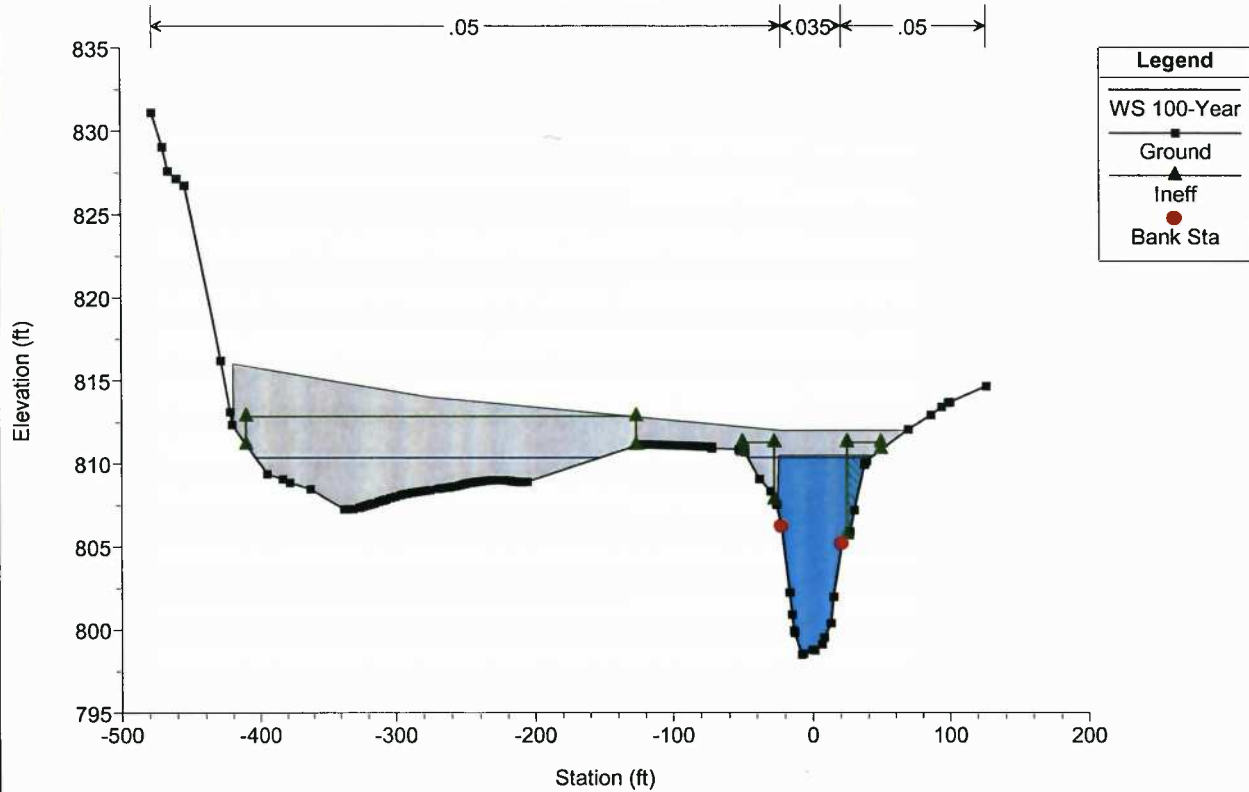
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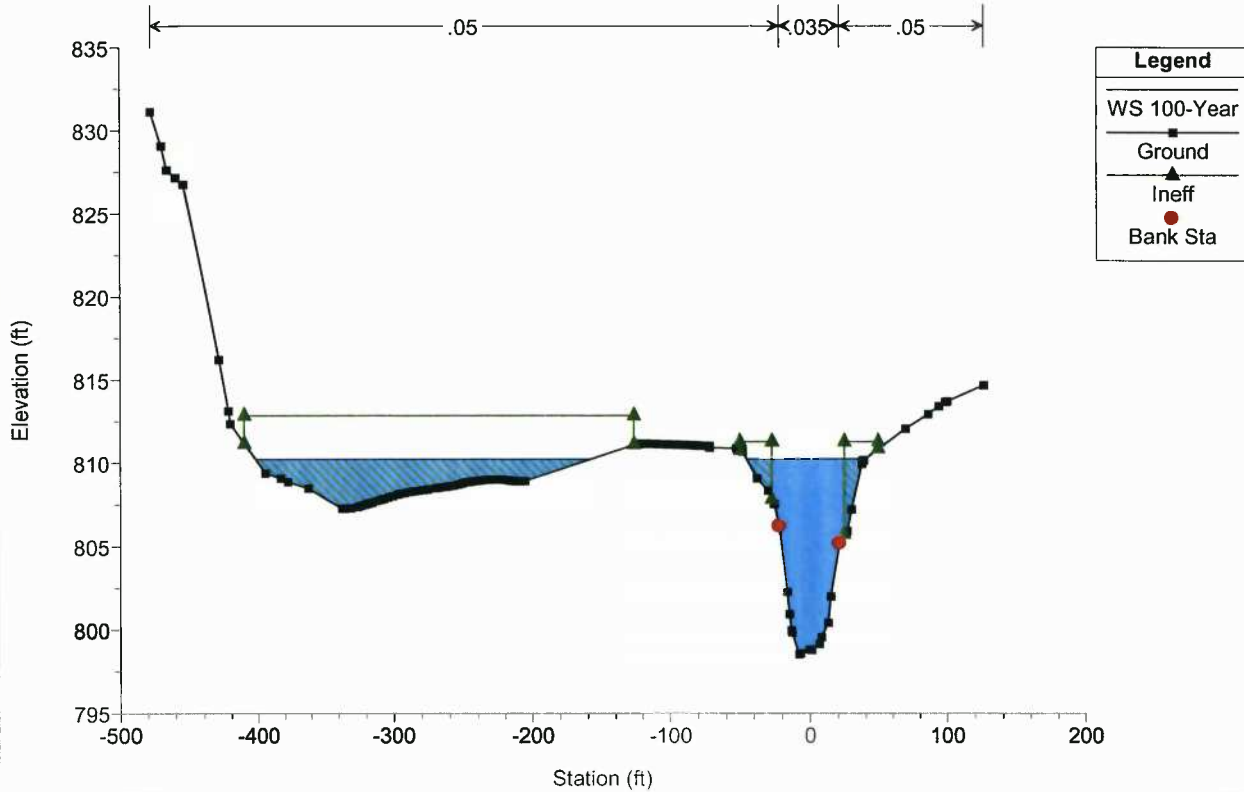
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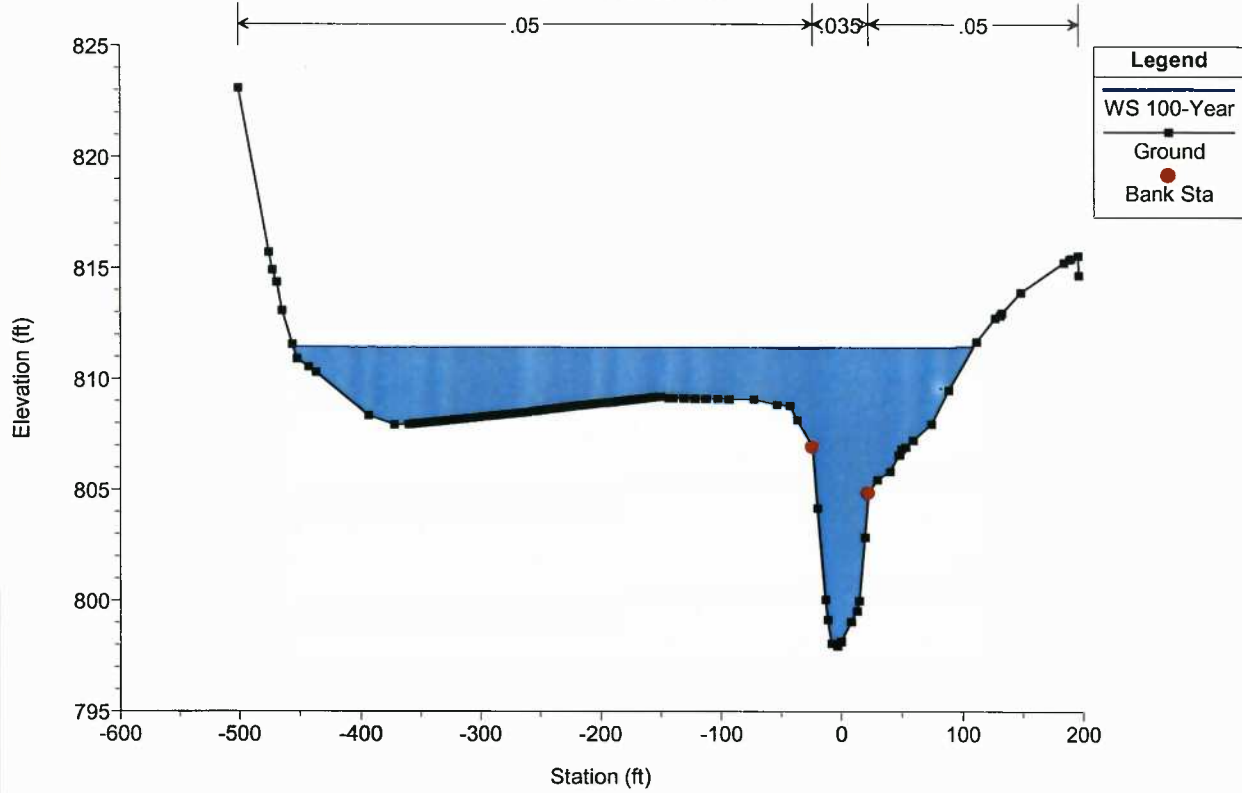
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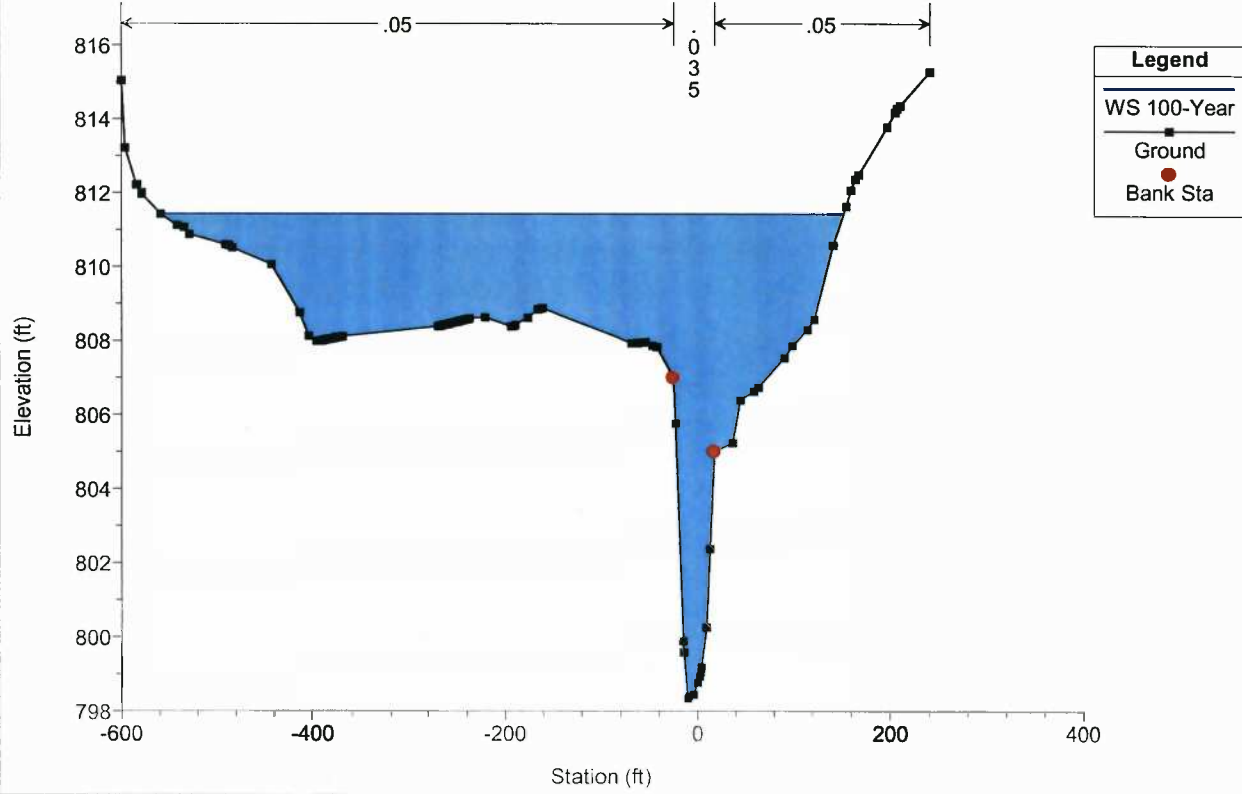
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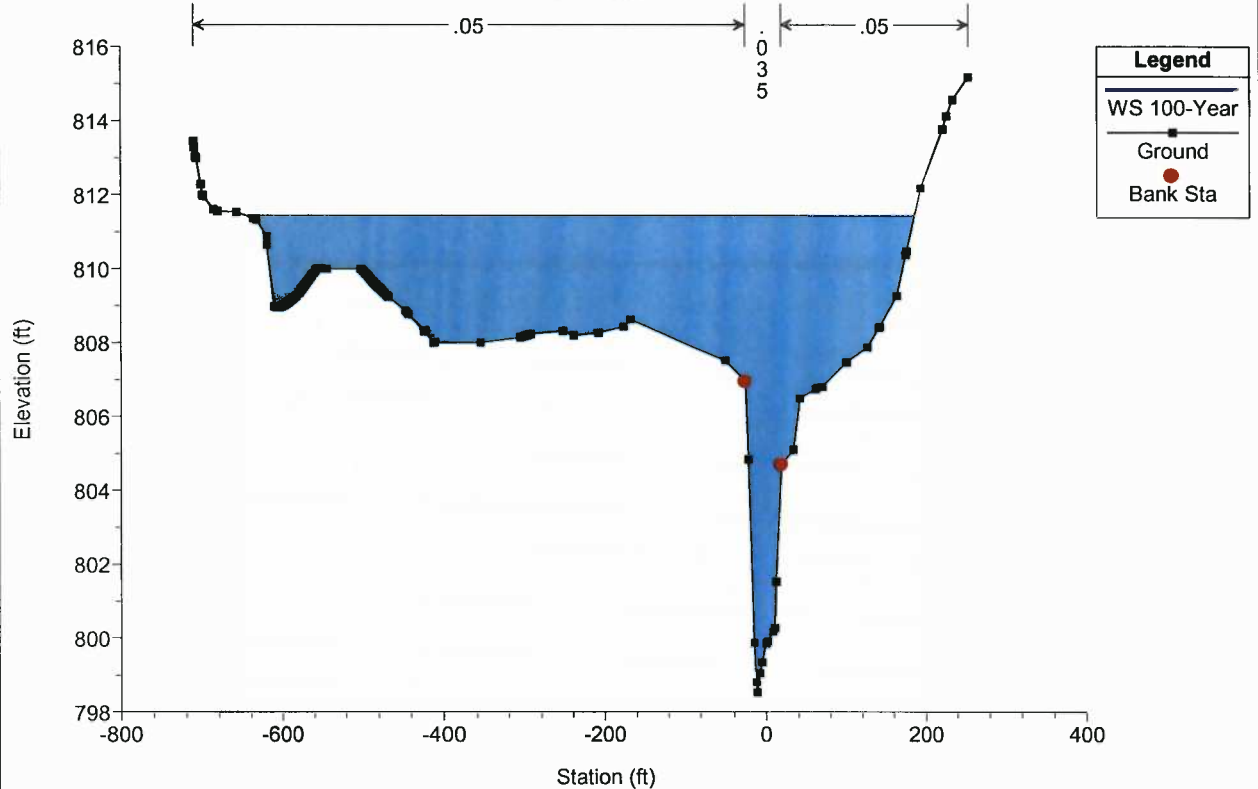
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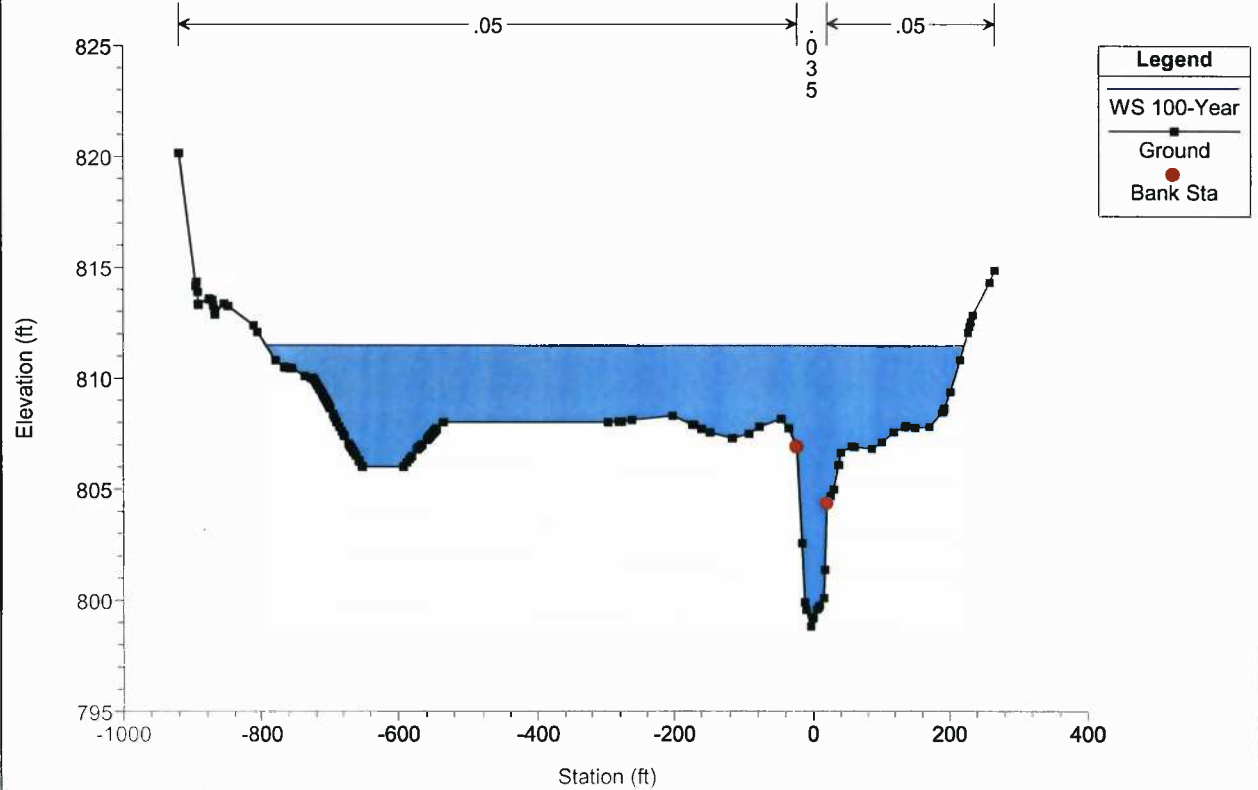
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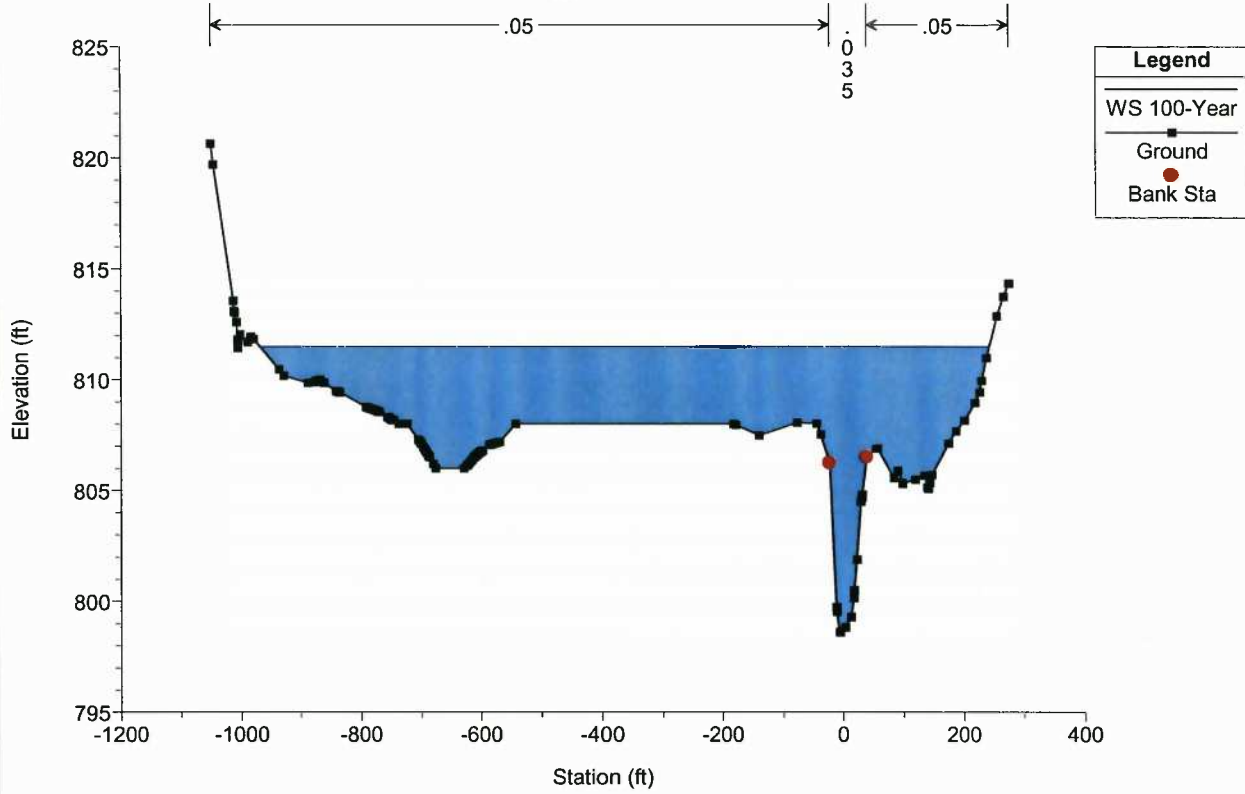
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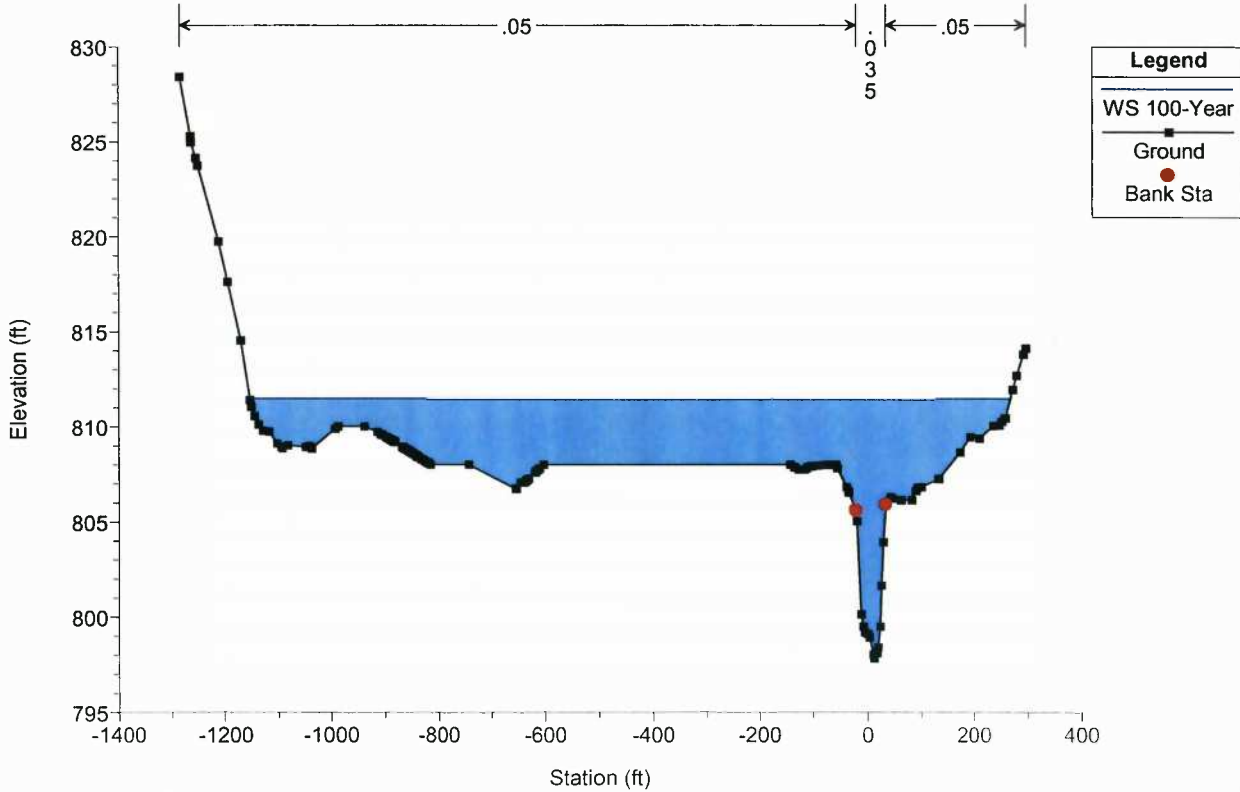
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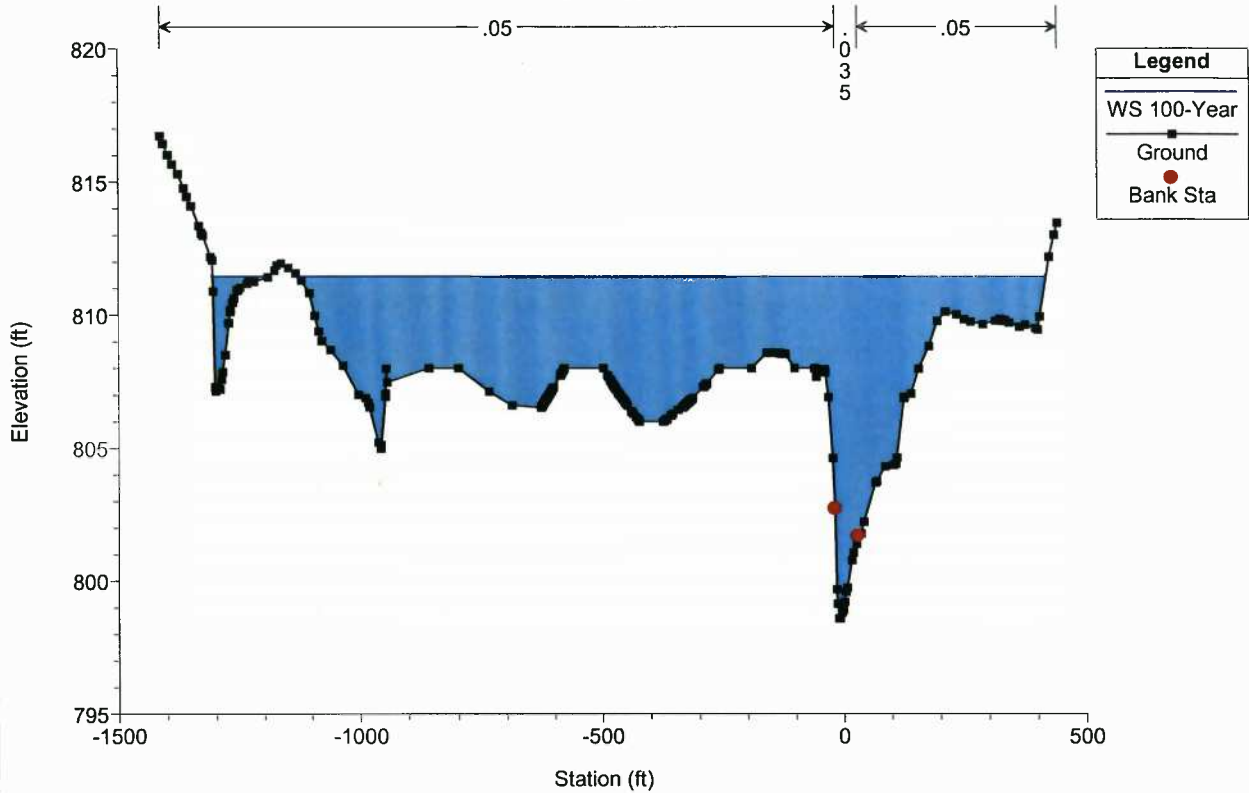
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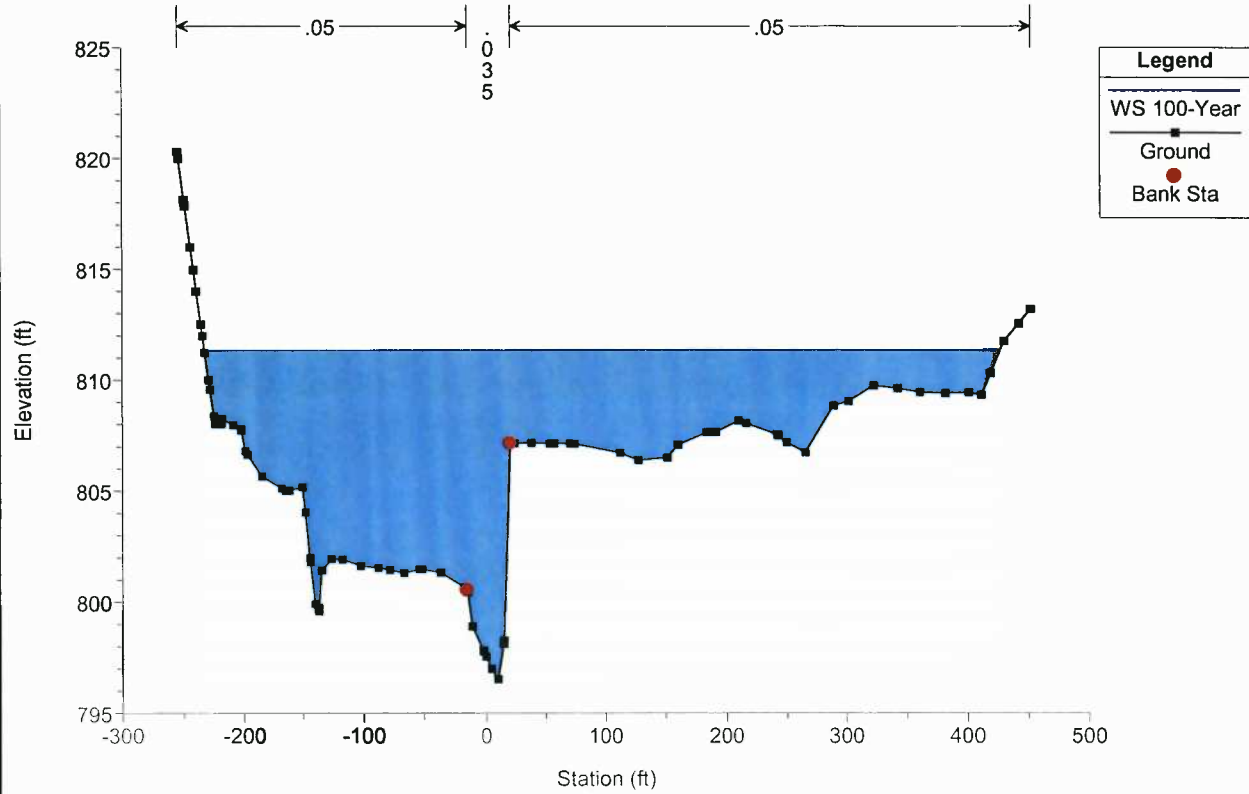
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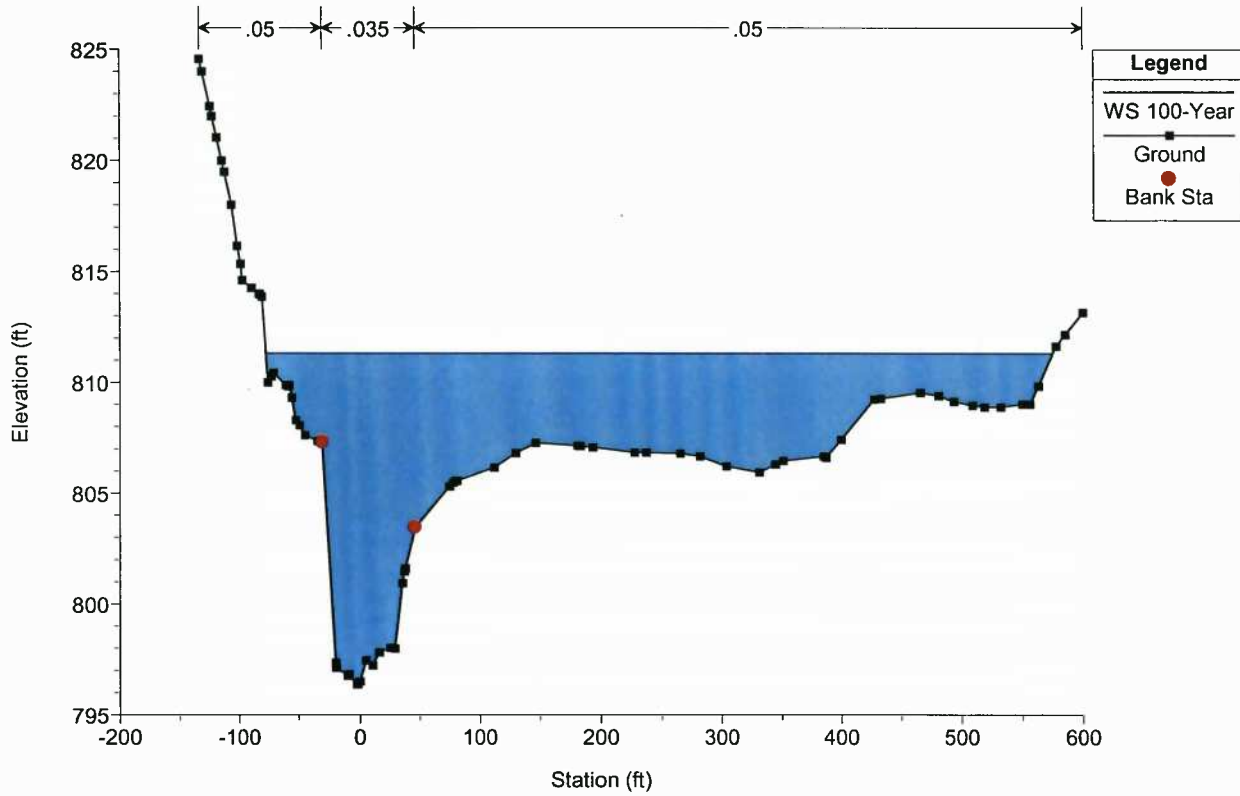
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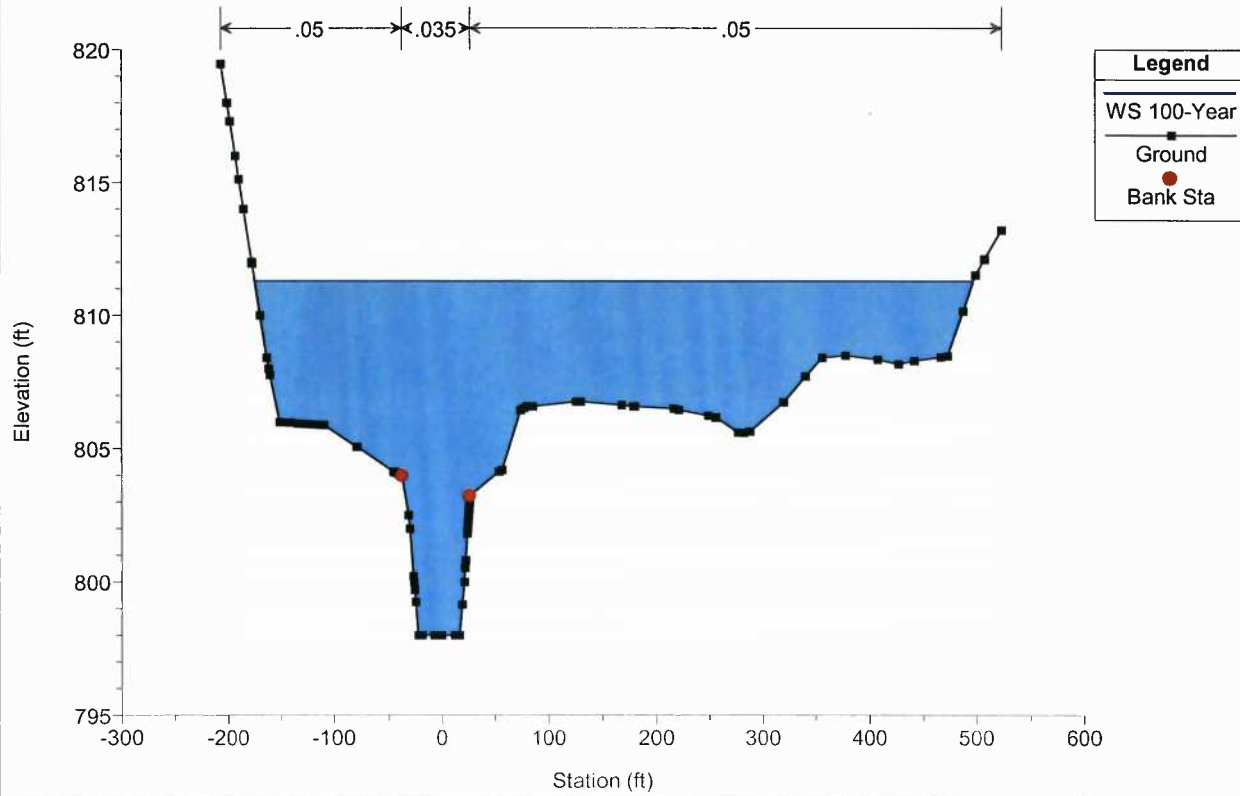
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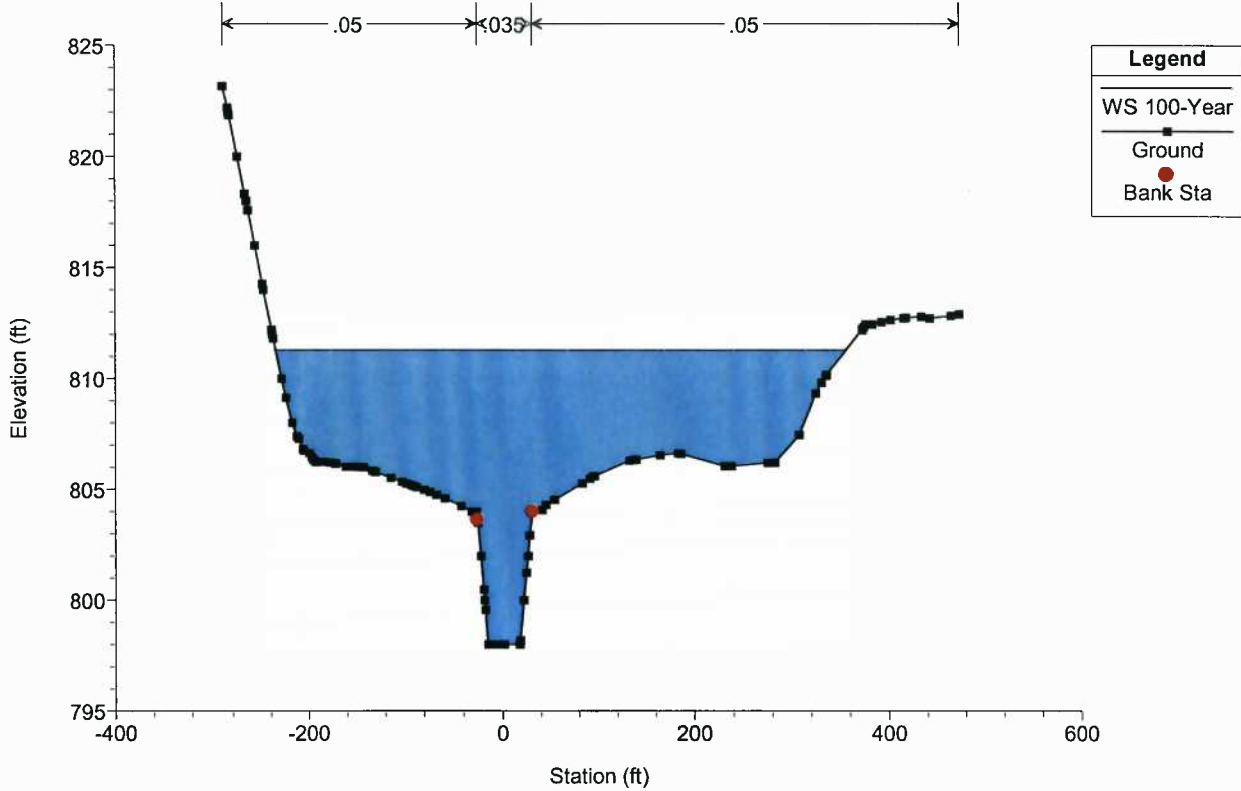


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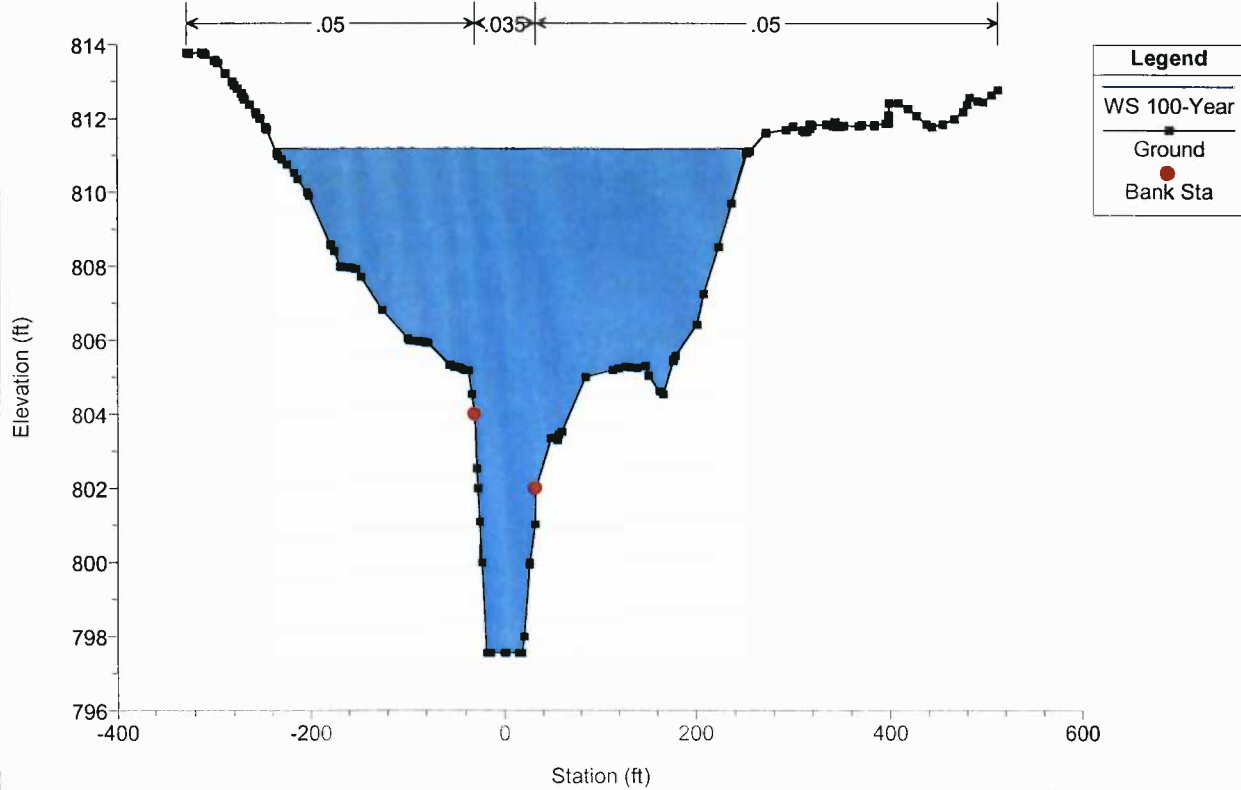




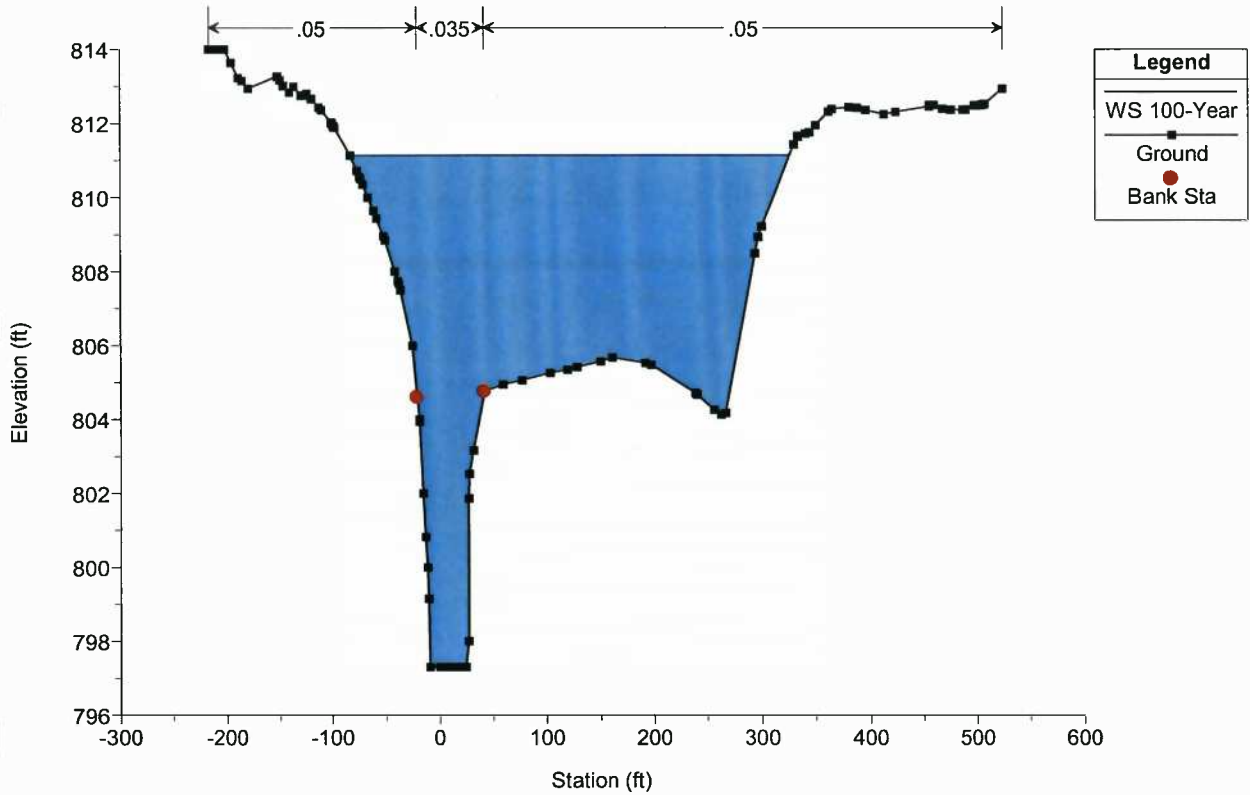
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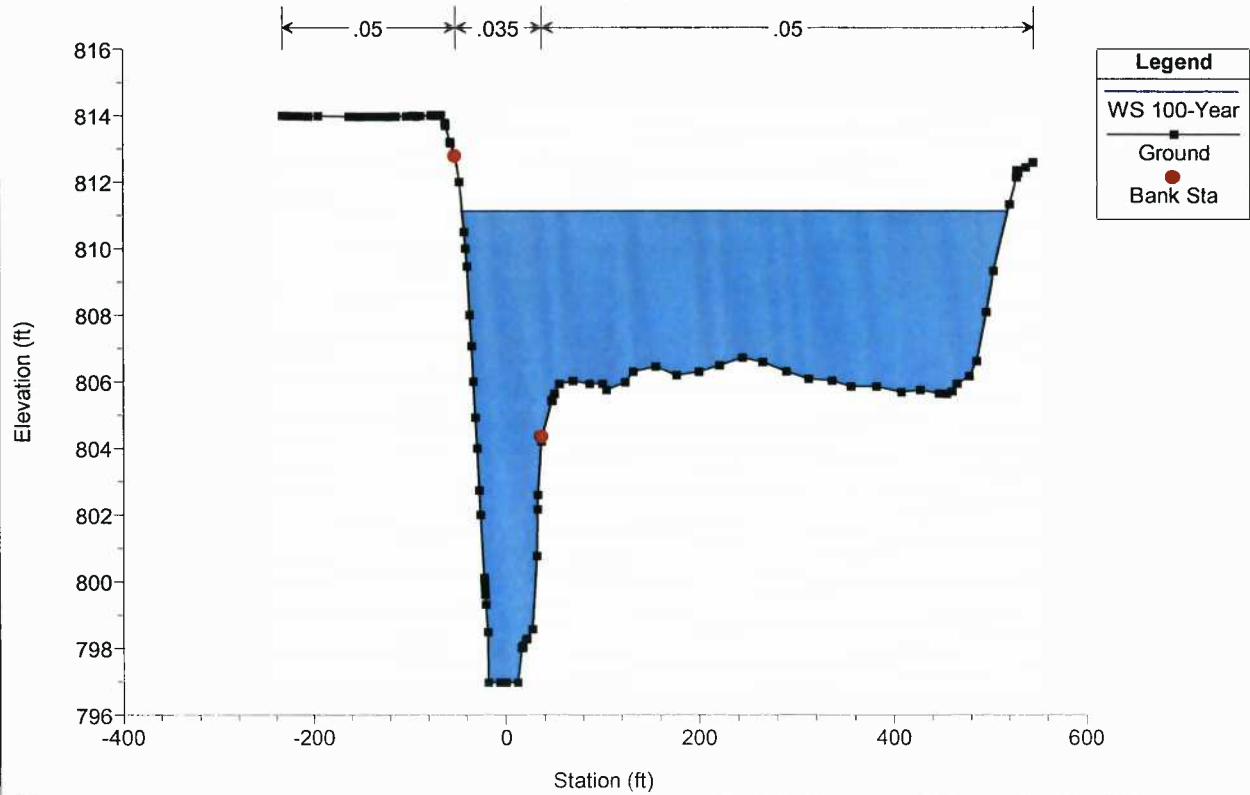
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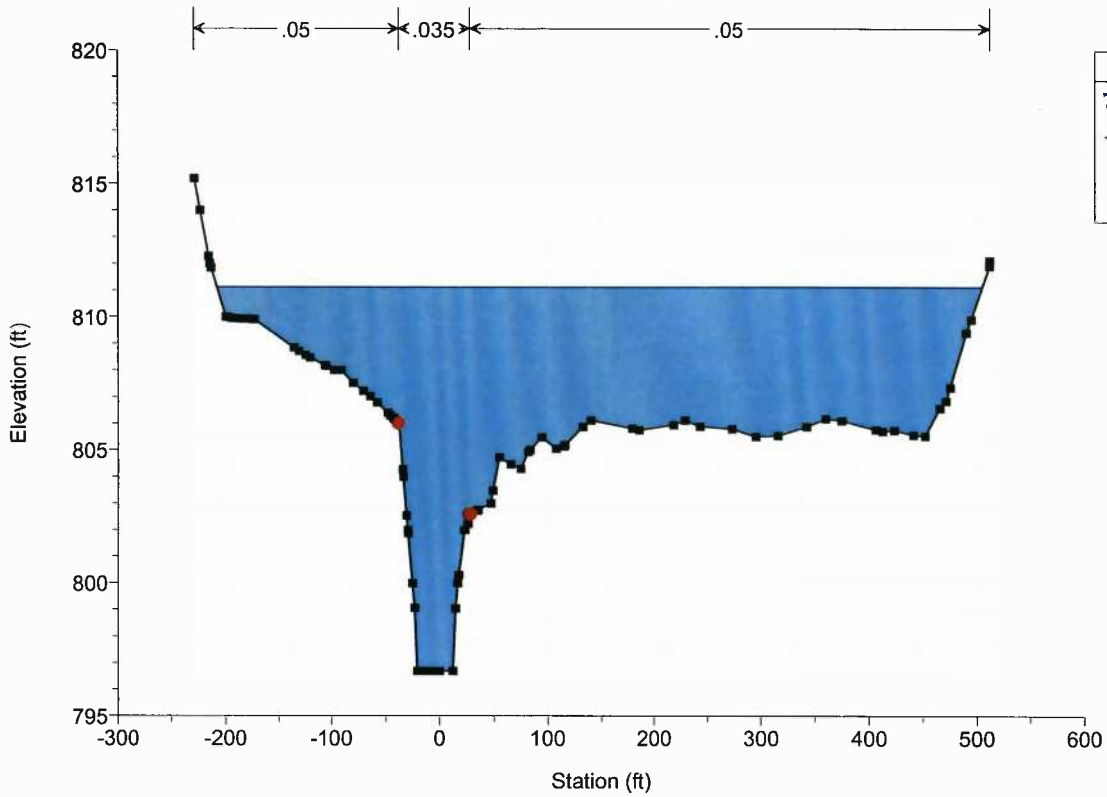
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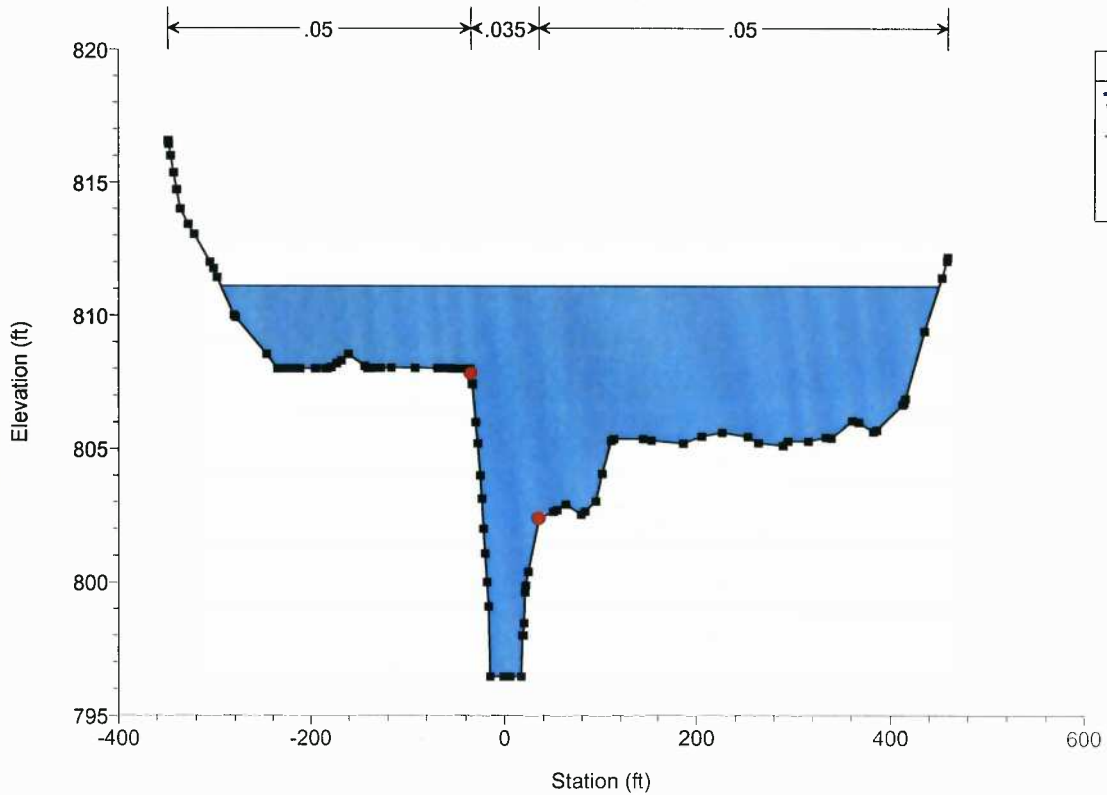
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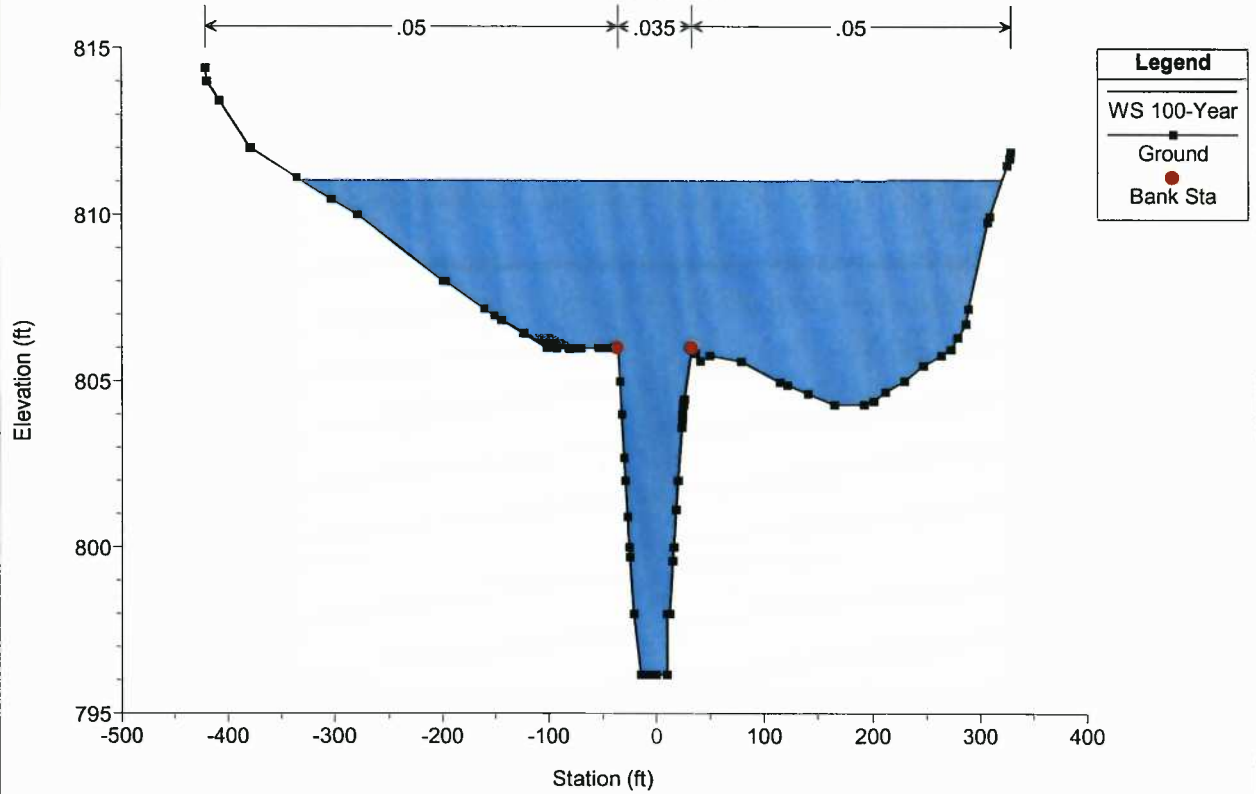
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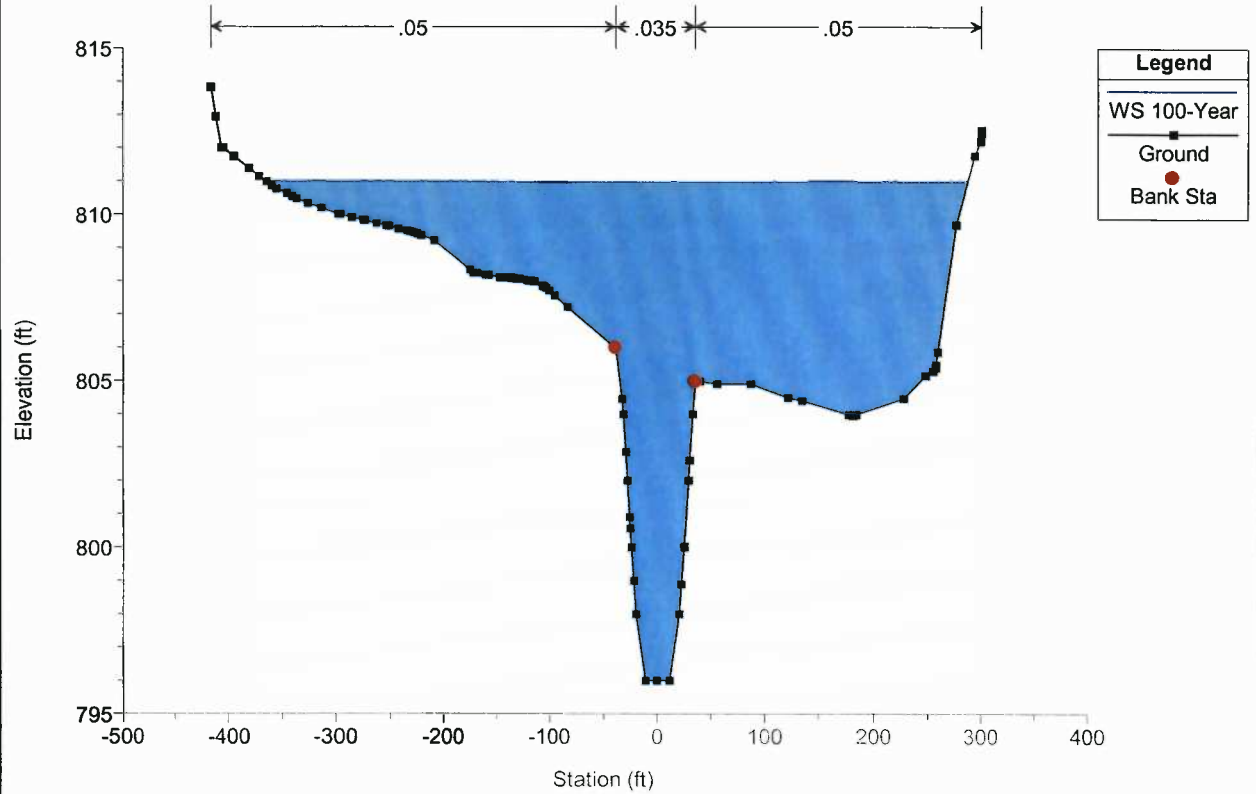
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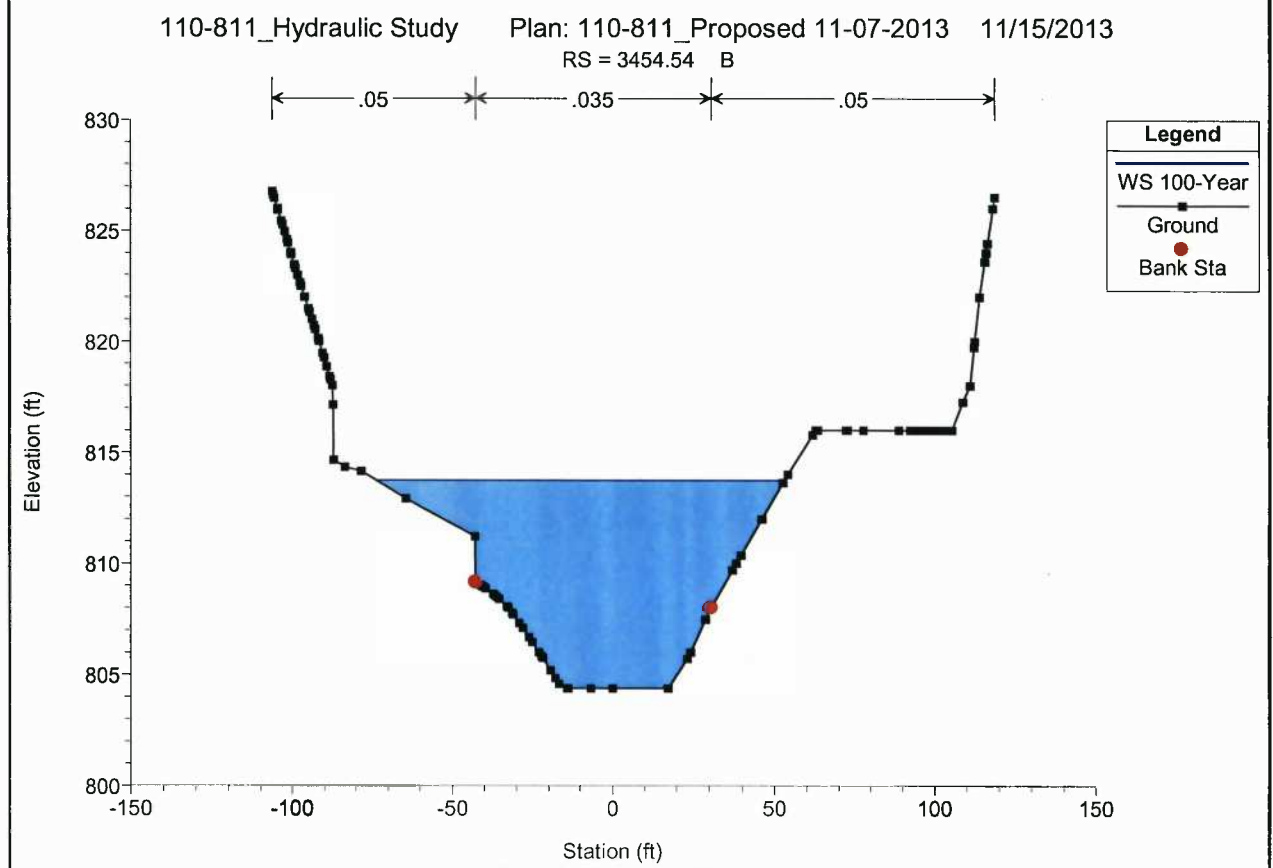
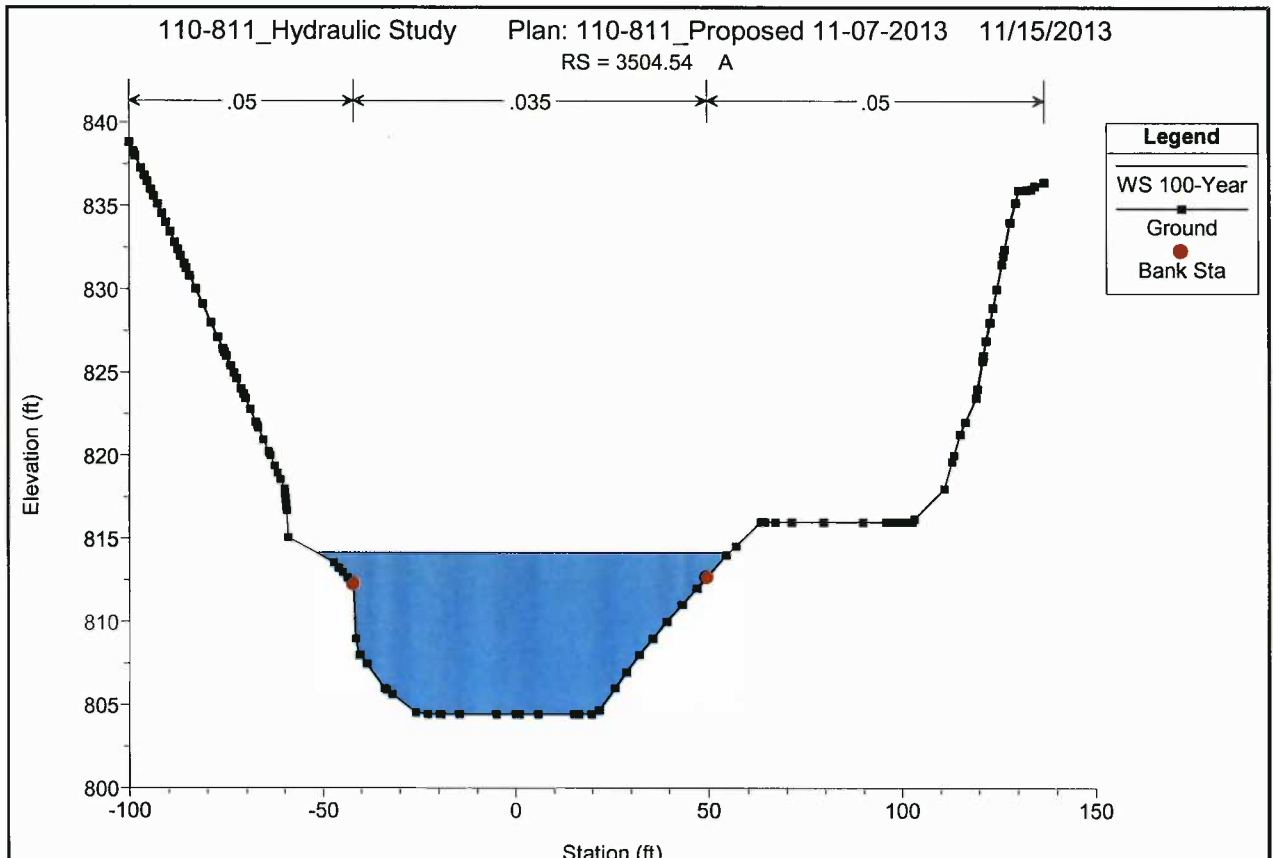


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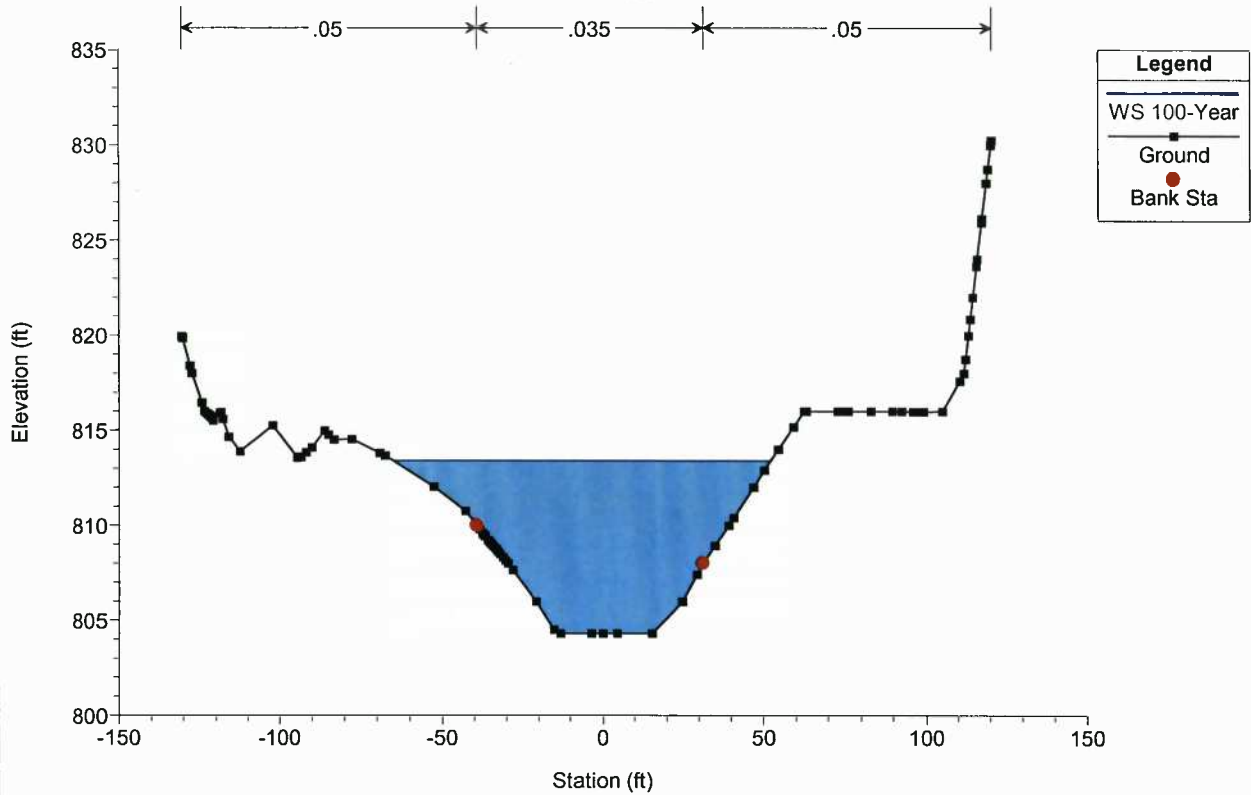
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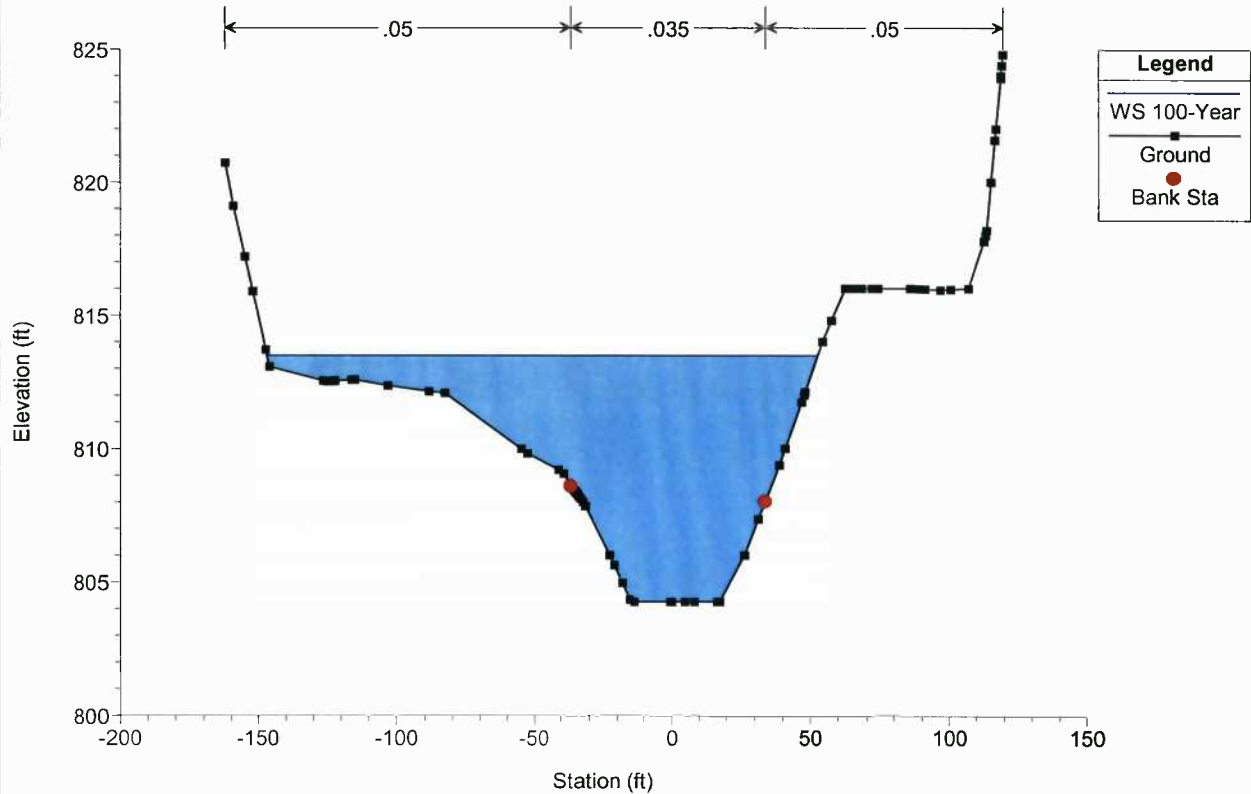


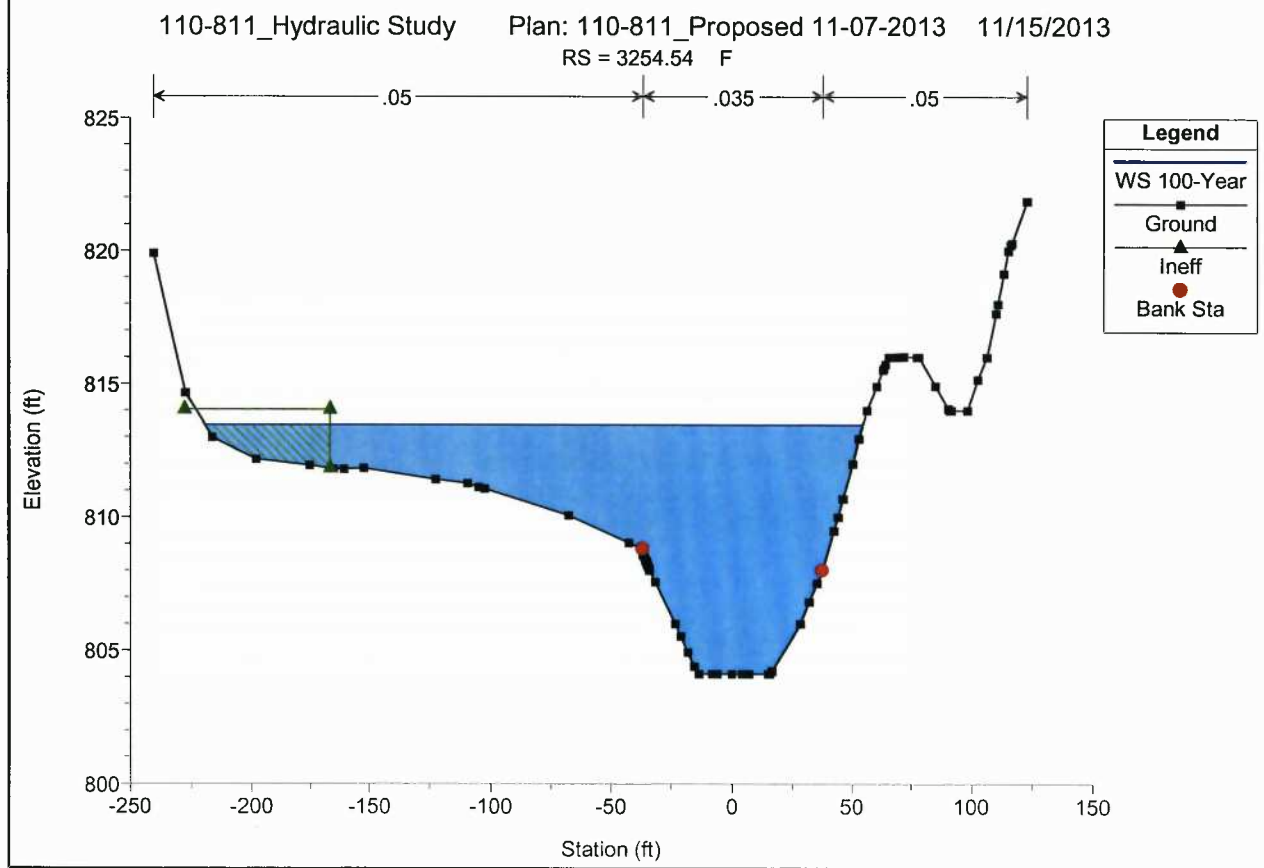
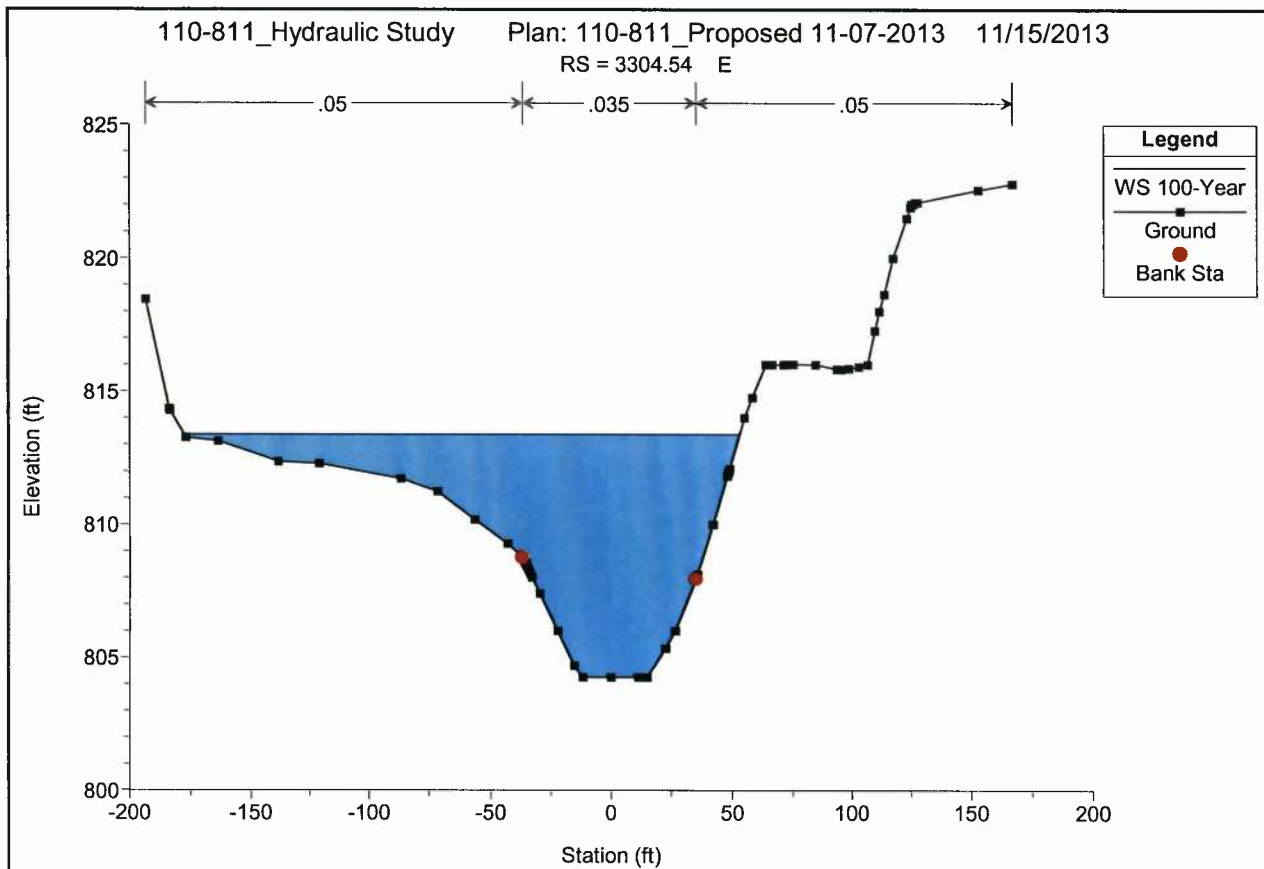
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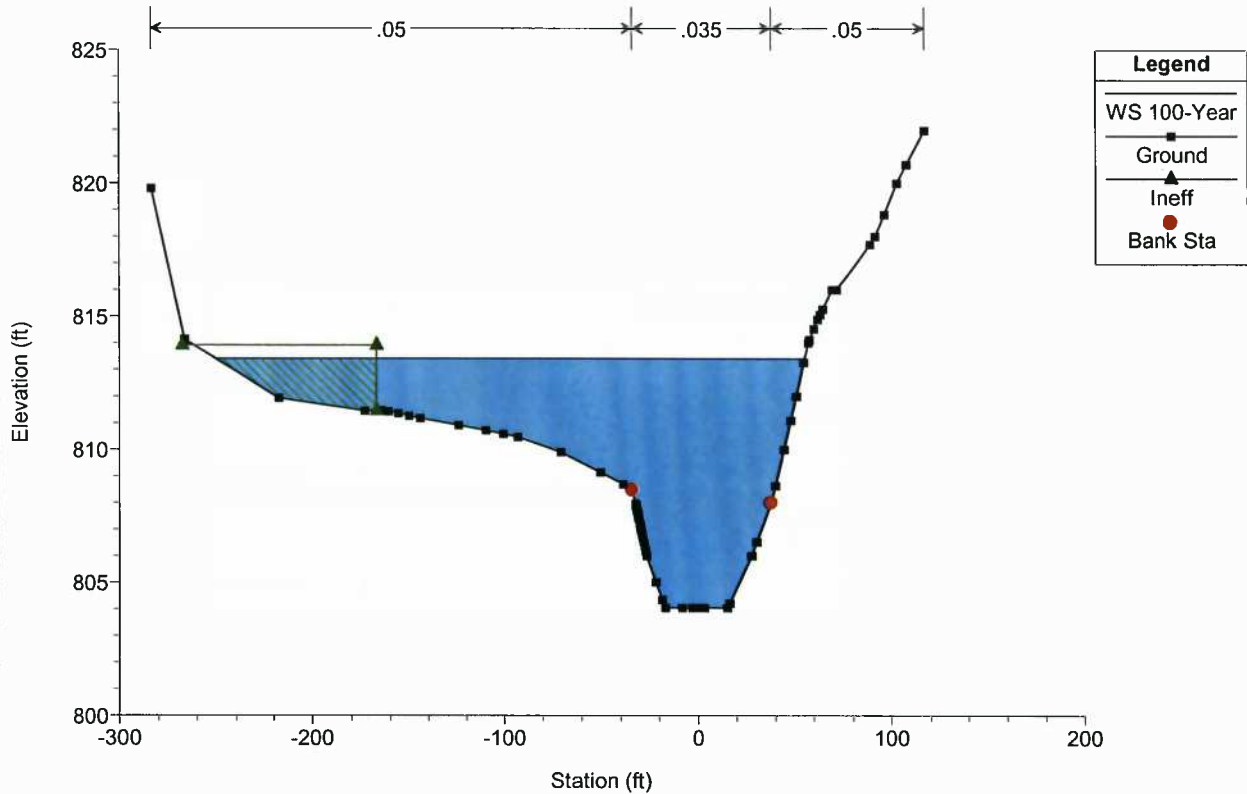


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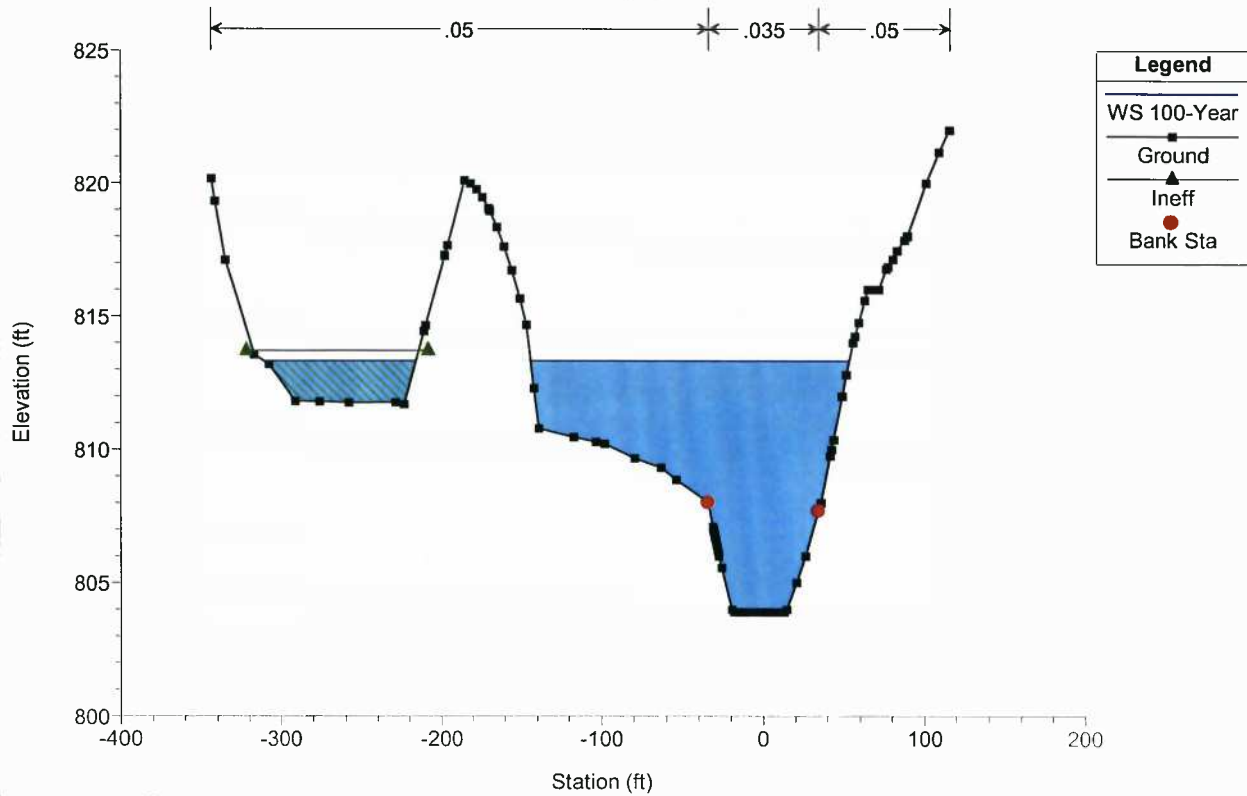




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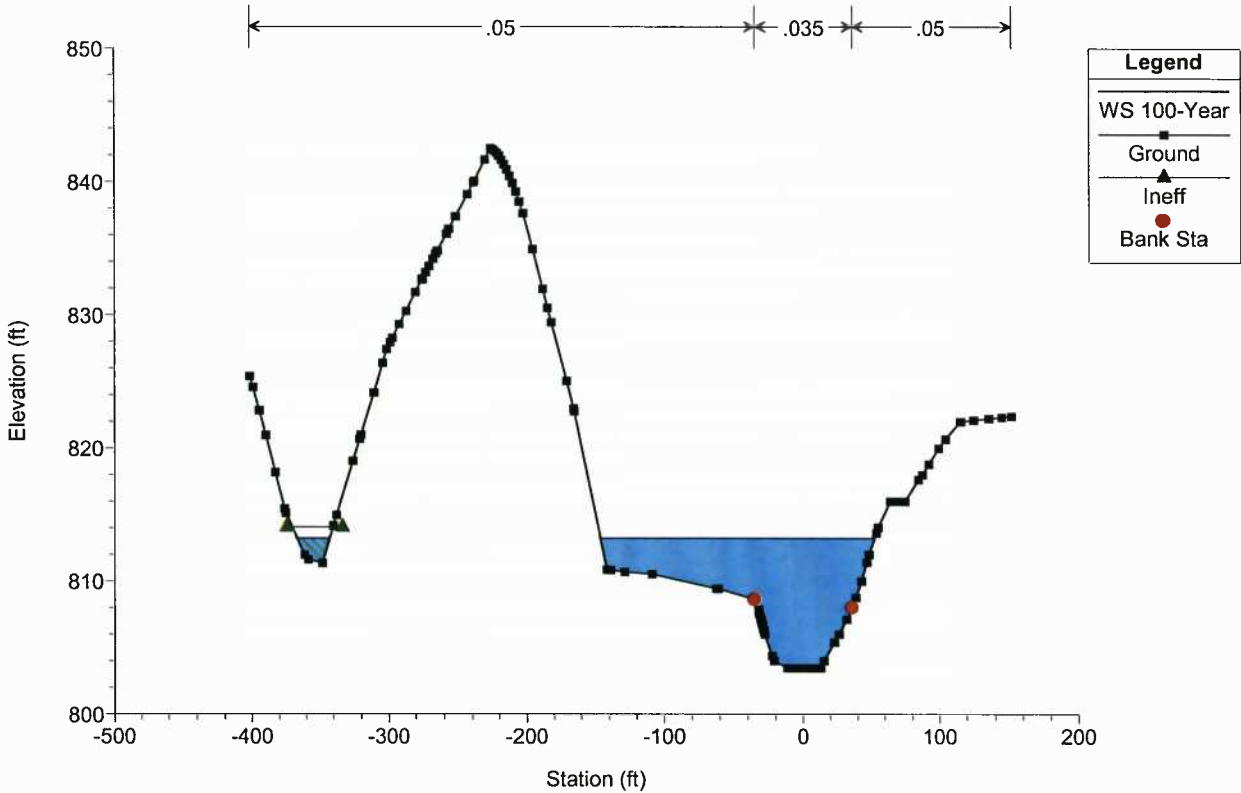


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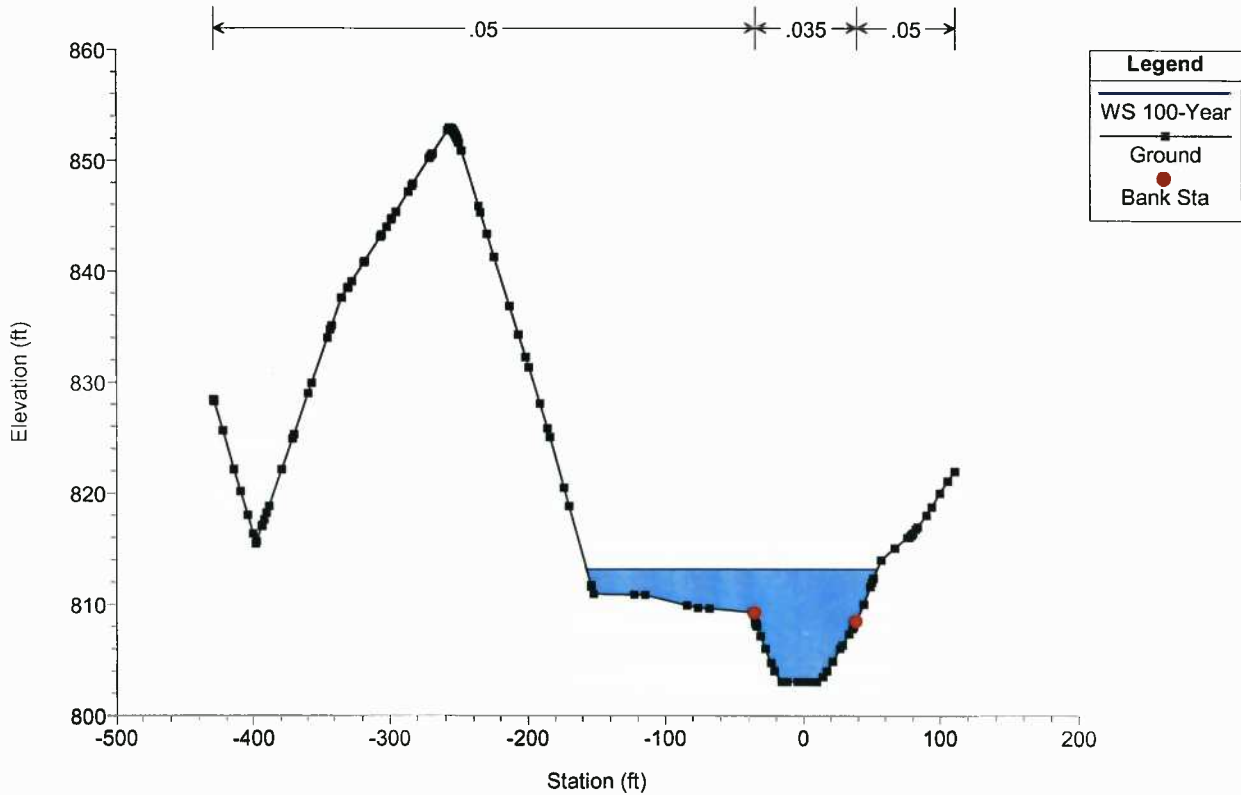




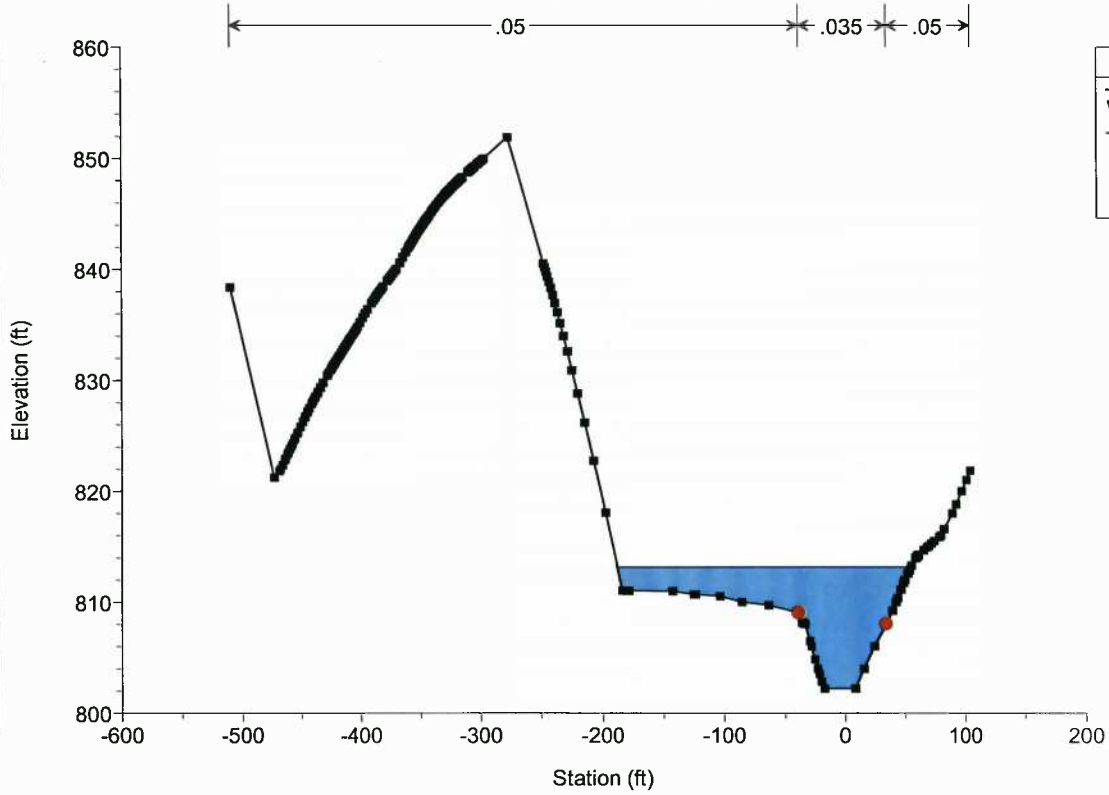
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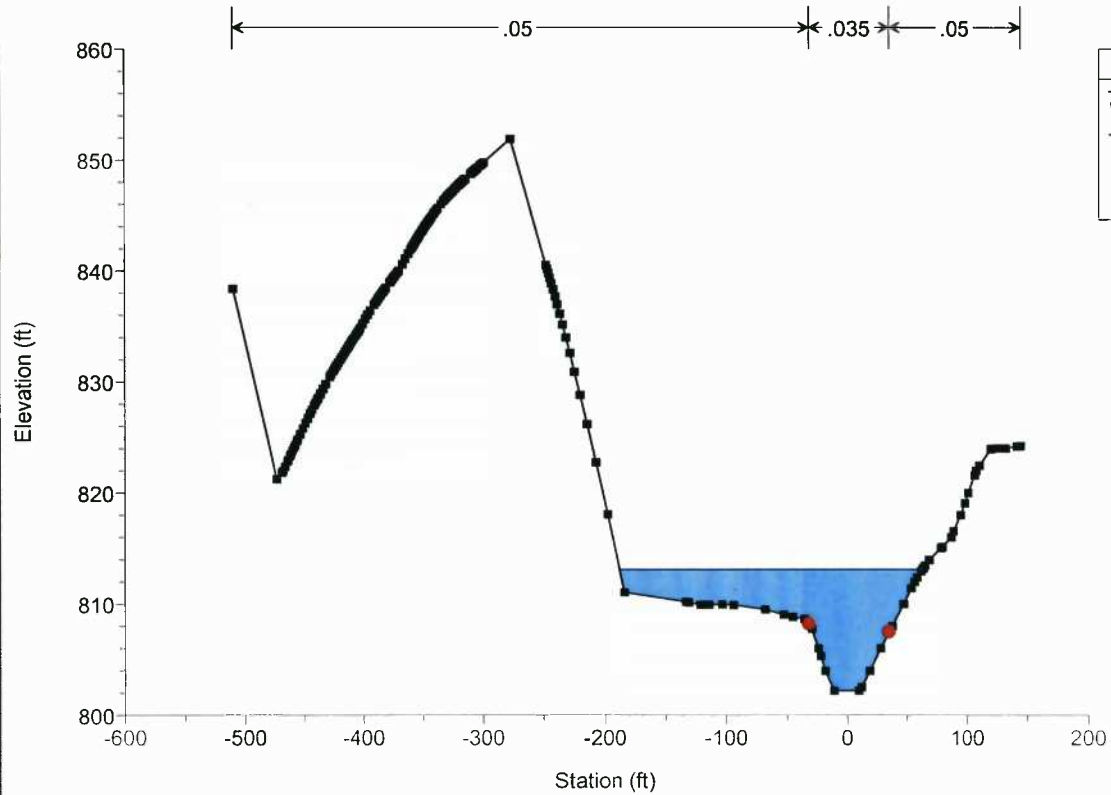
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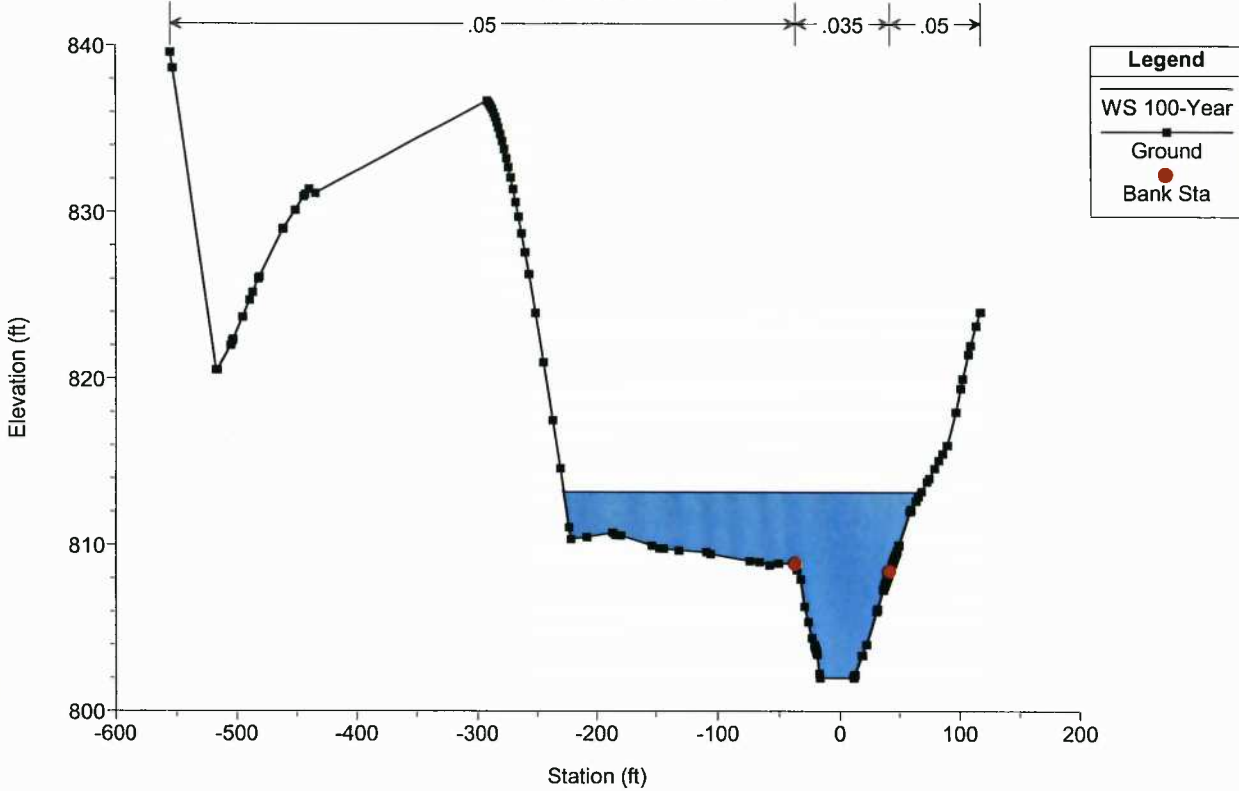
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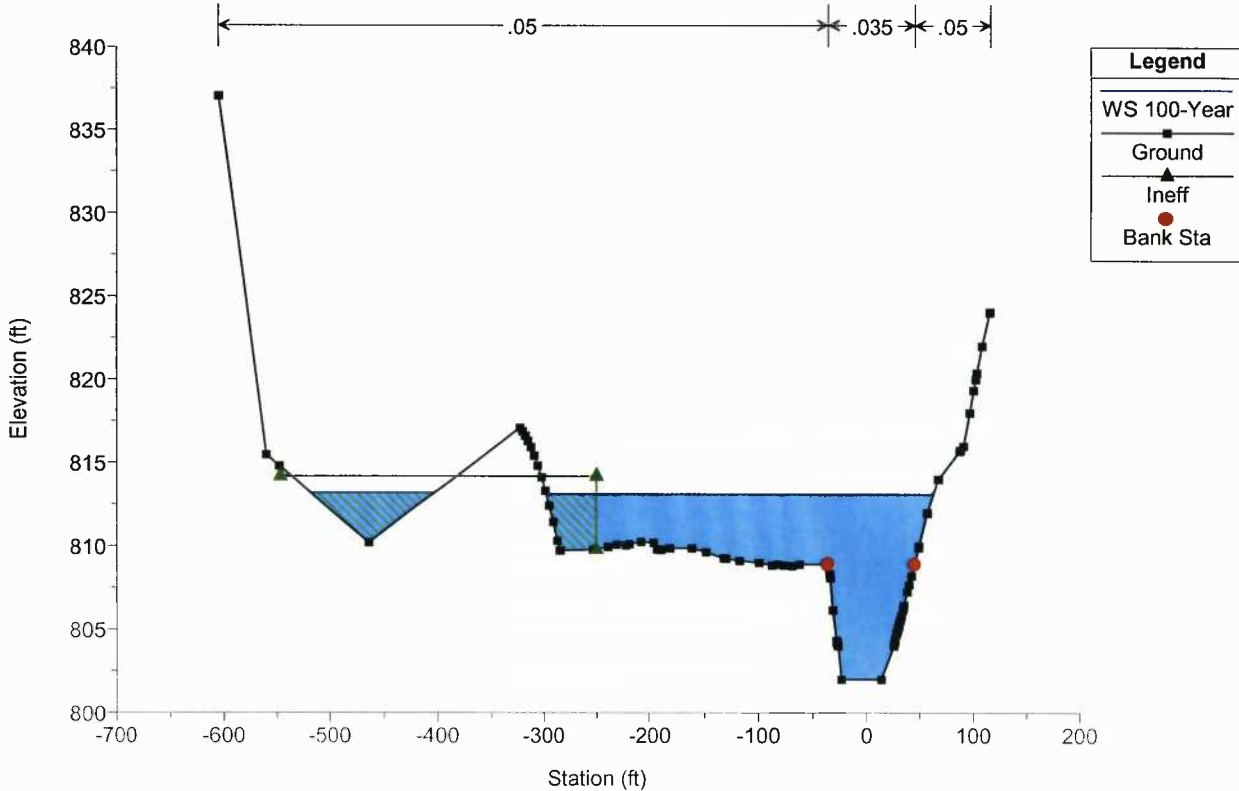
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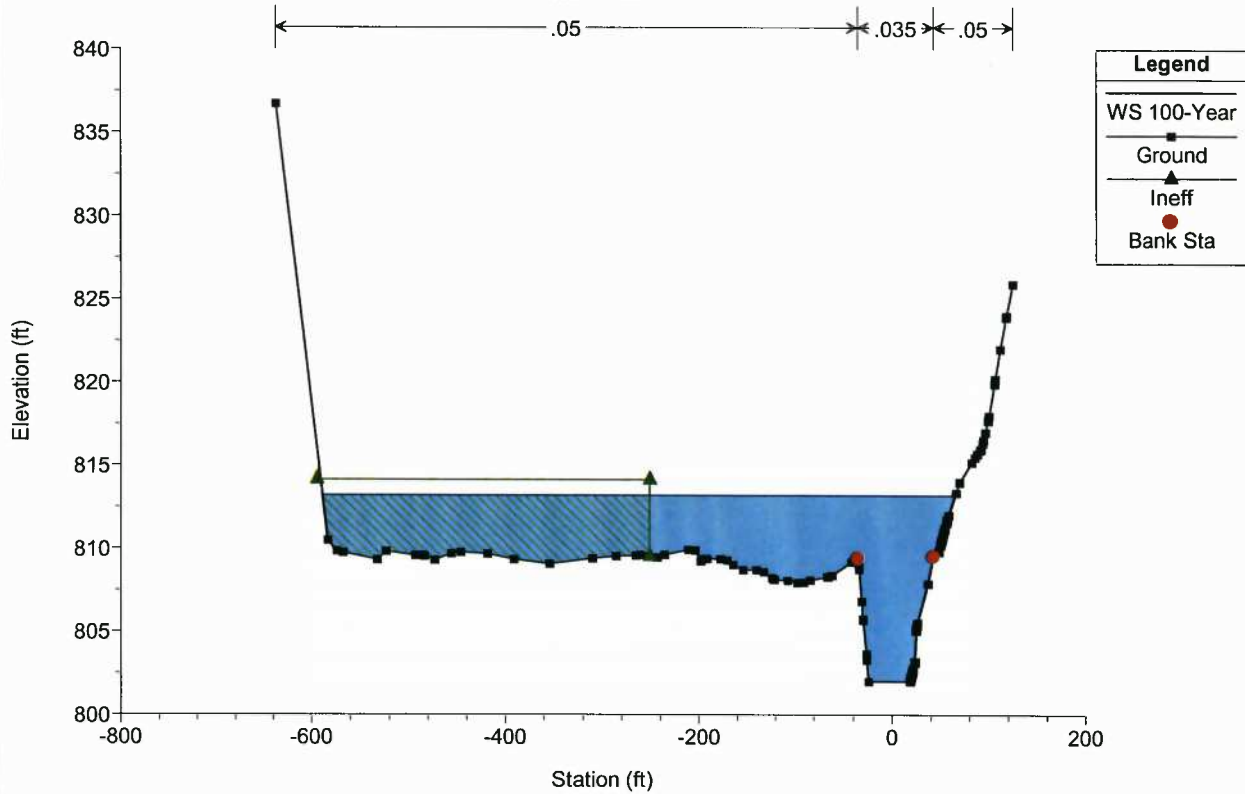
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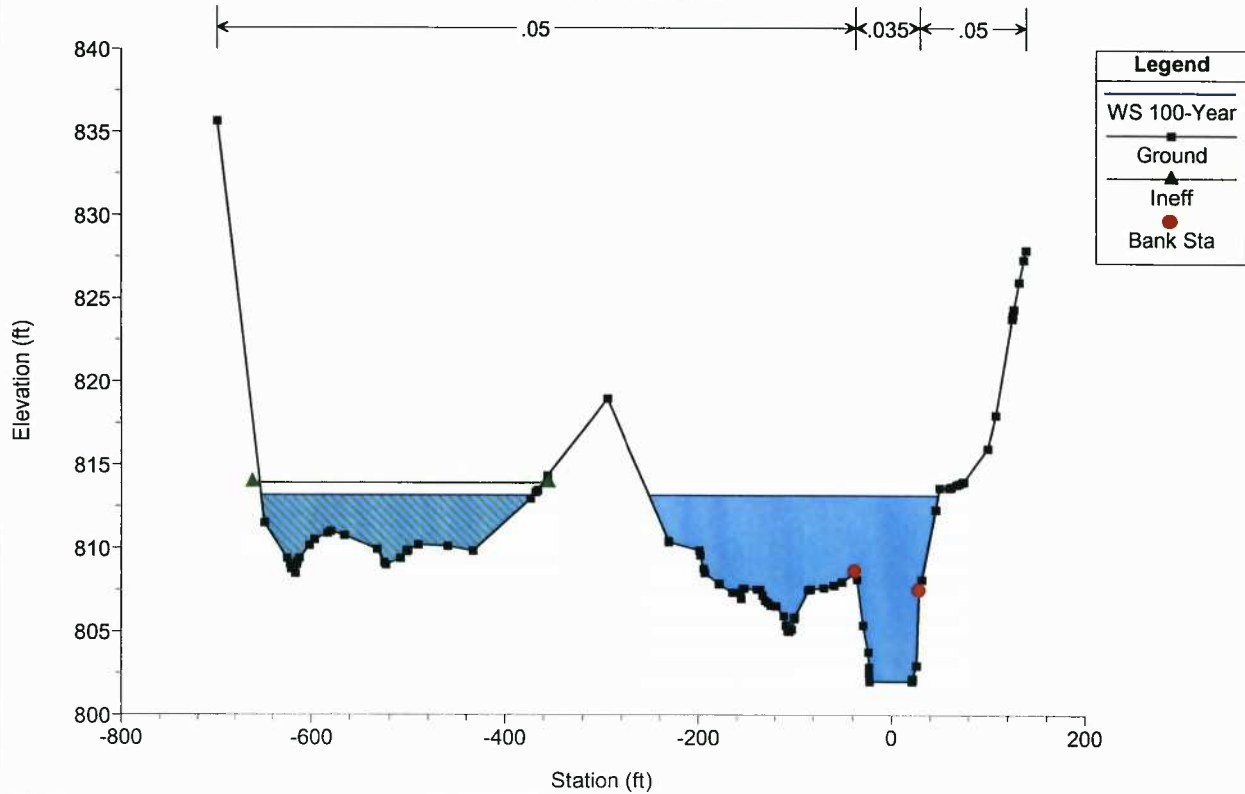
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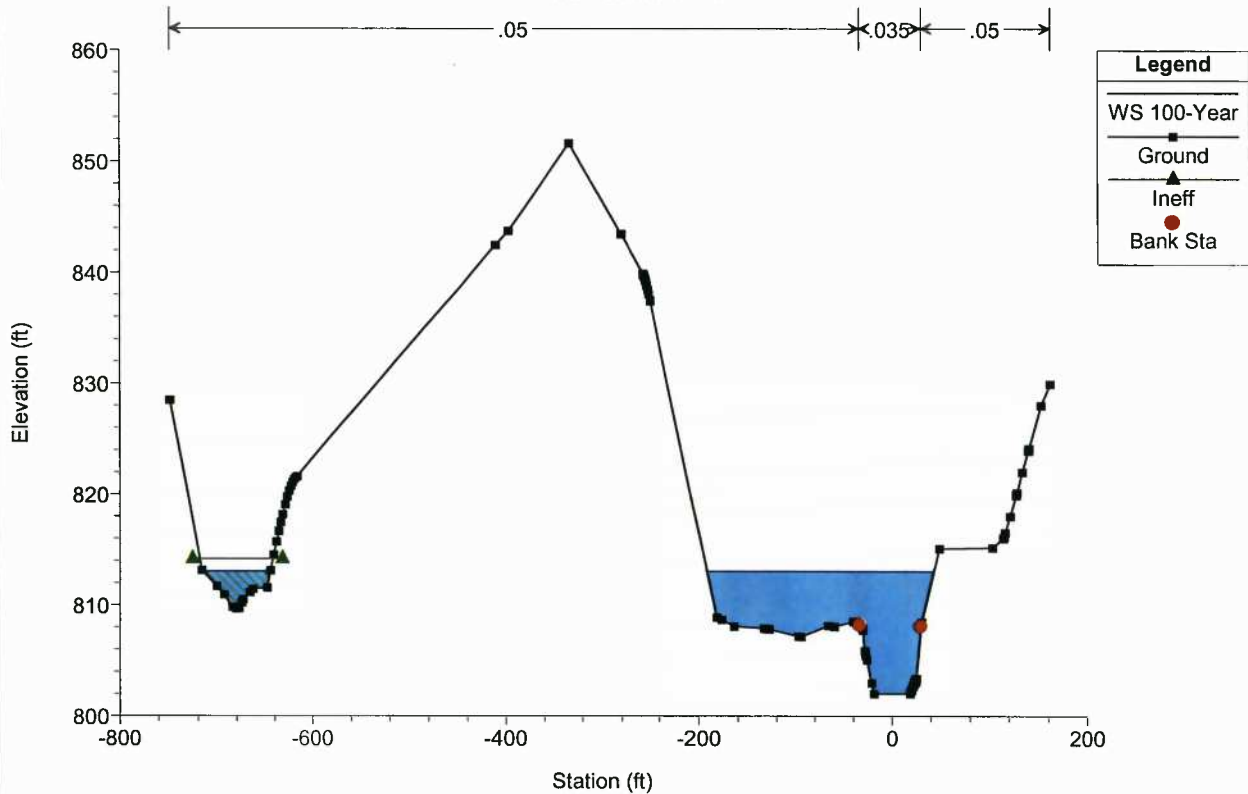
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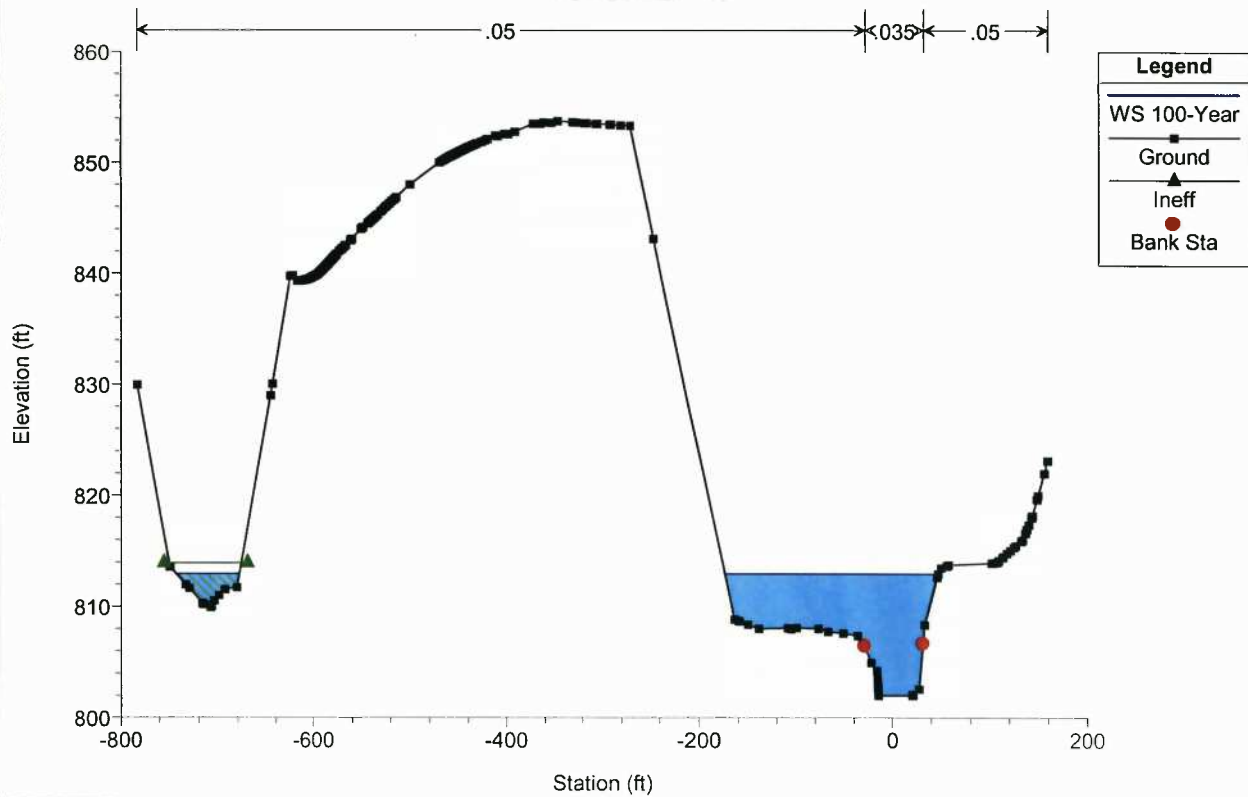
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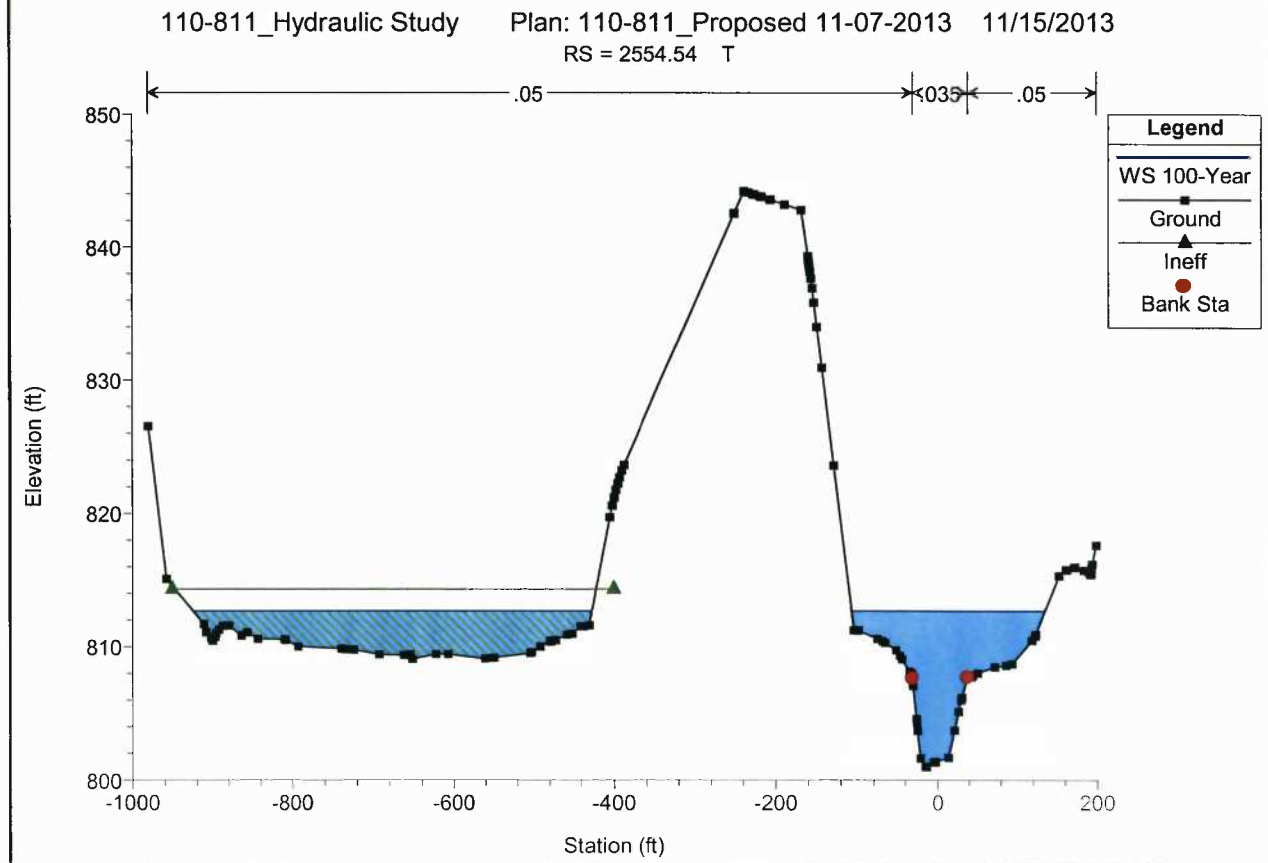
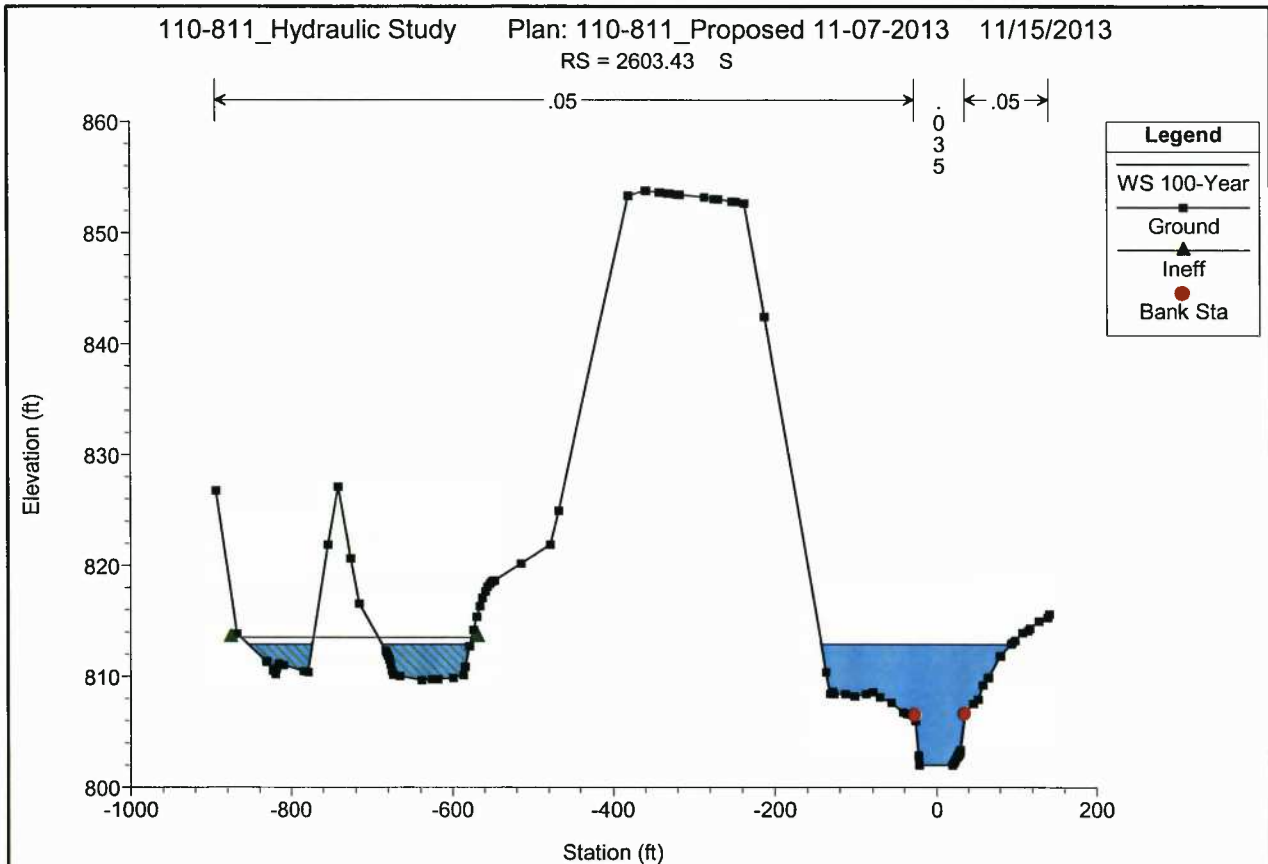


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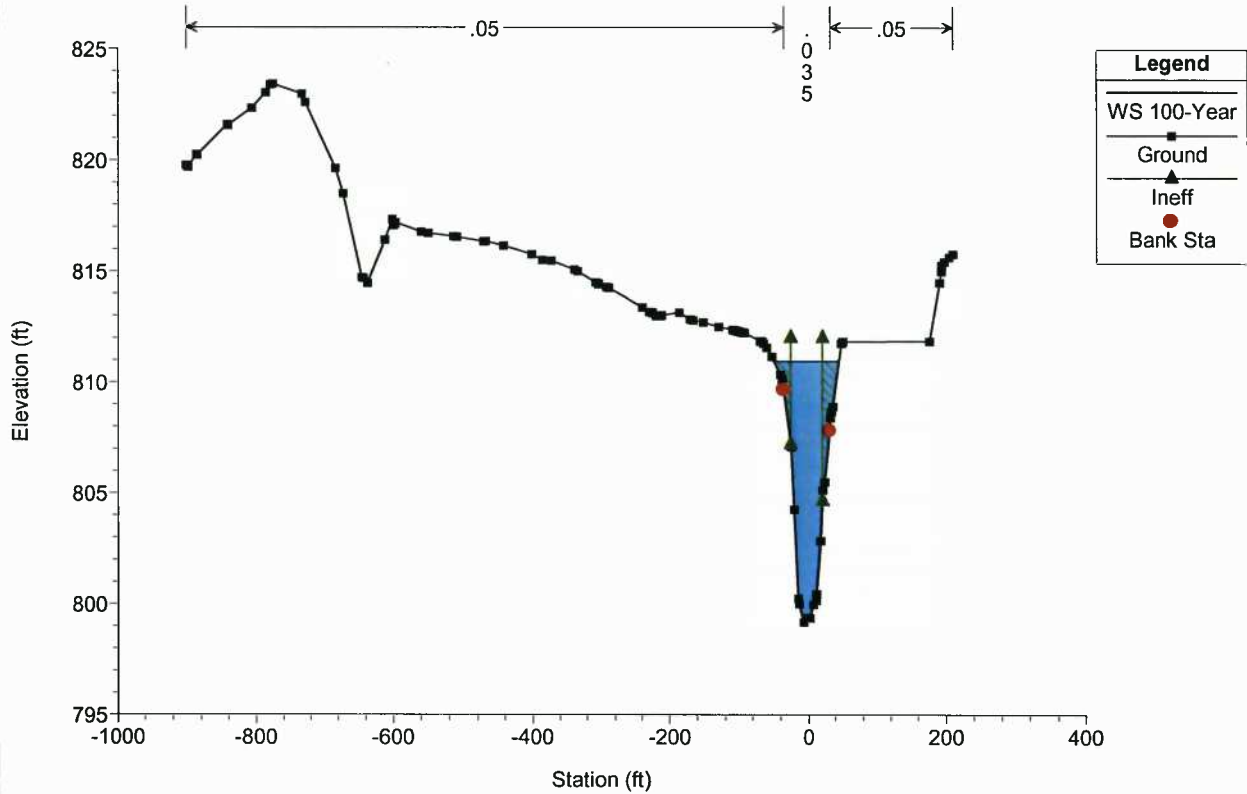


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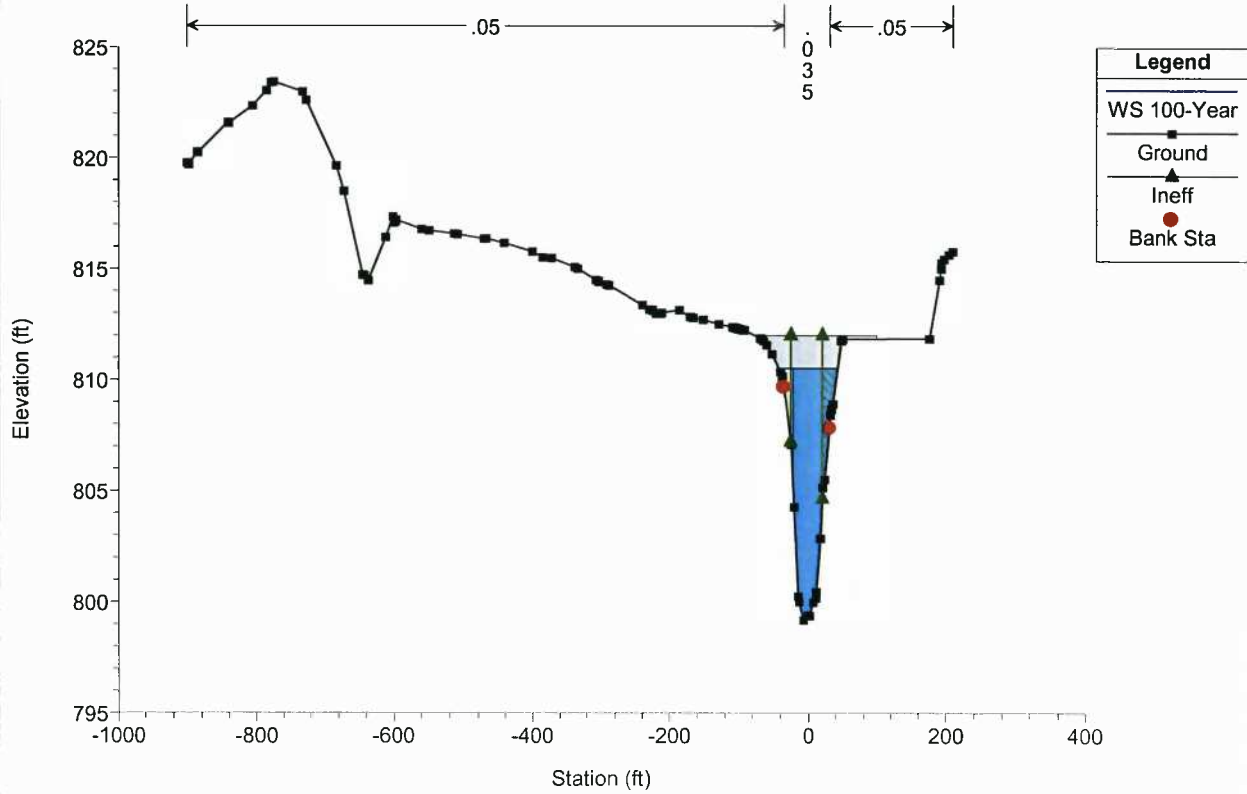




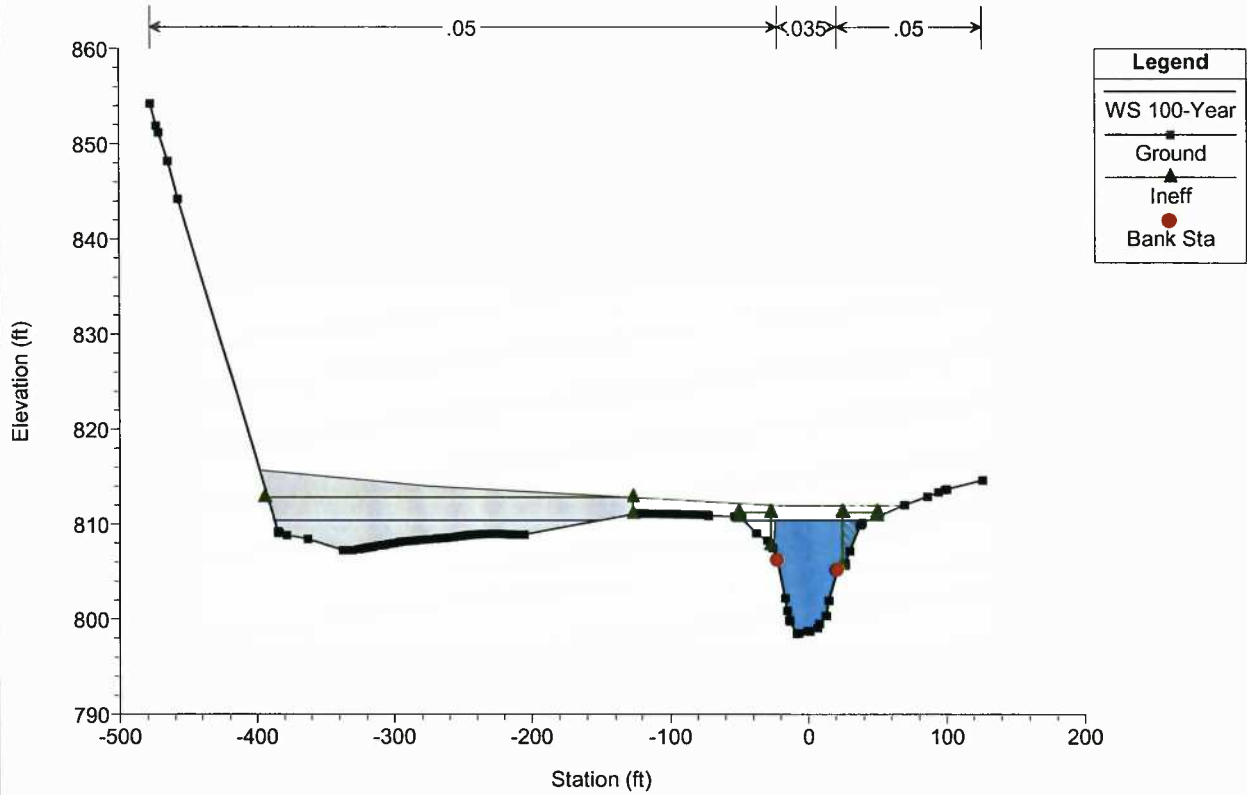
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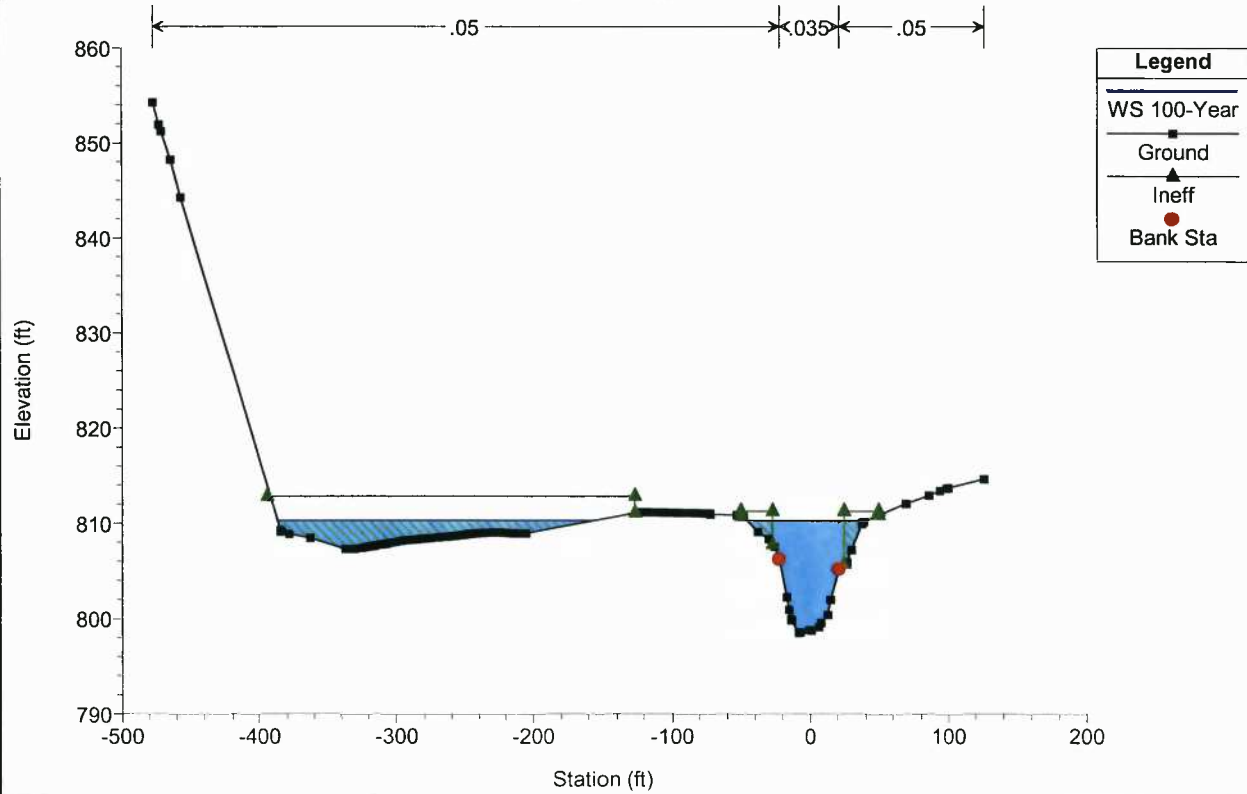
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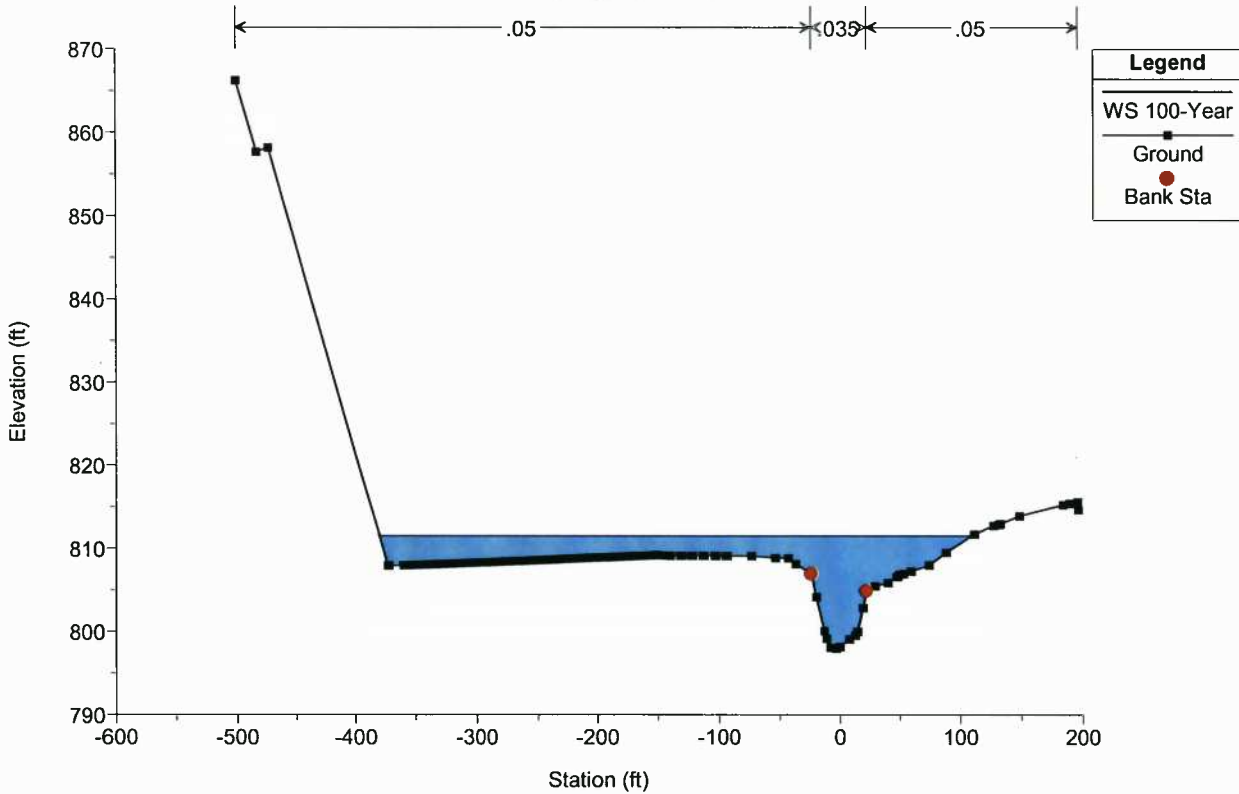


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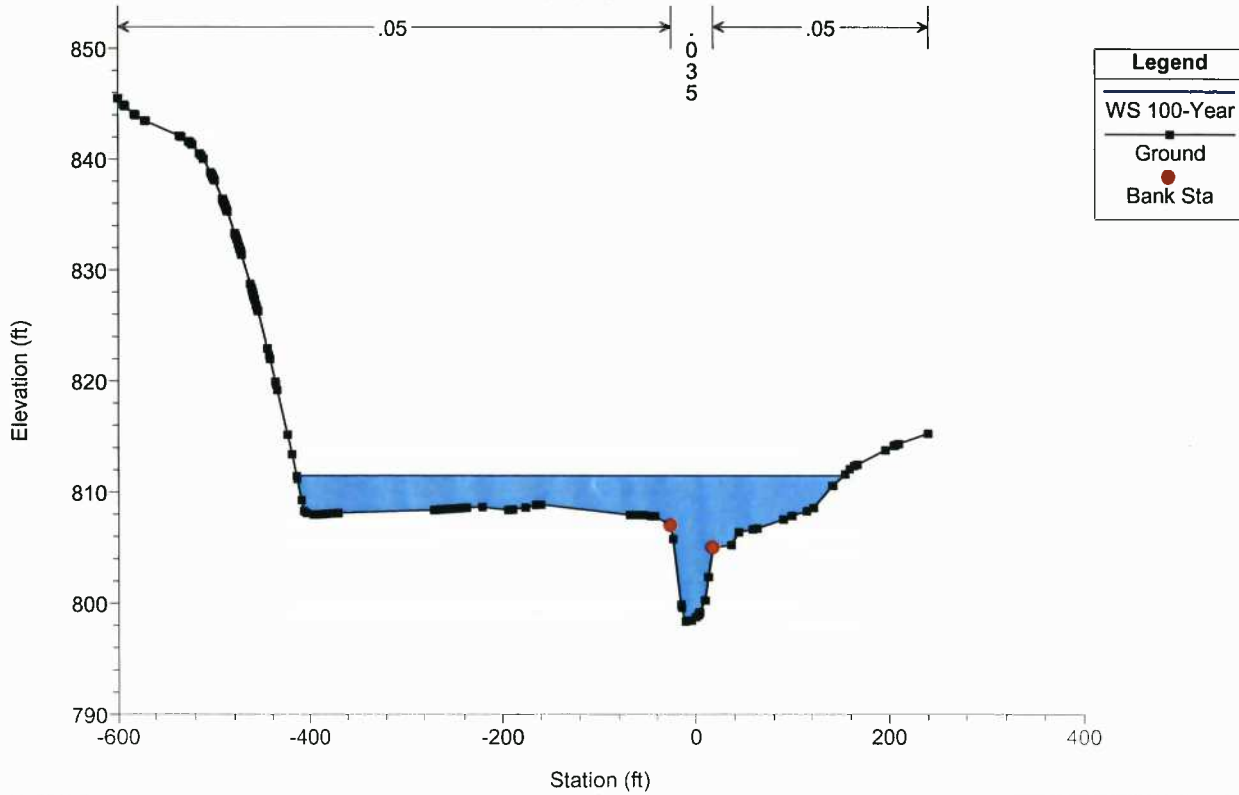


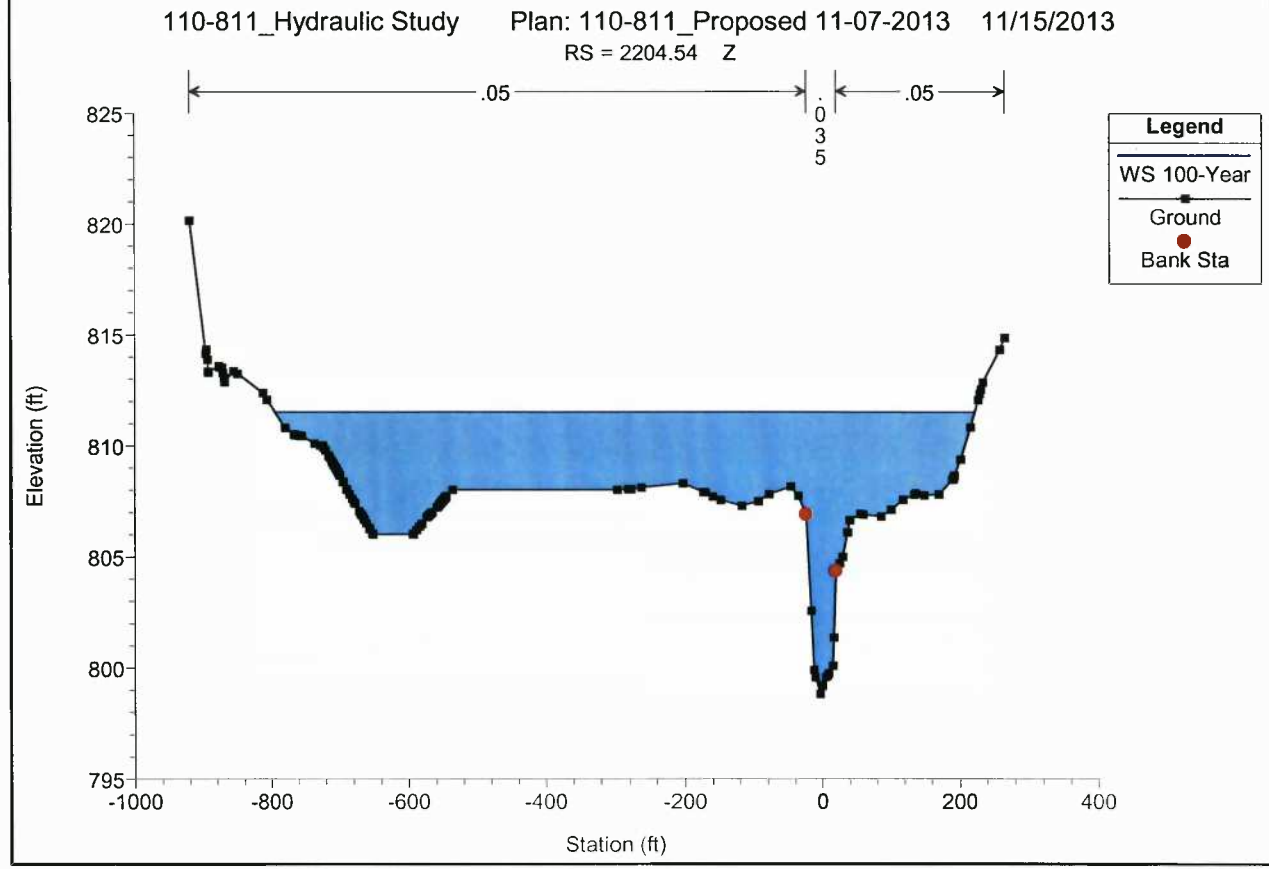
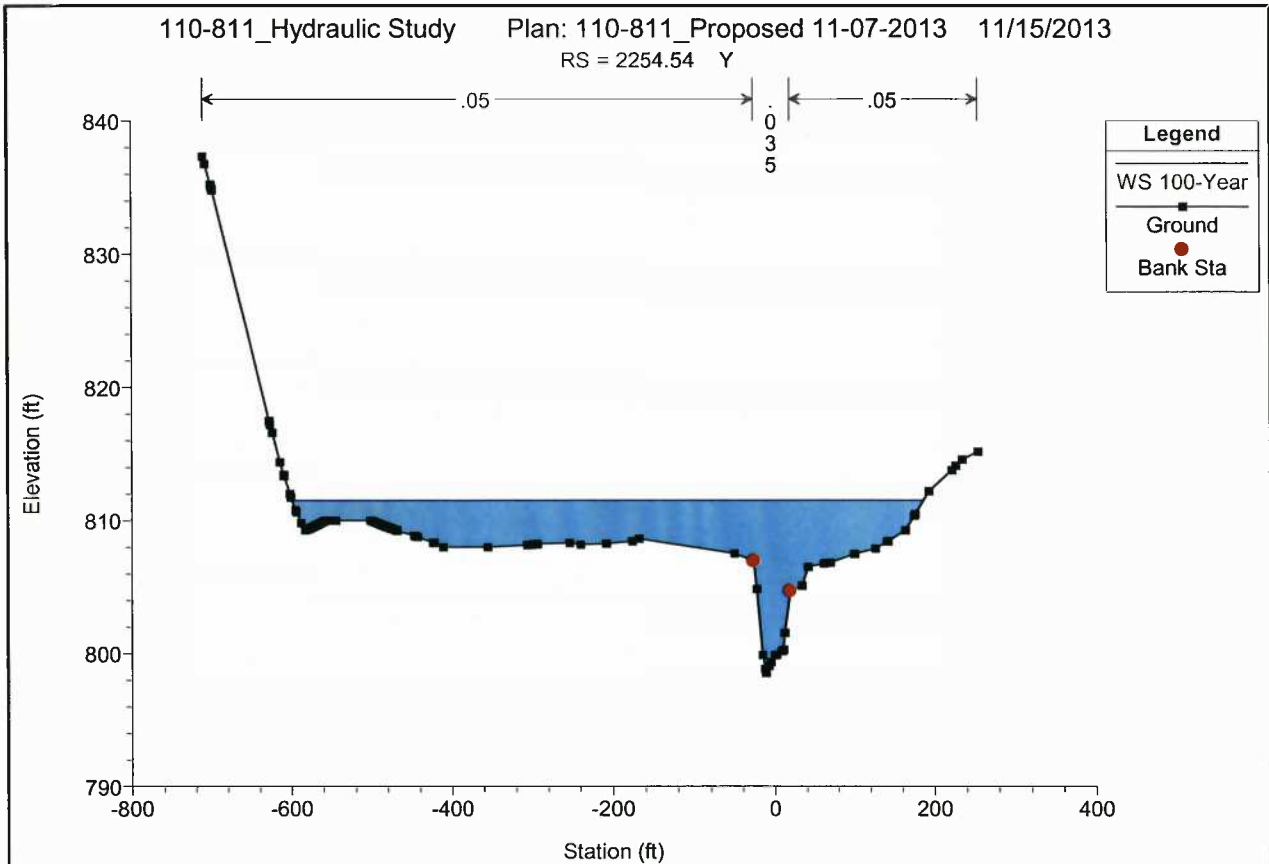


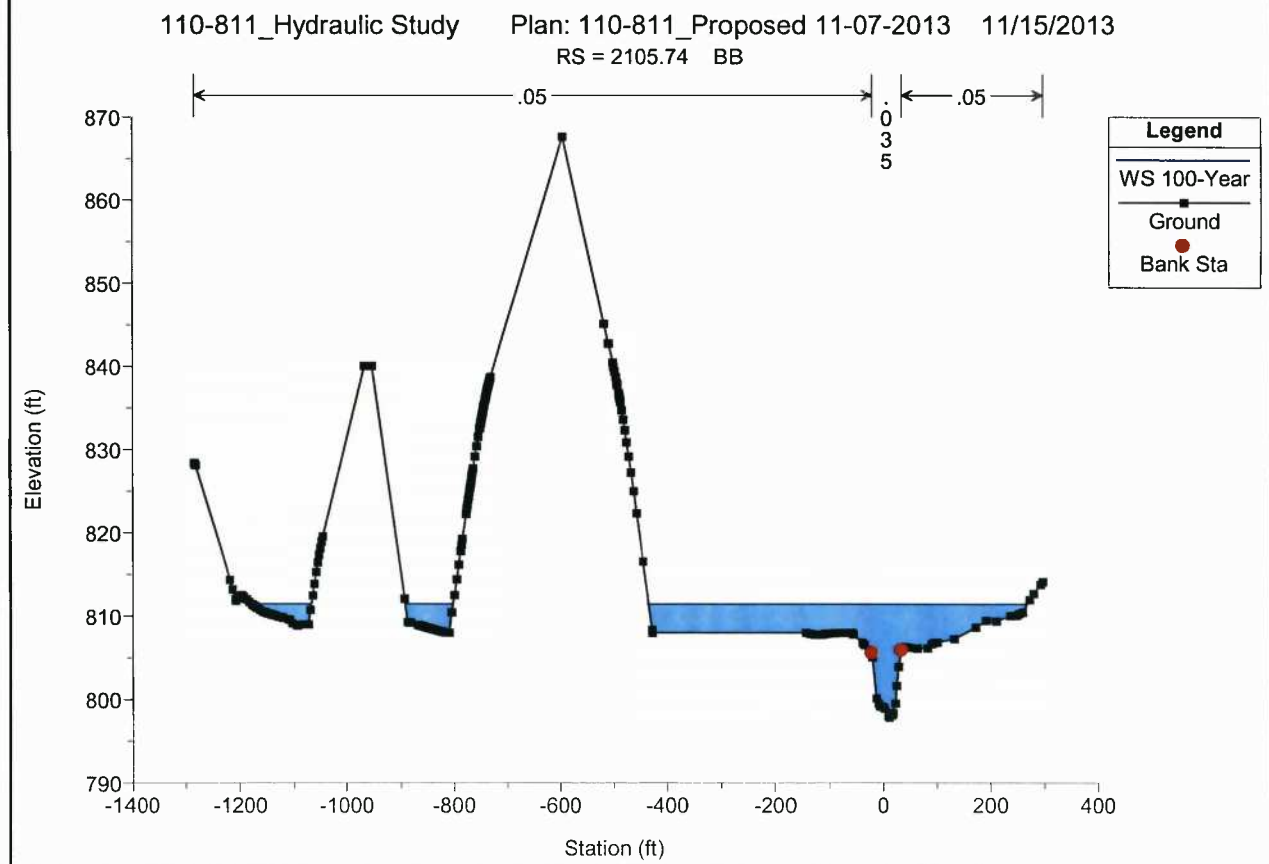
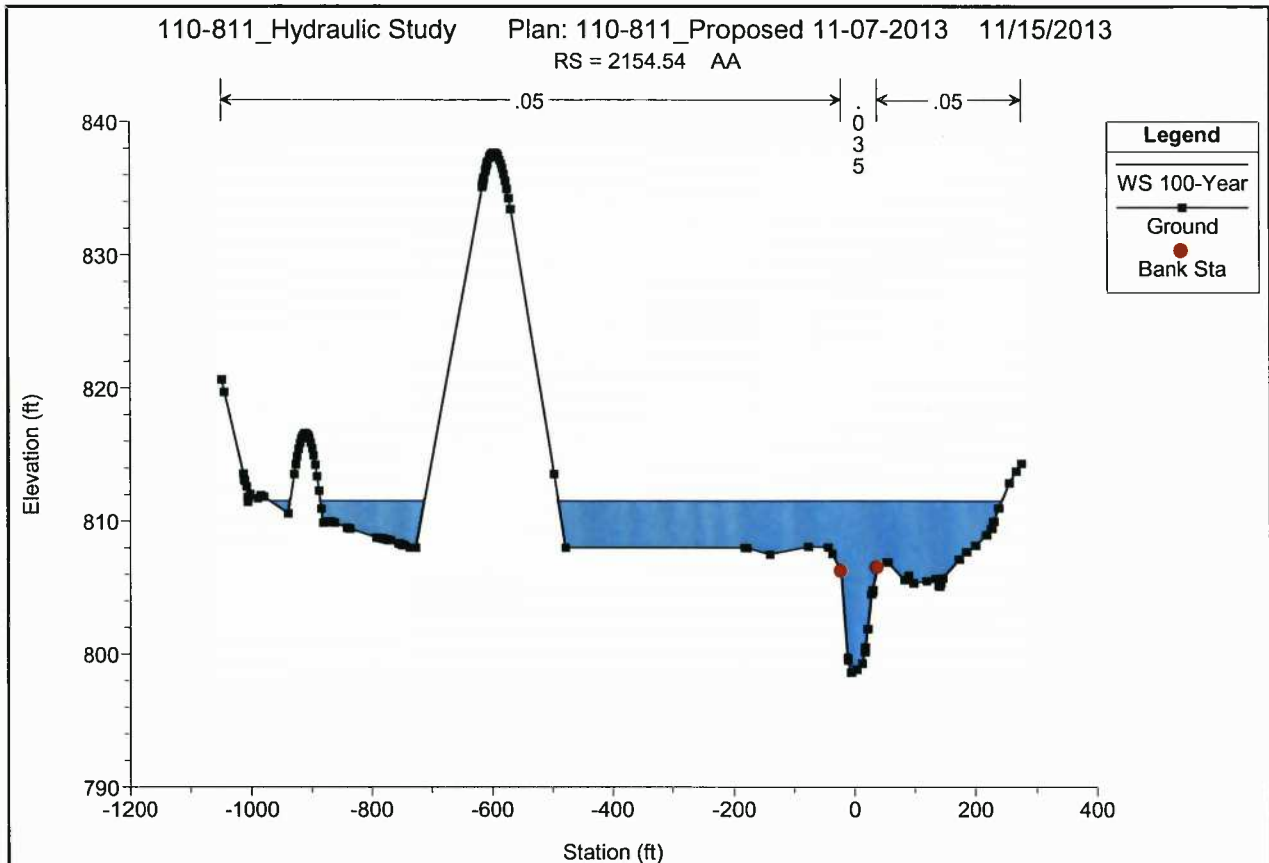
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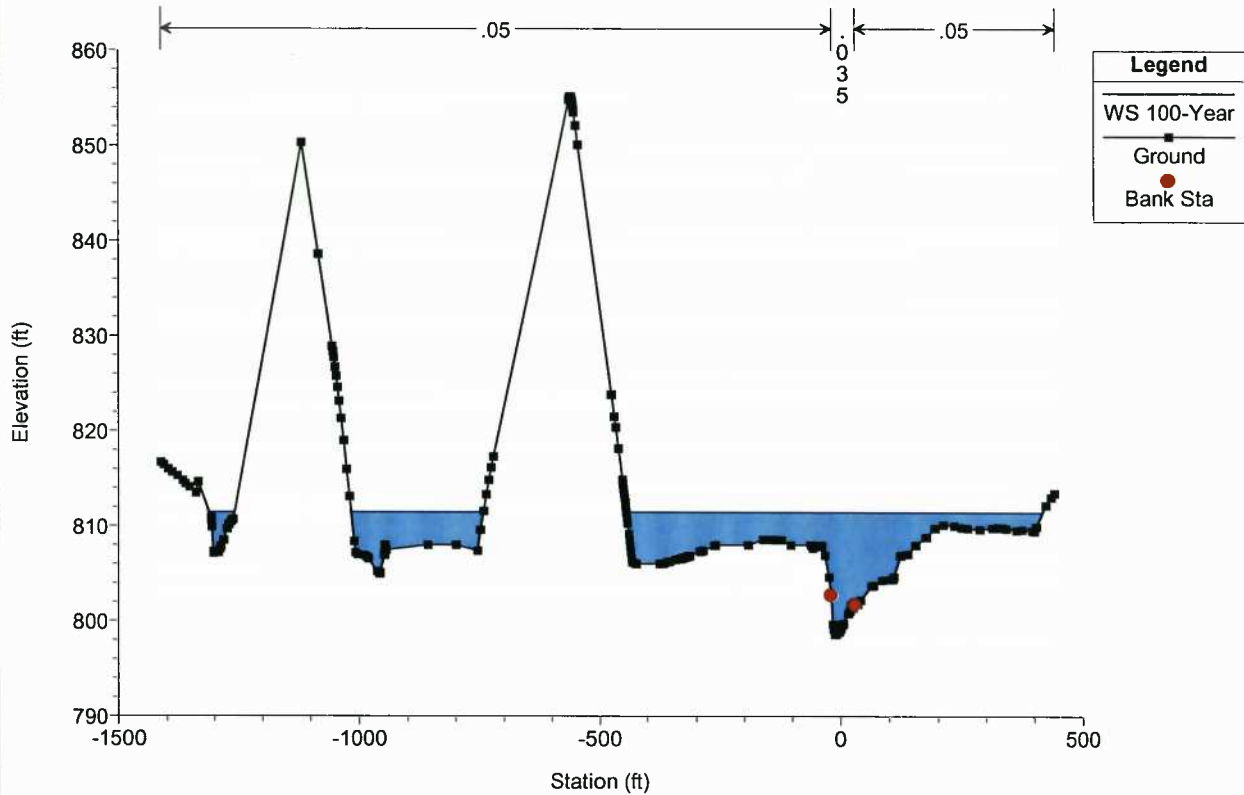
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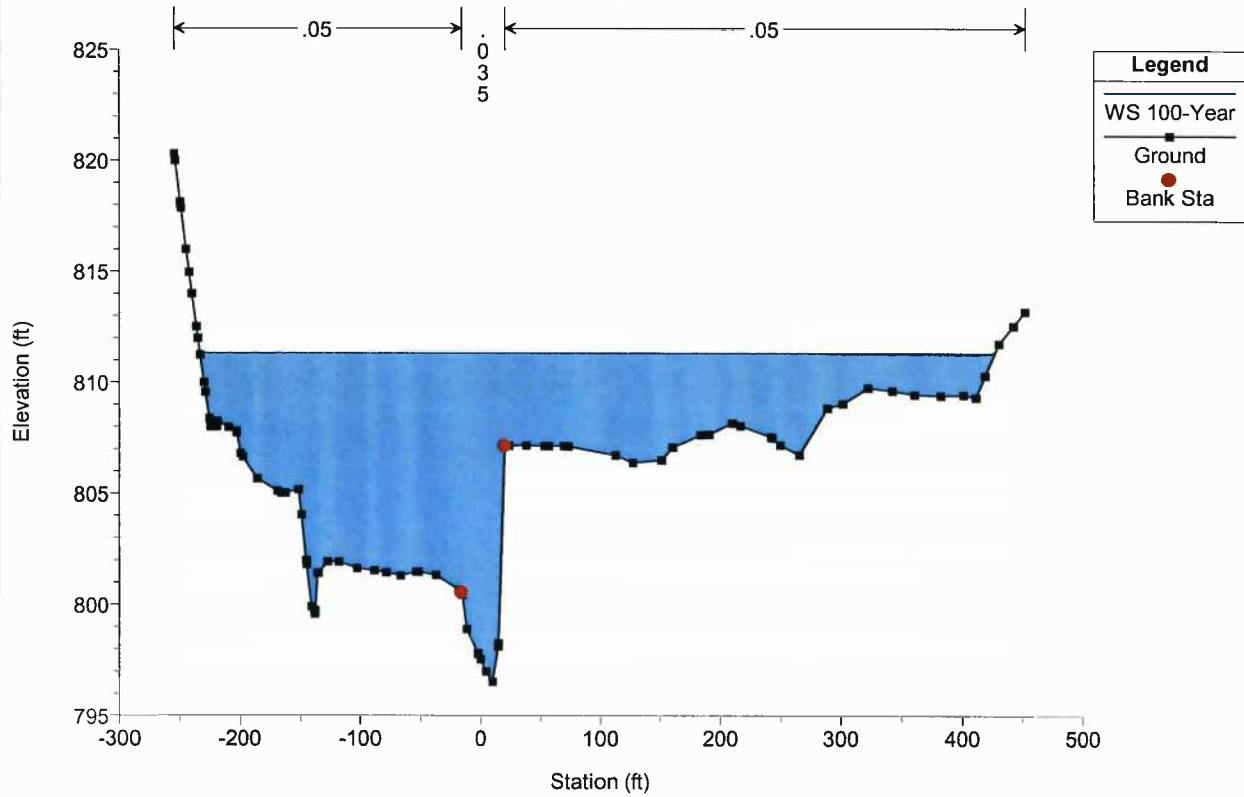




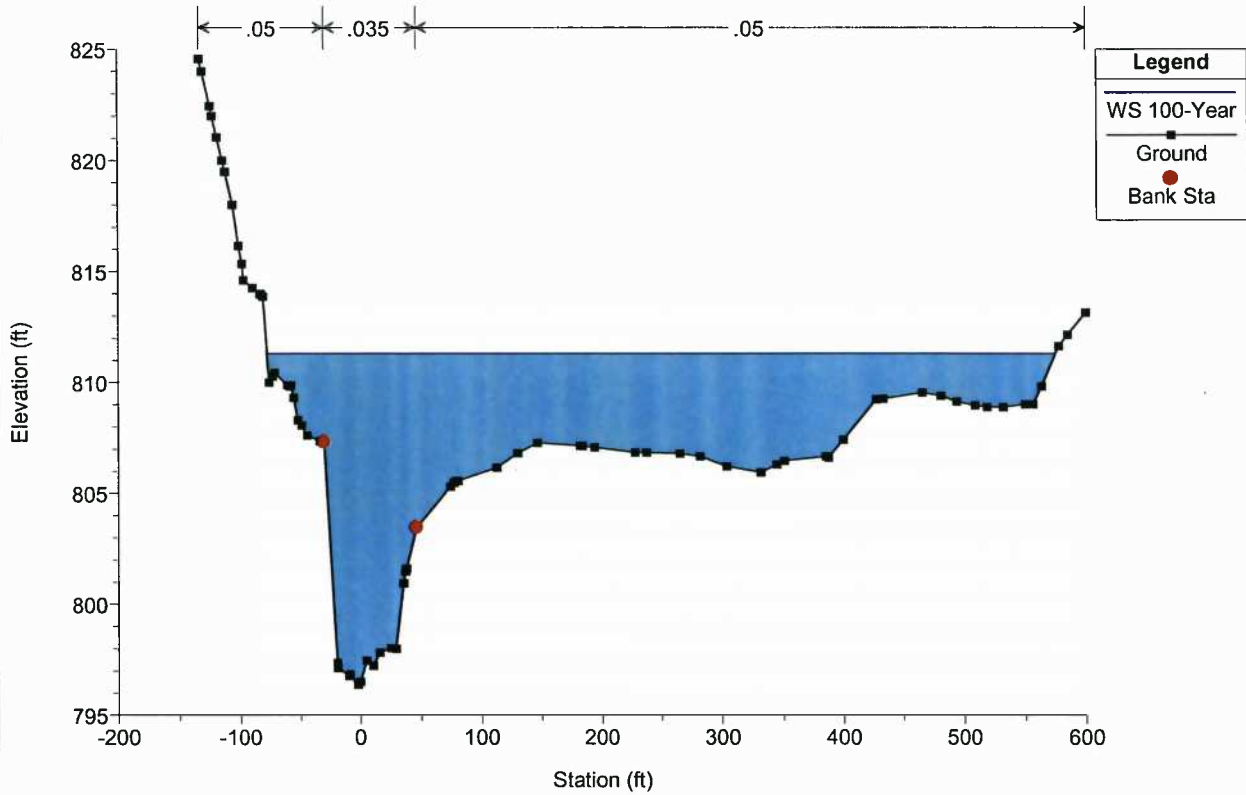
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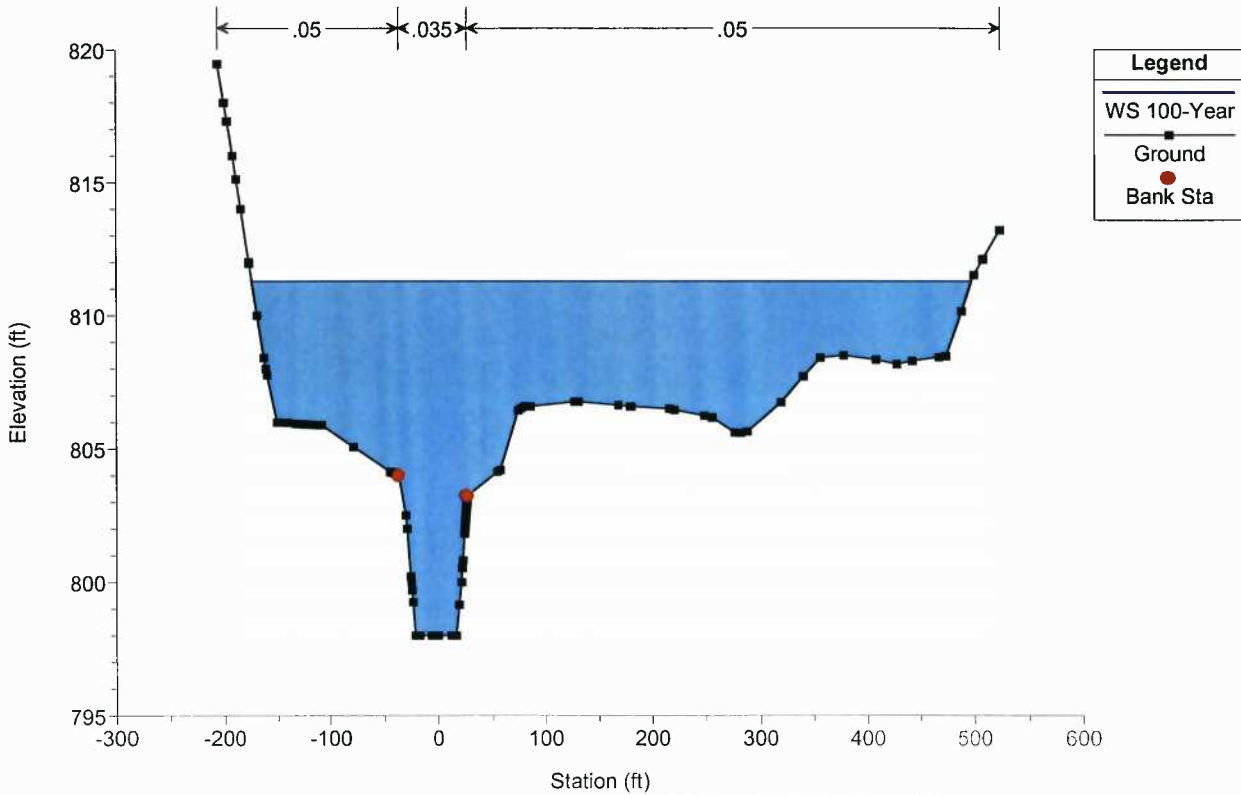
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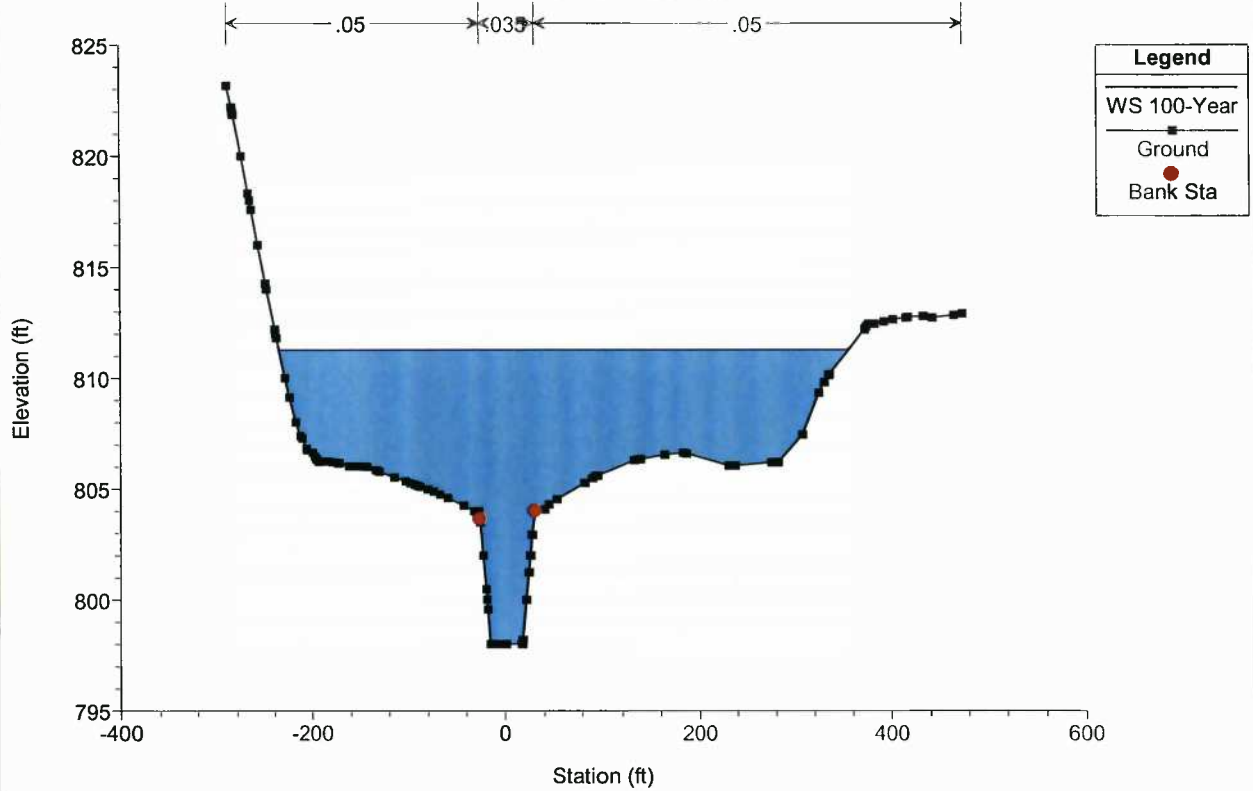
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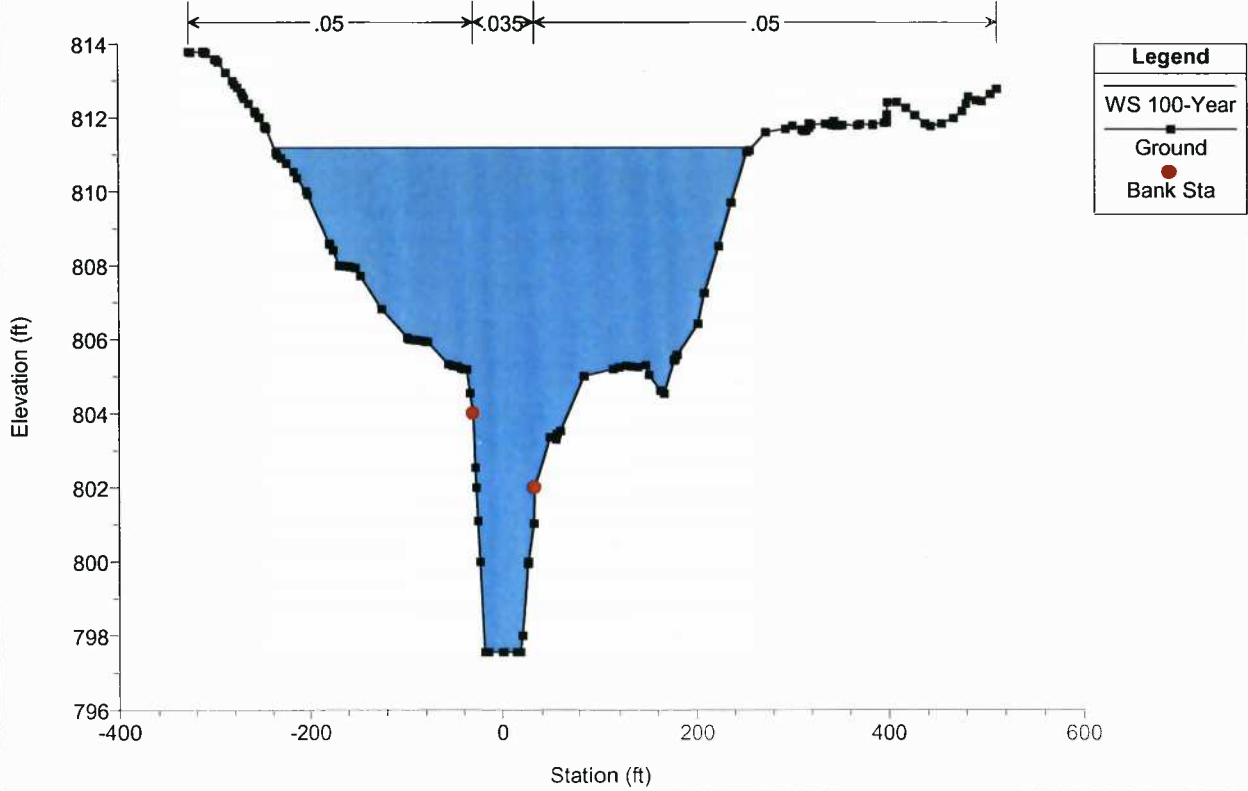
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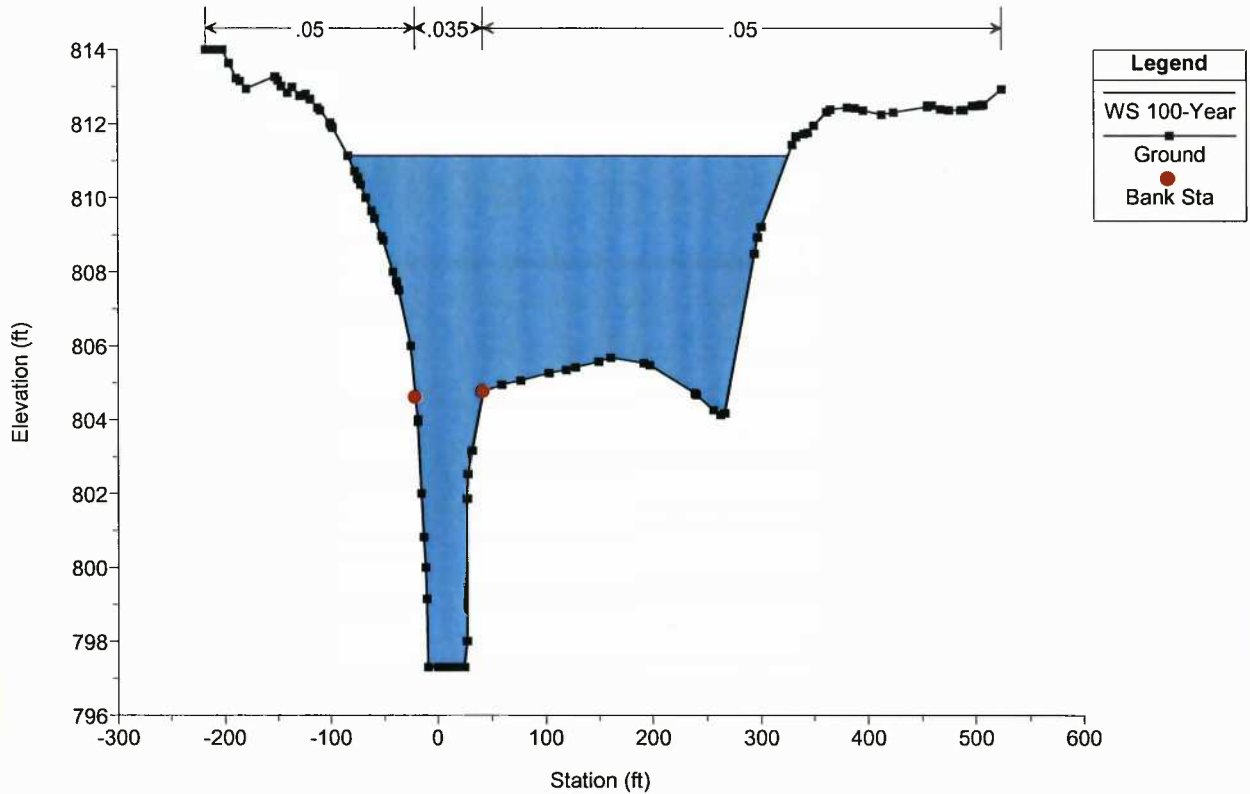
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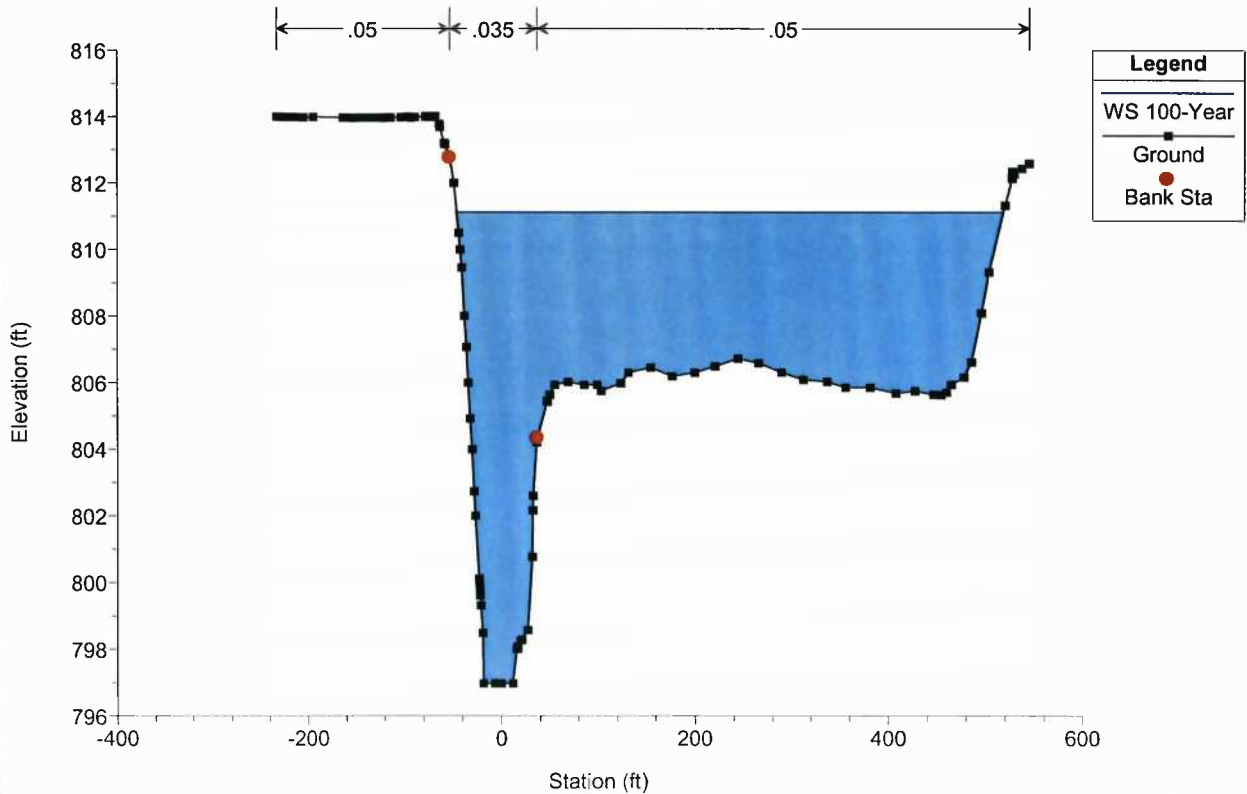
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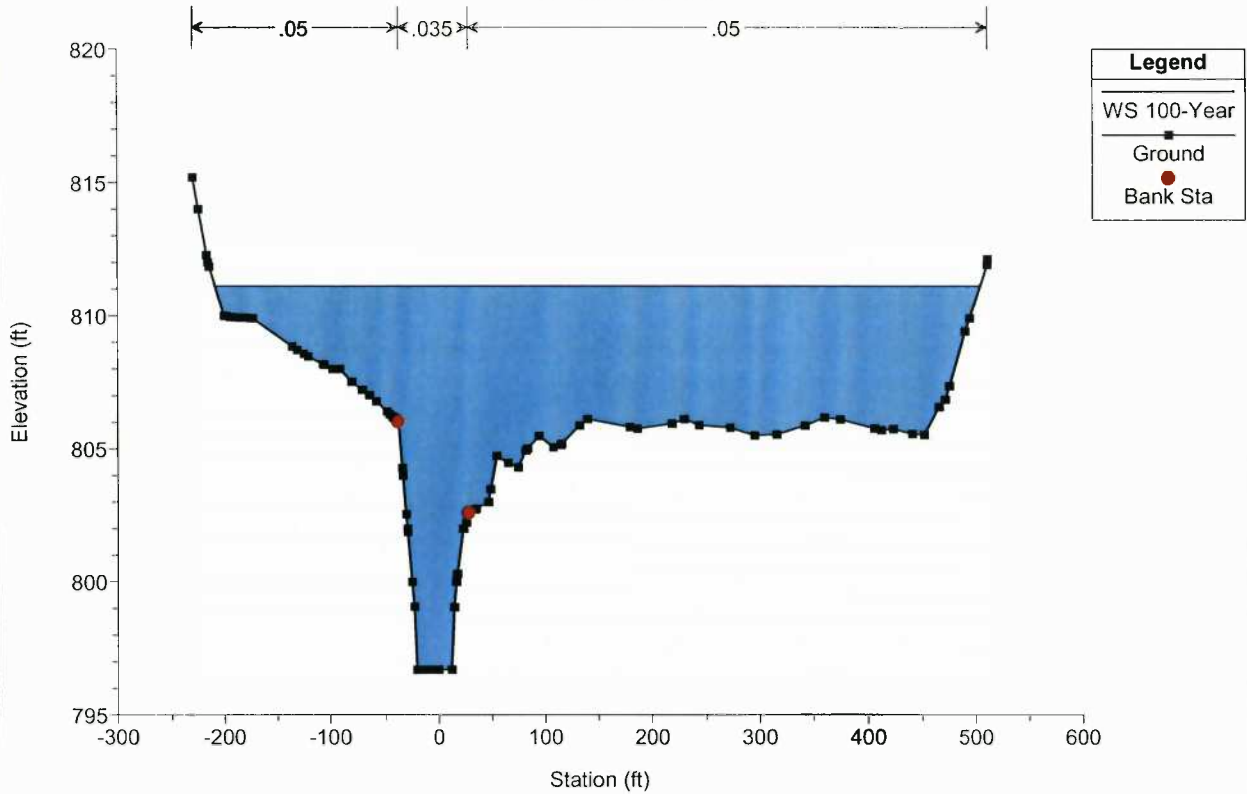
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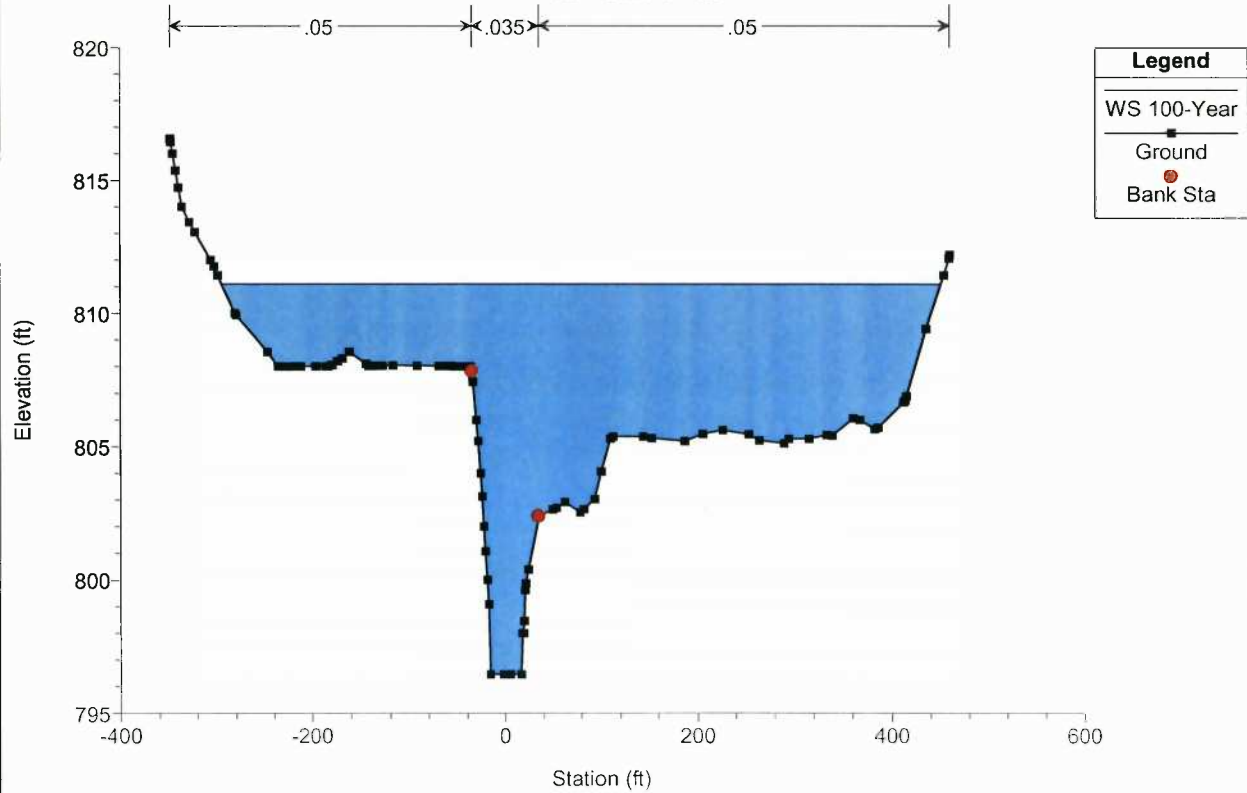
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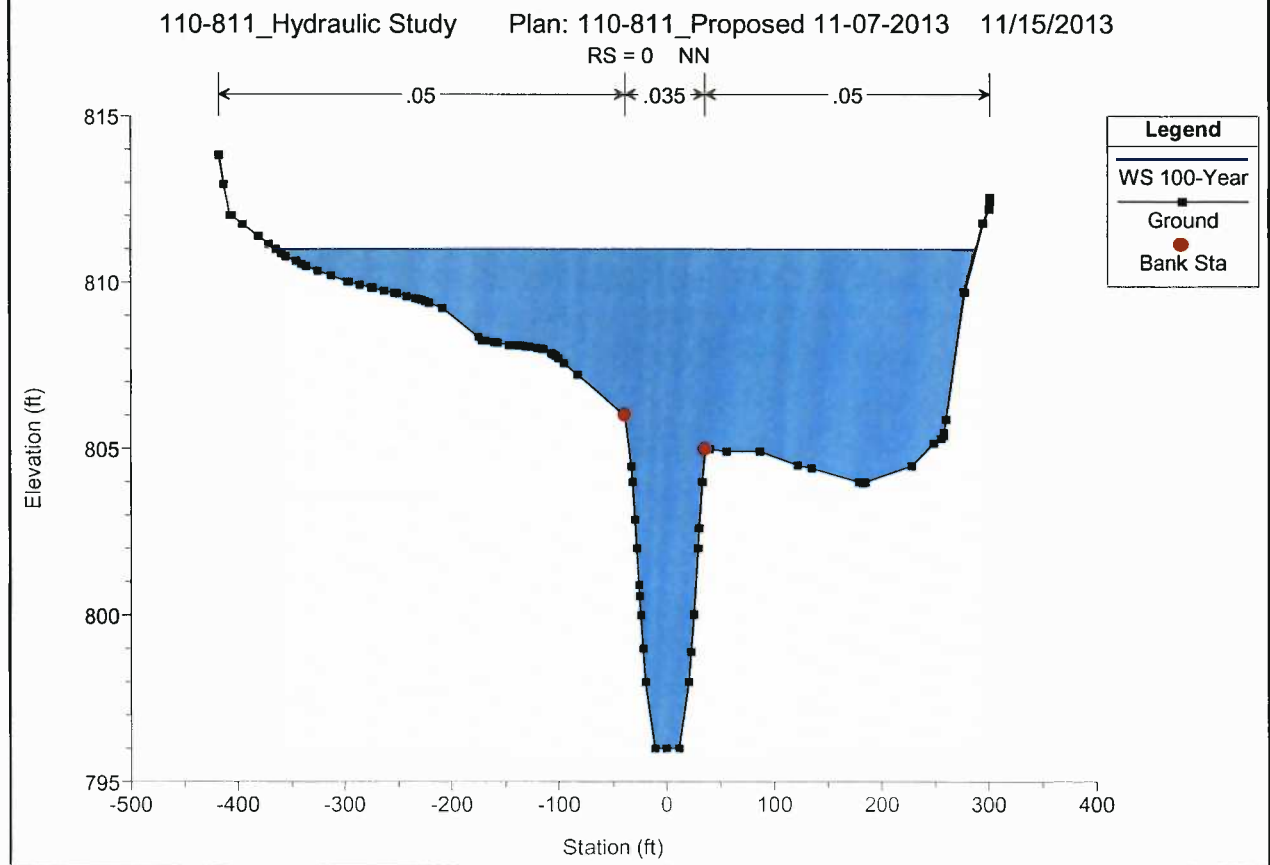
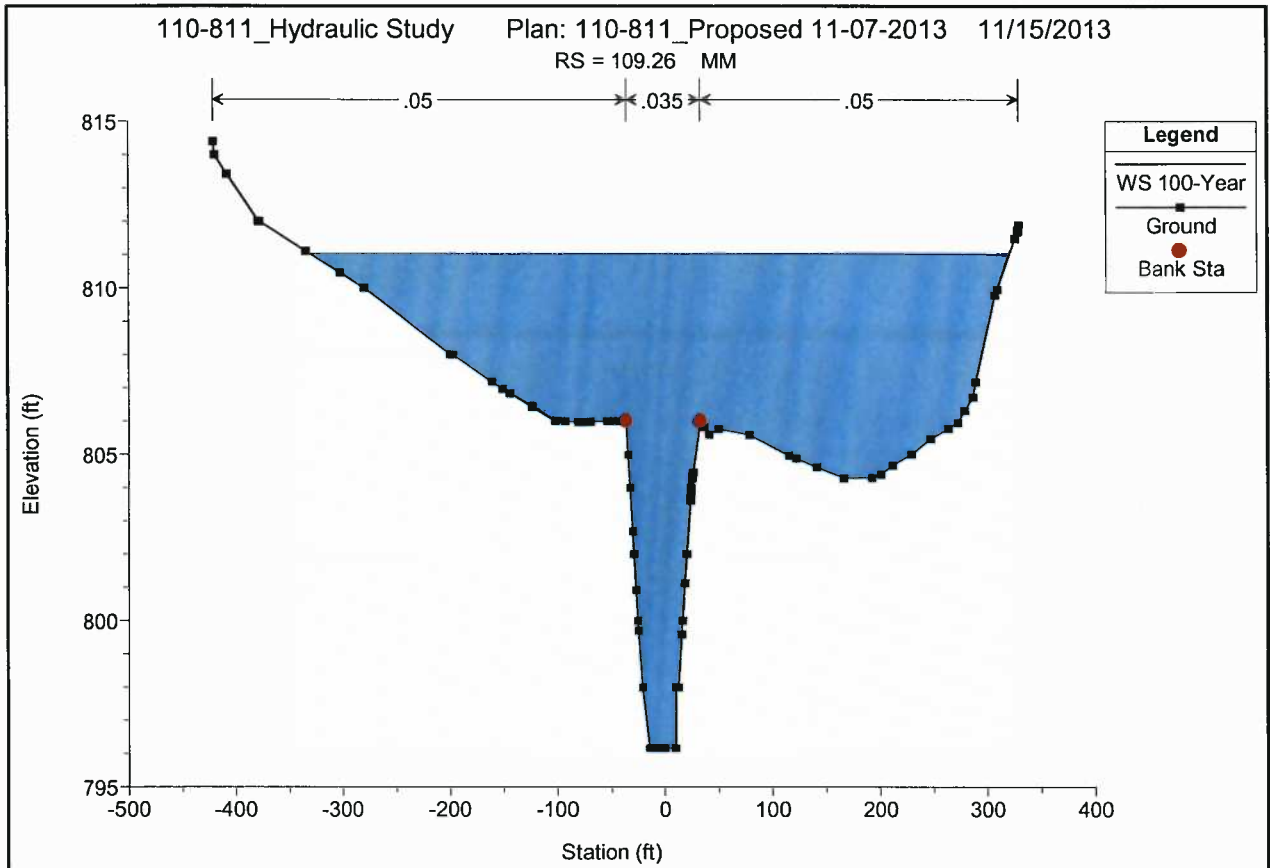
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110-811\_Hydraulic Study Plan: 110-811\_Proposed 11-07-2013 11/15/2013  
RS = 289.71 LL







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**APPENDIX E**

**HEC-RAS SUMMARY OF EXISTING AND PROPOSED  
HYDRAULIC CALCULATIONS**

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EXISTING

HEC-RAS Plan: ex River: Buckeye Creek Reach: Buckeye Creek Profile: 100-Year

Reach	River Sta	Profile	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
Buckeye Creek	3504.54	100-Year	5150.00	804.44	813.98		814.77	0.001945	7.15	728.25	104.91	0.45
Buckeye Creek	3454.54	100-Year	5150.00	804.38	813.54		814.63	0.002644	8.55	669.70	123.75	0.54
Buckeye Creek	3404.54	100-Year	5150.00	804.32	813.15		814.46	0.003440	9.38	608.41	113.94	0.61
Buckeye Creek	3354.54	100-Year	5150.00	804.25	813.21		814.22	0.002567	8.42	775.58	198.05	0.53
Buckeye Creek	3304.54	100-Year	5150.00	804.25	813.09		814.09	0.002669	8.44	783.65	214.04	0.54
Buckeye Creek	3254.54	100-Year	5150.00	804.12	813.18		813.89	0.001955	7.35	987.05	271.26	0.46
Buckeye Creek	3204.54	100-Year	5150.00	804.05	813.14		813.77	0.001761	7.09	1080.06	298.77	0.44
Buckeye Creek	3154.54	100-Year	5150.00	803.90	813.13		813.66	0.001516	6.69	1236.85	359.47	0.41
Buckeye Creek	3104.54	100-Year	5150.00	803.47	813.13		813.57	0.001277	6.17	1397.63	418.50	0.38
Buckeye Creek	3054.54	100-Year	5150.00	803.04	813.12		813.50	0.001105	5.77	1516.90	457.93	0.35
Buckeye Creek	3004.54	100-Year	5150.00	802.19	813.13		813.44	0.000895	5.31	1711.40	501.13	0.32
Buckeye Creek	2954.54	100-Year	5150.00	802.19	813.16		813.38	0.000698	4.79	2013.48	548.72	0.28
Buckeye Creek	2904.54	100-Year	5150.00	802.00	813.18		813.33	0.000477	3.96	2379.27	605.56	0.23
Buckeye Creek	2854.54	100-Year	5150.00	802.00	813.19		813.30	0.000361	3.53	2686.76	650.22	0.20
Buckeye Creek	2804.54	100-Year	5150.00	802.00	813.19		813.28	0.000308	3.20	2973.86	683.40	0.18
Buckeye Creek	2754.54	100-Year	5150.00	802.00	813.17		813.26	0.000323	3.41	2979.68	716.87	0.19
Buckeye Creek	2704.54	100-Year	5150.00	802.00	813.03		813.23	0.000598	4.61	2332.83	758.78	0.26
Buckeye Creek	2661.29	100-Year	5150.00	802.00	812.92	809.61	813.19	0.000753	5.23	1890.11	790.57	0.29
Buckeye Creek	2603.43	100-Year	5150.00	802.00	812.90	809.29	813.11	0.000580	4.71	1989.46	948.22	0.26
Buckeye Creek	2554.54	100-Year	5150.00	800.98	812.59	809.13	813.05	0.001076	6.11	1311.55	897.47	0.35
Buckeye Creek	2494.62	100-Year	5150.00	799.17	810.75	808.31	812.78	0.003845	11.43	450.53	90.80	0.65
Buckeye Creek	2460.04	Bridge										
Buckeye Creek	2417.85	100-Year	5150.00	798.50	810.20	808.31	812.37	0.004379	11.99	449.10	328.02	0.68
Buckeye Creek	2354.53	100-Year	5150.00	797.95	811.43		811.70	0.000761	5.48	1958.87	564.25	0.29
Buckeye Creek	2306.38	100-Year	5150.00	798.34	811.42		811.61	0.000648	4.95	2332.46	710.67	0.27
Buckeye Creek	2254.54	100-Year	5150.00	798.53	811.43		811.56	0.000476	4.18	2824.02	832.81	0.23
Buckeye Creek	2204.54	100-Year	5150.00	798.81	811.46		811.51	0.000236	3.00	3956.71	1014.95	0.16
Buckeye Creek	2154.54	100-Year	5150.00	798.60	811.46		811.50	0.000163	2.44	4714.72	1211.03	0.14
Buckeye Creek	2105.74	100-Year	5150.00	797.84	811.45		811.49	0.000161	2.57	4984.39	1422.68	0.14
Buckeye Creek	1903.41	100-Year	5150.00	798.59	811.44		811.46	0.000097	2.08	6304.55	1658.44	0.11
Buckeye Creek	1604.54	100-Year	5150.00	796.53	811.35		811.40	0.000177	2.79	3531.91	659.94	0.14
Buckeye Creek	1419.72	100-Year	5150.00	796.37	811.29		811.38	0.000197	3.06	3150.05	652.23	0.15
Buckeye Creek	1234.05	100-Year	5150.00	798.00	811.28		811.35	0.000169	2.82	3553.28	671.93	0.14
Buckeye Creek	1102.70	100-Year	5150.00	798.00	811.25		811.32	0.000185	2.93	3345.53	589.97	0.15
Buckeye Creek	972.12	100-Year	5150.00	797.56	811.18		811.29	0.000228	3.38	2761.62	496.01	0.17
Buckeye Creek	810.82	100-Year	5150.00	797.30	811.13		811.25	0.000312	3.58	2385.42	408.81	0.19
Buckeye Creek	632.35	100-Year	5150.00	796.97	811.11		811.18	0.000189	2.72	3224.53	564.55	0.15
Buckeye Creek	433.99	100-Year	5150.00	796.70	811.10		811.15	0.000148	2.61	3762.86	712.65	0.13
Buckeye Creek	289.71	100-Year	5150.00	796.46	811.09		811.14	0.000137	2.45	3910.40	744.61	0.13
Buckeye Creek	109.26	100-Year	5150.00	796.17	811.03		811.10	0.000200	2.91	3270.82	651.91	0.15
Buckeye Creek	0	100-Year	5150.00	796.00	811.00	803.91	811.08	0.000191	2.96	3099.82	653.27	0.15

PREPARED BY: T-G-J  
CHECKED BY: A-L-G

DATE: 11/20/2013  
DATE: 02-DEC-2013

PROPOSED

HEC-RAS Plan: prop River: Buckeye Creek Reach: Buckeye Creek Profile: 100-Year

Reach	River Sta	Profile	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
Buckeye Creek	3504.54	100-Year	5150.00	804.44	814.12		814.88	0.001833	7.02	742.94	106.62	0.44
Buckeye Creek	3454.54	100-Year	5150.00	804.38	813.72		814.75	0.002433	8.32	692.30	126.50	0.52
Buckeye Creek	3404.54	100-Year	5150.00	804.32	813.38		814.60	0.003073	9.06	635.49	116.93	0.58
Buckeye Creek	3354.54	100-Year	5150.00	804.25	813.47		814.37	0.002225	8.02	827.55	199.51	0.50
Buckeye Creek	3304.54	100-Year	5150.00	804.25	813.37		814.26	0.002293	8.01	846.85	230.48	0.50
Buckeye Creek	3254.54	100-Year	5150.00	804.12	813.45	810.89	814.08	0.001685	6.98	999.10	273.88	0.43
Buckeye Creek	3204.54	100-Year	5150.00	804.05	813.40	810.81	813.99	0.001554	6.81	1047.65	305.51	0.42
Buckeye Creek	3154.54	100-Year	5150.00	803.90	813.32	810.97	813.91	0.001555	6.88	1018.04	291.93	0.42
Buckeye Creek	3104.54	100-Year	5150.00	803.47	813.21	810.52	813.83	0.001599	6.95	993.74	222.49	0.42
Buckeye Creek	3054.54	100-Year	5150.00	803.04	813.15		813.75	0.001511	6.76	1018.55	211.10	0.41
Buckeye Creek	3004.54	100-Year	5150.00	802.19	813.12		813.68	0.001376	6.58	1090.00	242.18	0.39
Buckeye Creek	2954.54	100-Year	5150.00	802.19	813.08		813.60	0.001304	6.51	1157.11	250.06	0.38
Buckeye Creek	2904.54	100-Year	5150.00	802.00	813.15		813.50	0.000888	5.39	1402.69	295.51	0.32
Buckeye Creek	2854.58	100-Year	5150.00	802.00	813.17	808.73	813.44	0.000664	4.78	1595.81	477.09	0.27
Buckeye Creek	2804.54	100-Year	5150.00	802.00	813.17	809.69	813.39	0.000620	4.53	1695.27	653.35	0.26
Buckeye Creek	2754.54	100-Year	5150.00	802.00	813.16	809.03	813.36	0.000539	4.41	1786.90	581.95	0.24
Buckeye Creek	2704.54	100-Year	5150.00	802.00	813.02	809.53	813.32	0.000761	5.19	1438.06	305.49	0.29
Buckeye Creek	2661.29	100-Year	5150.00	802.00	812.92	809.57	813.27	0.000862	5.60	1338.89	286.14	0.31
Buckeye Creek	2603.43	100-Year	5150.00	802.00	812.85	809.23	813.21	0.000807	5.54	1364.22	425.05	0.30
Buckeye Creek	2554.54	100-Year	5150.00	800.98	812.67	809.14	813.15	0.001069	6.13	1192.91	739.50	0.35
Buckeye Creek	2494.62	100-Year	5150.00	799.17	810.93	808.31	812.89	0.003616	11.22	458.90	94.23	0.63
Buckeye Creek	2460.04	Bridge										
Buckeye Creek	2417.85	100-Year	5150.00	798.50	810.27	808.31	812.41	0.004266	11.90	452.88	317.09	0.67
Buckeye Creek	2354.53	100-Year	5150.00	797.95	811.45		811.75	0.000813	5.68	1812.50	489.46	0.30
Buckeye Creek	2306.38	100-Year	5150.00	798.34	811.47		811.66	0.000622	4.86	2207.41	566.82	0.26
Buckeye Creek	2254.54	100-Year	5150.00	798.53	811.48		811.60	0.000464	4.14	2794.11	785.48	0.23
Buckeye Creek	2204.54	100-Year	5150.00	798.81	811.51		811.56	0.000228	2.95	4005.44	1016.43	0.16
Buckeye Creek	2154.54	100-Year	5150.00	798.60	811.48		811.54	0.000247	3.02	3613.34	937.71	0.17
Buckeye Creek	2105.74	100-Year	5150.00	797.84	811.43		811.53	0.000303	3.52	3263.39	902.57	0.19
Buckeye Creek	1903.41	100-Year	5150.00	798.59	811.43		811.47	0.000158	2.65	4724.19	1186.69	0.14
Buckeye Creek	1604.54	100-Year	5150.00	796.53	811.35		811.40	0.000177	2.79	3531.91	659.94	0.14
Buckeye Creek	1419.72	100-Year	5150.00	796.37	811.29		811.38	0.000197	3.06	3150.05	652.23	0.15
Buckeye Creek	1234.05	100-Year	5150.00	798.00	811.28		811.35	0.000169	2.82	3553.28	671.93	0.14
Buckeye Creek	1102.70	100-Year	5150.00	798.00	811.25		811.32	0.000185	2.93	3345.53	589.97	0.15
Buckeye Creek	972.12	100-Year	5150.00	797.56	811.18		811.29	0.000228	3.38	2761.62	496.01	0.17
Buckeye Creek	810.82	100-Year	5150.00	797.30	811.13		811.25	0.000312	3.58	2385.42	408.81	0.19
Buckeye Creek	632.35	100-Year	5150.00	796.97	811.11		811.18	0.000189	2.72	3224.53	564.55	0.15
Buckeye Creek	433.99	100-Year	5150.00	796.70	811.10		811.15	0.000148	2.61	3762.86	712.65	0.13
Buckeye Creek	289.71	100-Year	5150.00	796.46	811.09		811.14	0.000137	2.45	3910.40	744.61	0.13
Buckeye Creek	109.26	100-Year	5150.00	796.17	811.03		811.10	0.000200	2.91	3270.82	651.91	0.15
Buckeye Creek	0	100-Year	5150.00	796.00	811.00	803.91	811.08	0.000191	2.96	3099.82	653.27	0.15

PREPARED BY: TWS  
CHECKED BY: ALG

DATE: 11/20/2013  
DATE: 02-DEC-2013

Buckeye Creek  
 Existing vs. Proposed HEC-RAS Models  
 100-Year Water Surface Elevations Summary  
 Sherwood Gas Processing Plant - Doddridge County, WV  
 Project: 110-811

PREPARED BY: TGJ  
 DATE: 11/20/2013  
 CHECKED: *AKG*  
 DATE: *02-13-2013*

ID	River Station	100-Year Peak Flow (cfs)	Water Surface Elevations Existing	Water Surface Elevations Proposed	Water Surface Elevations Existing vs. Proposed
A	35+04.54	5150	813.98	814.12	0.14
B	34+54.54	5150	813.54	813.72	0.18
C	34+04.54	5150	813.15	813.38	0.23
D	33+54.54	5150	813.21	813.47	0.26
E	33+04.54	5150	813.09	813.37	0.28
F	32+54.54	5150	813.18	813.45	0.27
G	32+04.54	5150	813.14	813.40	0.26
H	31+54.54	5150	813.13	813.32	0.19
I	31+04.54	5150	813.13	813.21	0.08
J	30+54.54	5150	813.12	813.15	0.03
K	30+04.54	5150	813.13	813.12	-0.01
L	29+54.54	5150	813.16	813.08	-0.08
M	29+04.54	5150	813.18	813.15	-0.03
N	28+54.58	5150	813.19	813.17	-0.02
O	28+04.54	5150	813.19	813.17	-0.02
P	27+54.54	5150	813.17	813.16	-0.01
Q	27+04.54	5150	813.03	813.02	-0.01
R	26+61.29	5150	812.92	812.92	0.00
S	26+03.43	5150	812.90	812.85	-0.05
T	25+54.54	5150	812.59	812.67	0.08
U	24+94.62	5150	810.75	810.93	0.18
		New Bridge			
V	24+17.85	5150	810.20	810.27	0.07
W	23+54.53	5150	811.43	811.45	0.02
X	23+06.38	5150	811.42	811.47	0.05
Y	22+54.54	5150	811.43	811.48	0.05
Z	22+04.54	5150	811.46	811.51	0.05
AA	21+54.54	5150	811.46	811.48	0.02
BB	21+05.74	5150	811.45	811.43	-0.02
CC	19+03.41	5150	811.44	811.43	-0.01
DD	16+04.54	5150	811.35	811.35	0.00
EE	14+19.72	5150	811.29	811.29	0.00
FF	12+34.05	5150	811.28	811.28	0.00
GG	11+02.70	5150	811.25	811.25	0.00
HH	9+72.12	5150	811.18	811.18	0.00
II	8+10.82	5150	811.13	811.13	0.00
JJ	6+04.54	5150	811.11	811.11	0.00
KK	433.99	5150	811.10	811.10	0.00
LL	289.71	5150	811.09	811.09	0.00
MM	109.26	5150	811.03	811.03	0.00
NN	0	5150	811.00	811.00	0.00

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**APPENDIX F**

**DODDRIDGE COUNTY FLOODPLAIN PERMITS**

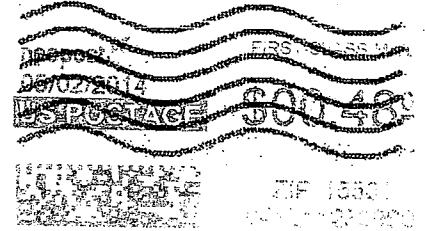
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**CME**  
ENGINEERING

CME Engineering LP  
165 East Union Street, Suite 100  
Somerset, PA 15501

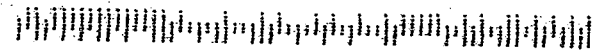
JOHNSTOWN PA 159

02 MAY 2014 PM 2 T



Ralph Sandora & Edwin Wriston  
Doddridge Mount Fidoplain Managers  
118 East Court Street  
West Union, WV 26456

2645601262





Antero Resources  
1625 17th Street  
Denver, Colorado 80202  
Office 303.357.7310  
Fax 303.357.7315

December 20, 2013

Doddridge County Commission  
Attn: Dan Wellings, Doddridge County Floodplain Manager  
118 East Court Street, Room 102  
West Union, WV 26456

Mr. Wellings:

Per your request, after your onsite inspection with Anthony Smith on 11/7/13, Antero Resources Corporation (Antero) would like to submit an updated HEC-RAS for our Buckeye Creek at Powell Withdrawal project. Our project is located in Doddridge County and according to the No Rise Certification; the water intake structure associate with the Powell Well pad will not impact the effective 100-year flood elevations, floodway elevations, or floodway widths on Buckeye Creek.

Attached you will find the following:

- Updated HEC-RAS
- No Rise Certification

If you have any questions please feel free to contact me at (303) 357-6820.

Thank you in advance.

Sincerely,

Shauna DeMattee  
Permit Representative  
Antero Resources Corporation

Enclosures

2013 DEC 27 PM 2:52  
BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

FILED





P.O. Box 254  
Dailey, WV 26259  
(304)338-6985

### **"NO-RISE" CERTIFICATION**

This is to certify that I am a duly qualified registered professional engineer licensed to practice in the State of West Virginia.

It is further to certify that the attached technical data supports the finding that the proposed Water Intake Structure Associated with Powell Well Pad will not impact the effective 100-year flood elevations, floodway elevations, or floodway widths on Buckeye Creek. The area of interest is located in a Zone AE with no floodway established as contained in the effective Flood Insurance Study for Doddridge County, WV and Incorporated Areas dated October 4, 2011 and Flood Insurance Rate Map Panel 54017C0140C.

Attached are the following documents that support the findings:

- Firm Flood Insurance Rate Map
- Flood Insurance Study Profile
- Plan of the proposed Tank Pad
- HEC-RAS Hydraulic Modeling Verifying that the Well Pad is out of the Regulatory Floodplain and Reasonably Safe from Flooding

Additional Notes:

*General:*

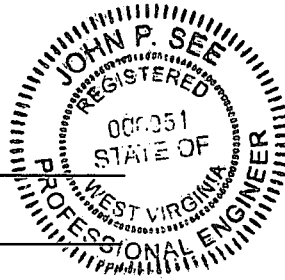
Although a portion of the Tank Pad is located within the Zone AE as delineated on the Flood Insurance Rate Map, NO fill will be placed below an elevation of 811-feet NAVD88 as detailed in the effective Flood Insurance Study profile. Additionally, a HEC-RAS Hydraulic Model was developed based on high resolution LiDAR Digital Elevation Model to verify that this area is outside the 1-Percent Annual Chance Flood inundation area; therefore reasonably safe from flooding.

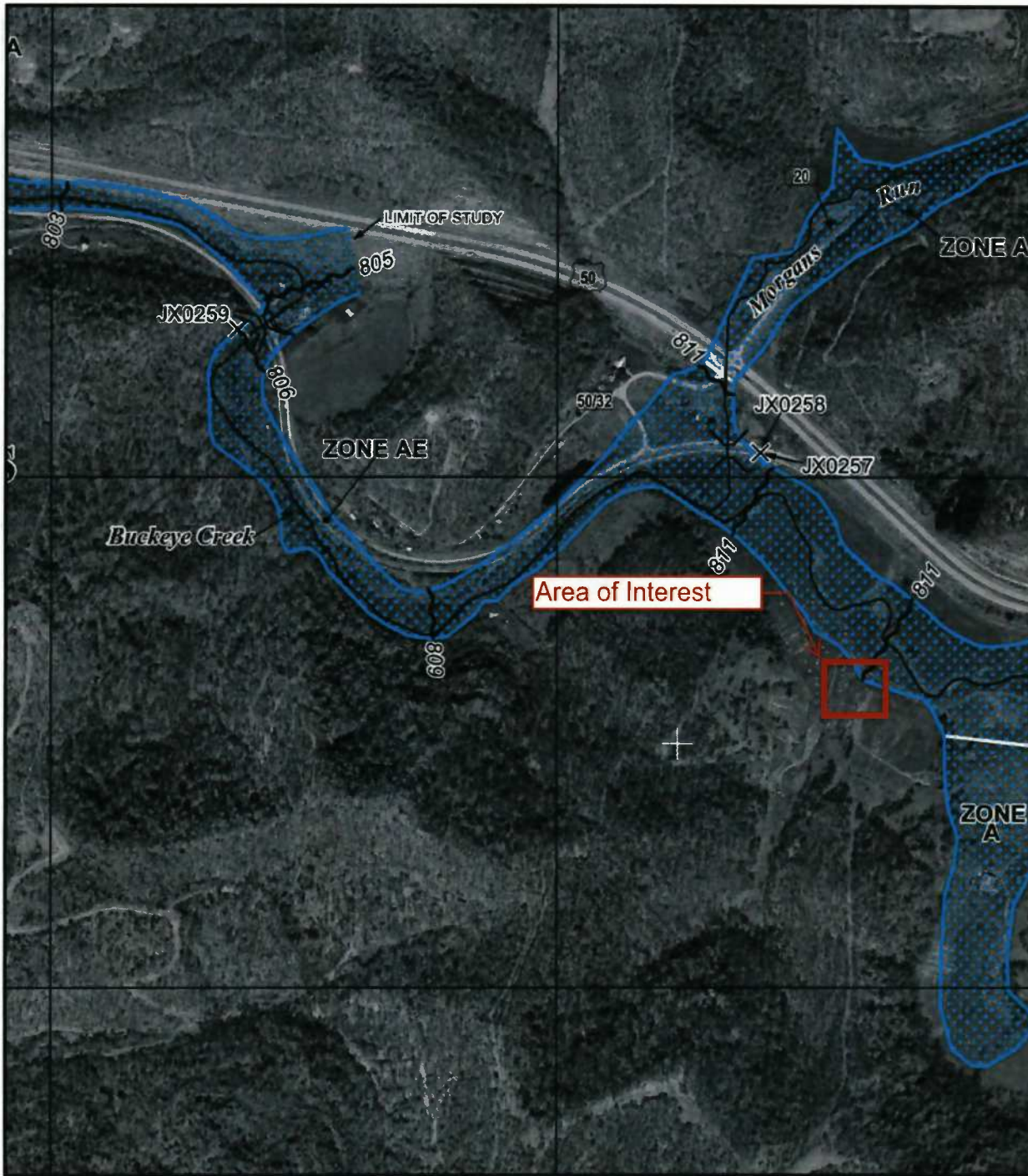
The proposed activity within the 1-Percent Annual Chance Flood boundary is isolated to the placement of a water withdraw intake within the stream channel, which will be located near the stream channel invert. It is not anticipated that this water intake will have a measurable effect on water surface elevations during flooding of any magnitude.

Date: 12/18/13

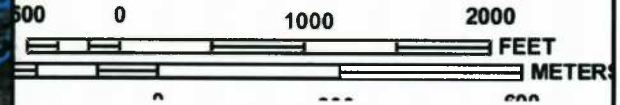
Signature: *Jlee*

Title: ENGINEER





MAP SCALE 1" = 1000'



NFP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0140C

**FIRM**

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

PANEL 140 OF 325  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	540024	0140	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  
54017C0140C**

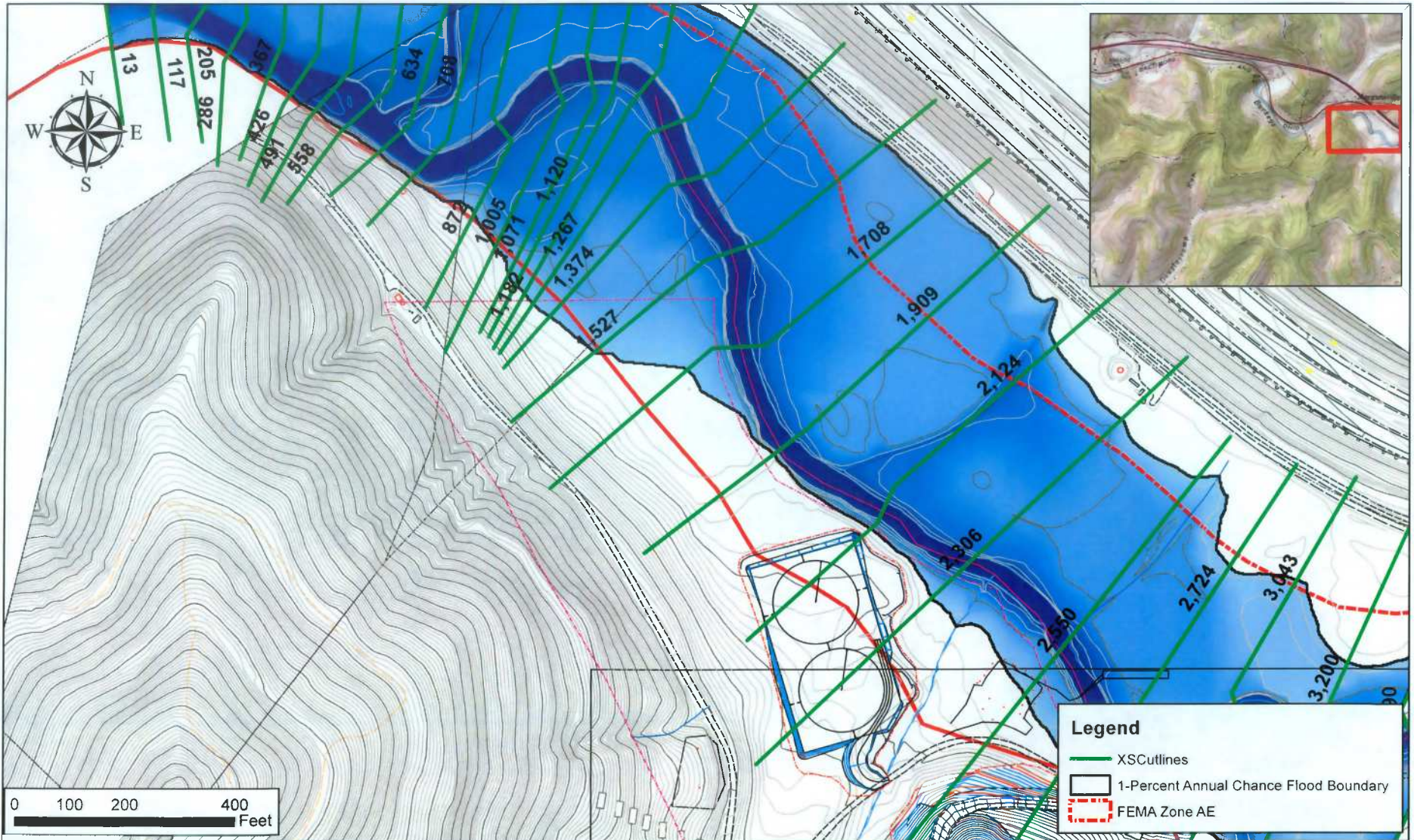
**MAP REVISED  
OCTOBER 4, 2011**

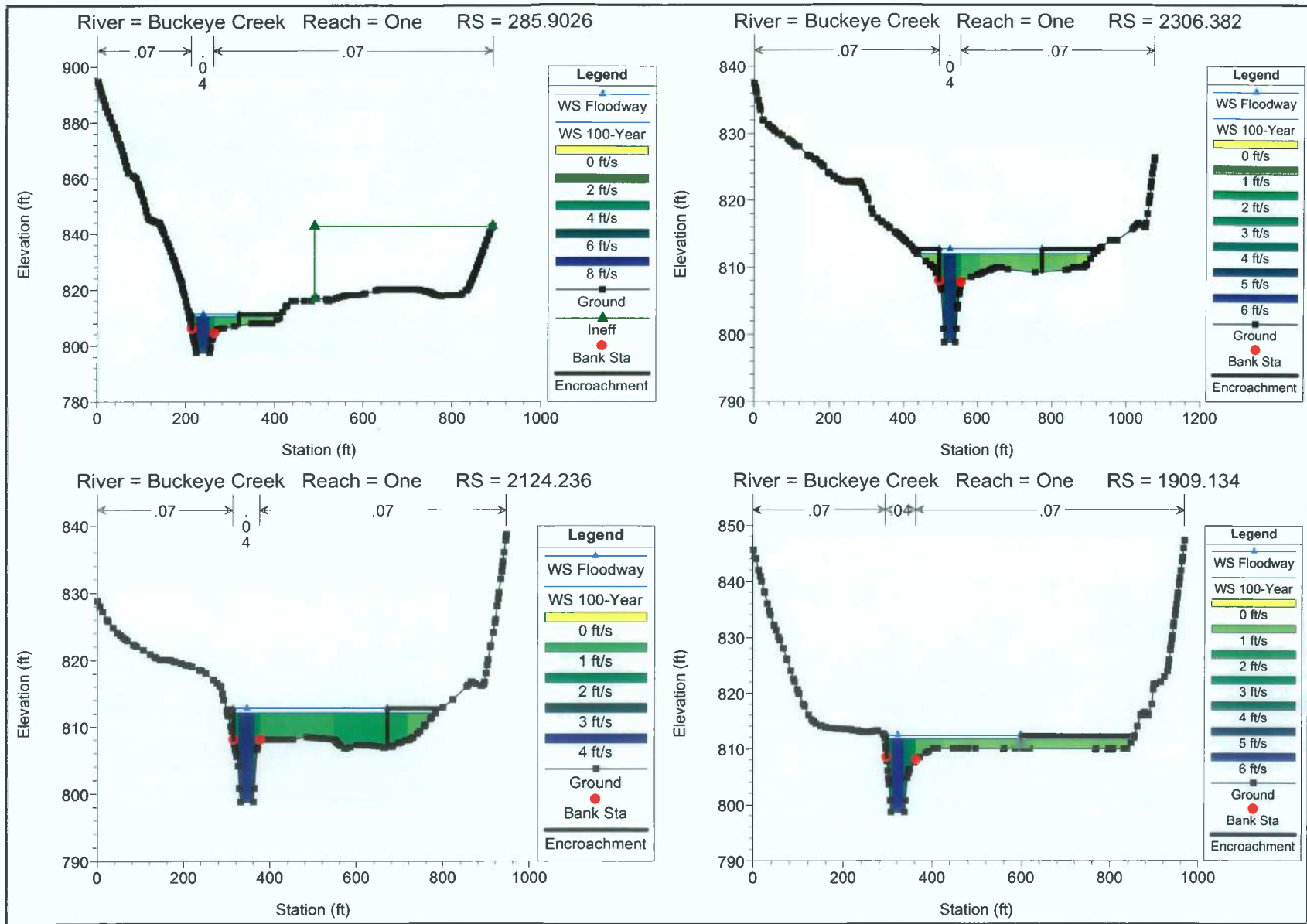
Federal Emergency Management Agency

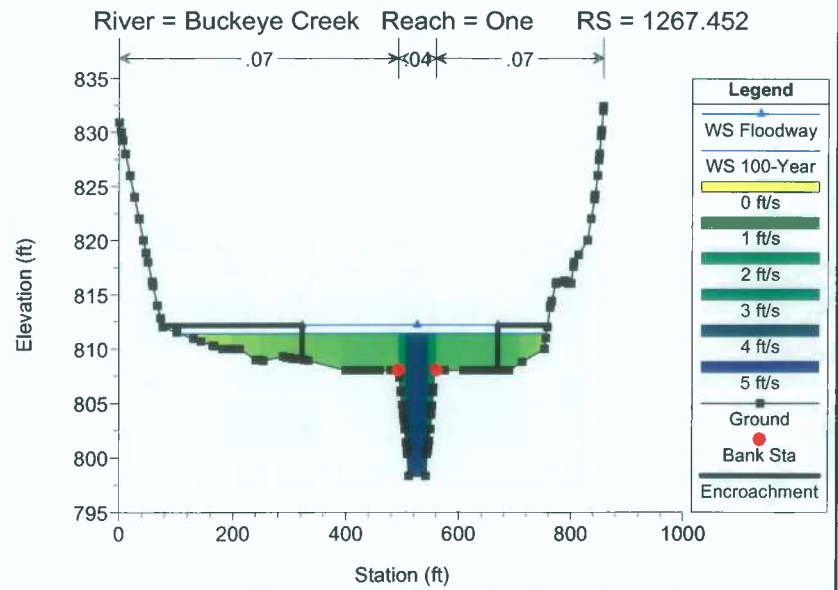
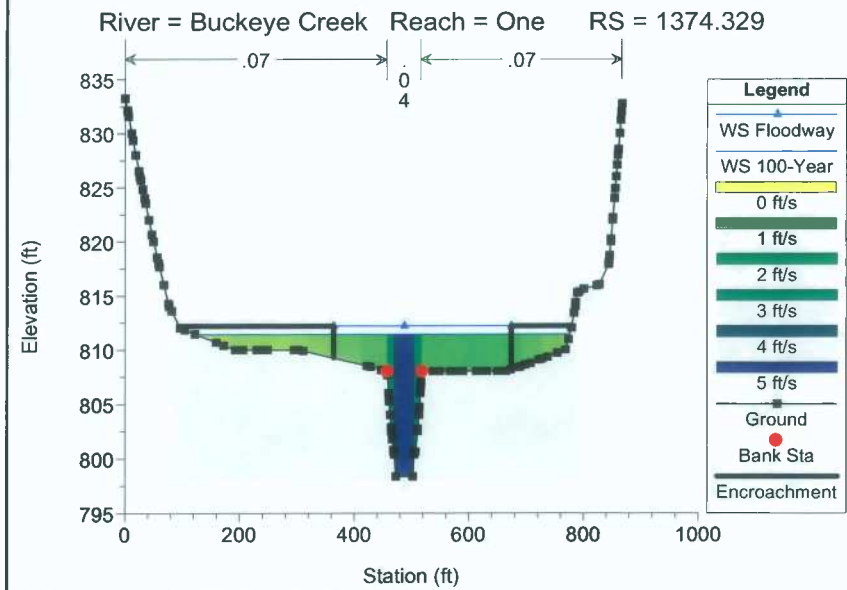
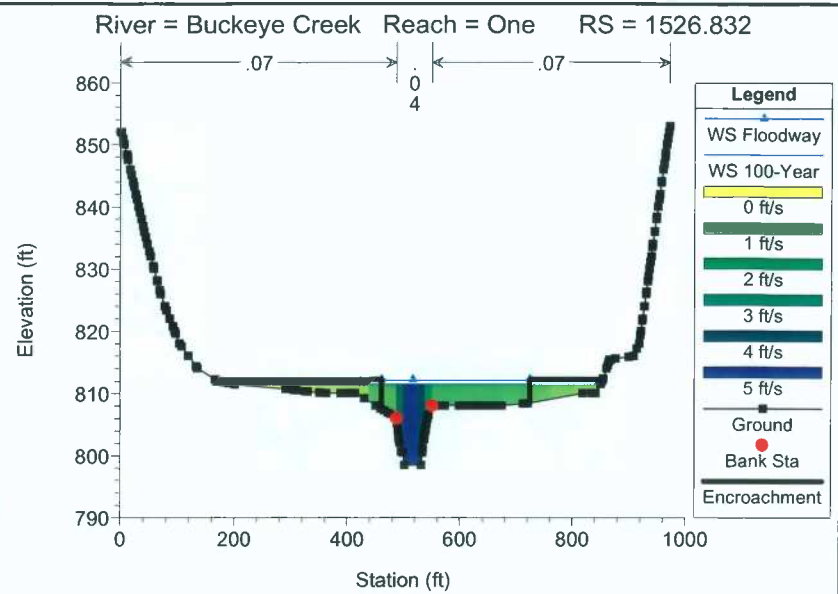
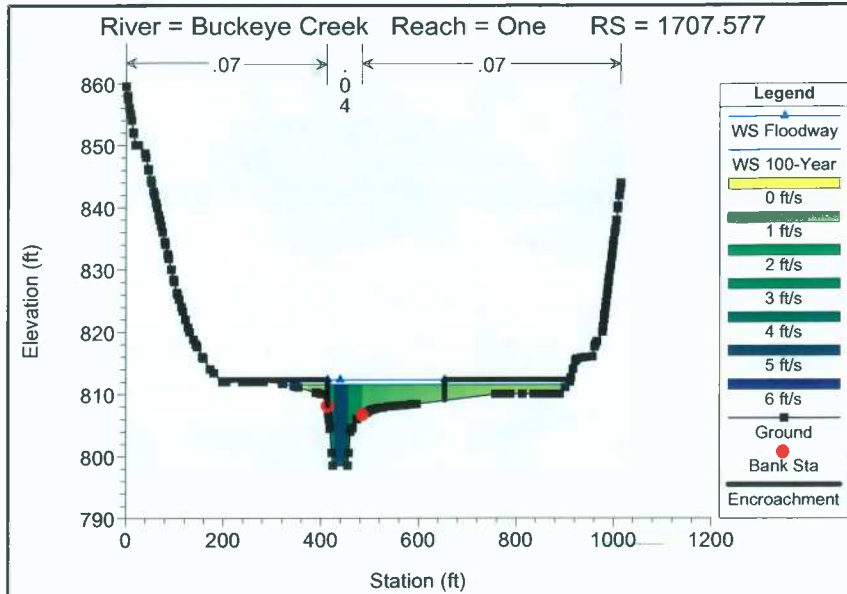
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program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

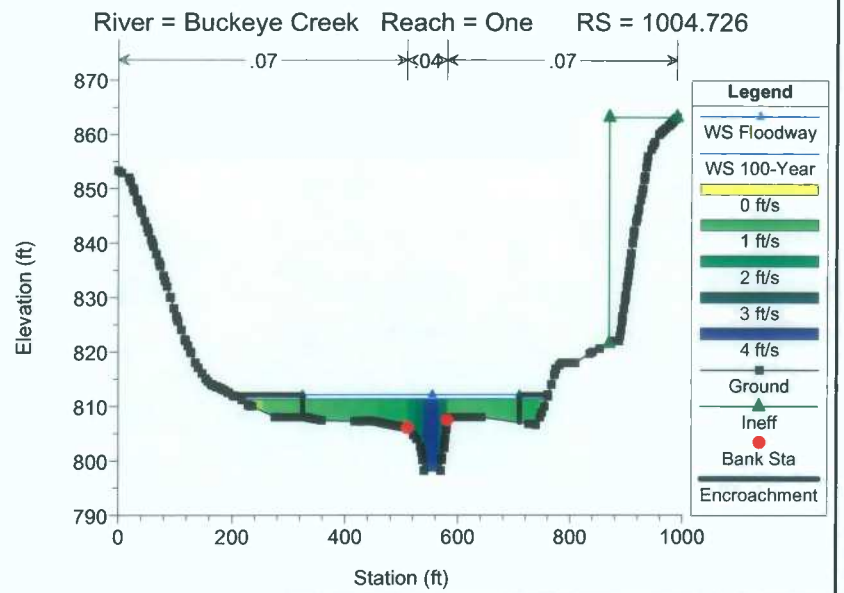
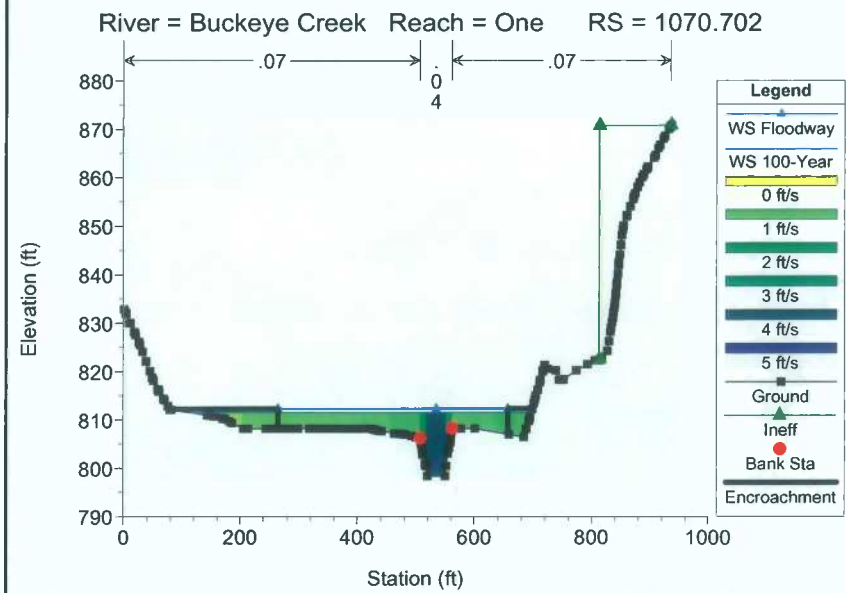
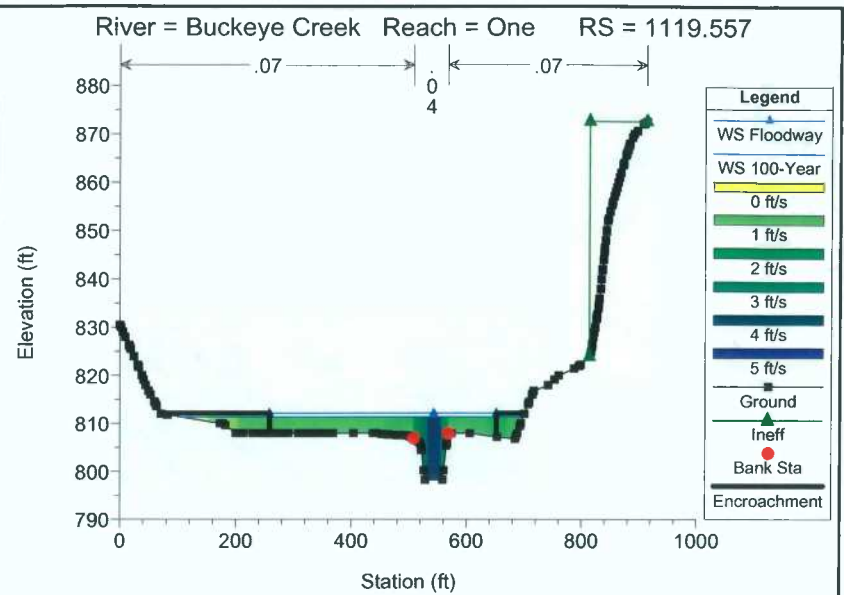
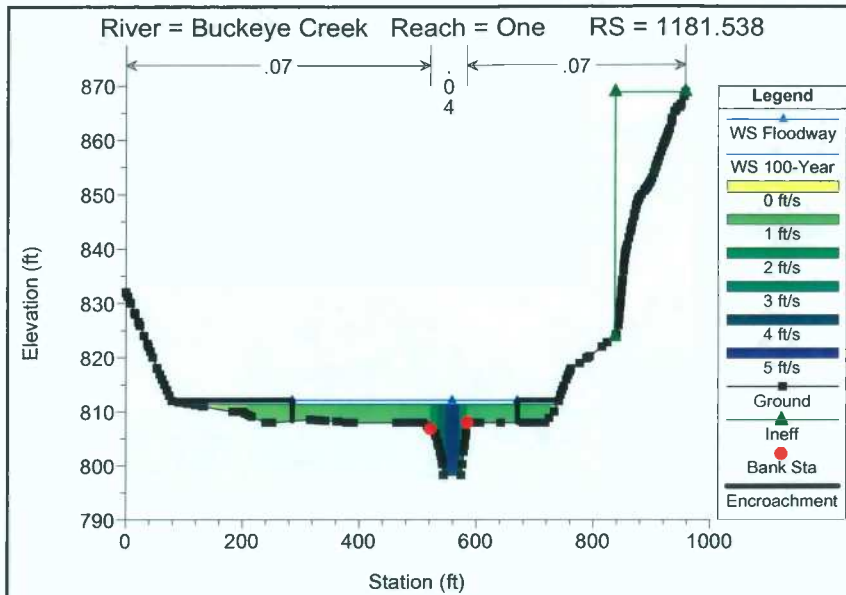


# Buckeye Creek - 1-Percent Annual Chance Flood (Existing)

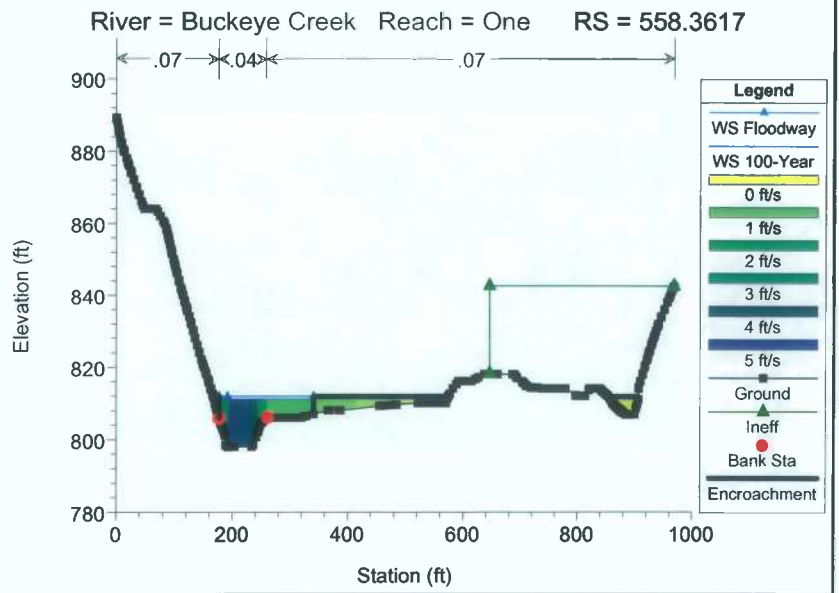
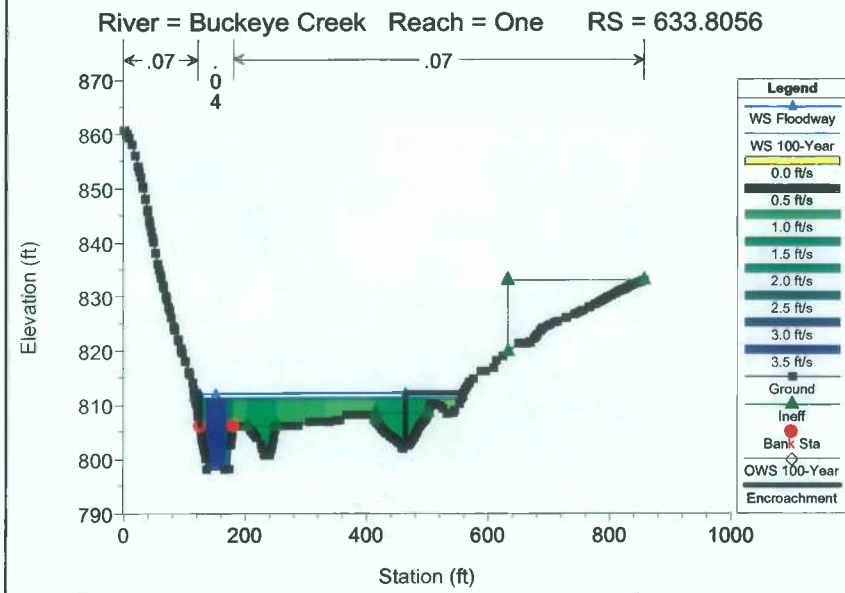
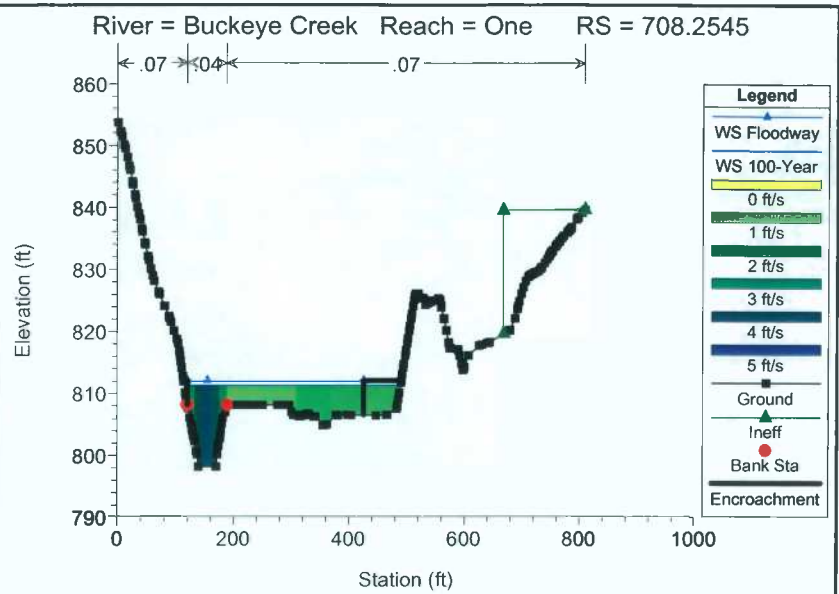
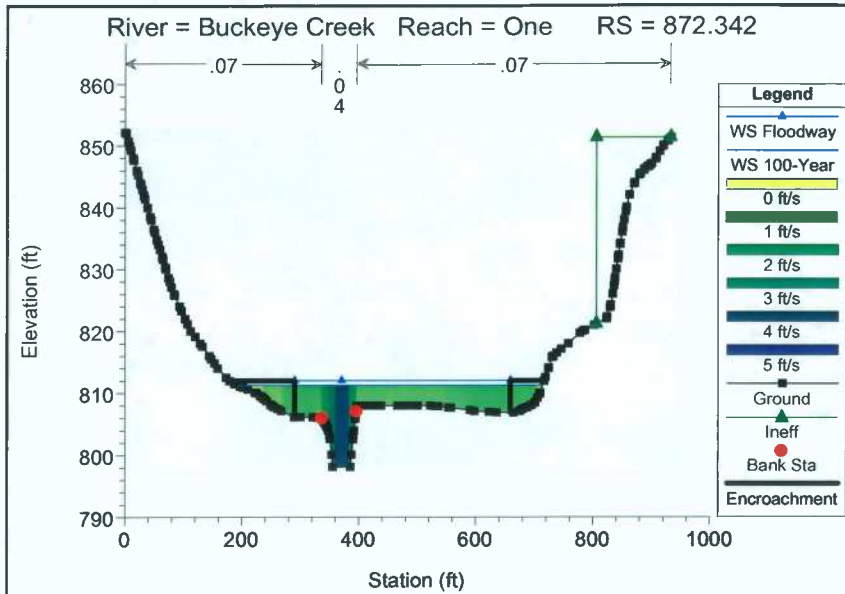


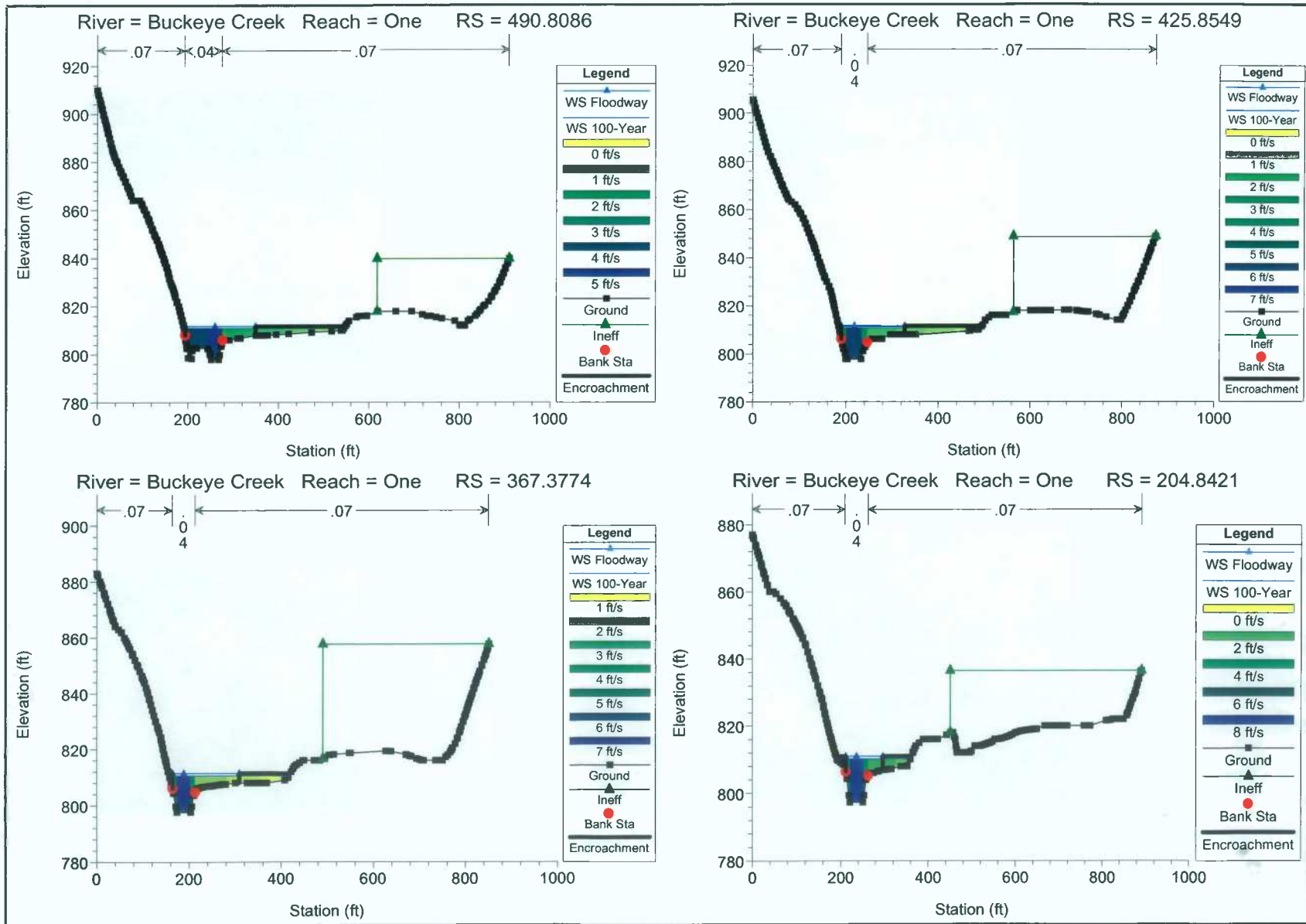












10:47am.

3-3-14

Rob McHale

724-249-7152

Catee - Flood Plain needs  
to be taken care  
of.

13-103

of 14-123

DEP of  
USACE

Andy Gullone

Civic & Environmental

412-249-3179

Doddridge County Watershed Association  
Route 2 Box 210A  
West Union, West Virginia 26456

April 21, 2014

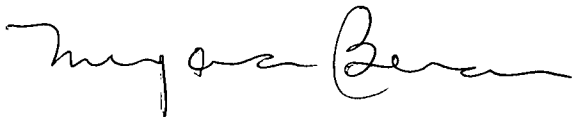
Attn: Robert E. McHale, P.G.  
Manager of Governmental & Regulatory Affairs  
MarkWest Energy Partners, L.P.  
601 Technology Drive; STE 300  
Canonsburg, PA 15317

Dear Mr. McHale:

The attached Appeal was submitted to the Doddridge County Commission acting as the Floodplain Appeals Board for Doddridge County on April 7, 2014 by the Doddridge County Watershed Association.

This letter serves as your notification of the appeal that was filed for Floodplain permit 13-103.

Sincerely,



Mirijana Beram  
Acting on behalf of the  
Doddridge County Watershed Association

✓ CC: Doddridge County Commission  
Bo Wriston, Doddridge County Floodplain Manager  
Beth Rogers, Doddridge County Clerk

Date: April 7, 2014

To: Doddridge County Floodplain Appeals Board (Shirley Williams, Gregory Robinson & Ralph Sandora)

Re: Appeal for Floodplain permit 13-103 that was issued to Mark West Liberty Sherwood Processing plant on March 18, 2014

We appeal the decision by the interim floodplain manager that was issued to Mark West on March 18, 2014. The floodplain permit was granted by Mr. Ralph Sandora, filling in as the Floodplain Manager, at the County Commission meeting on March 18, 2013. **(CORRECTION DATE SHOULD BE MARCH 18, 2014)**

Our reasons for filing this appeal are as follows:

- a. We feel that allowing storage of temporary fill in the floodway will adversely affect the health of our watershed.
- b. Additional permits from the USACE and WV DEP are required prior to the issuance of the floodplain permit. As of today, these permits have not been issued. Mark West neglected to notify County officials that the additional permits had been applied for or granted. See page 33 Section 7.2 item E which states "any permit required of any other governmental agencies, whether state or federal or local, that requires site approval, shall be filed with the County Clerk, date/time stamped and filed with the official Floodplain Permit application prior to final issuance of said permit and prior to start of construction."
- c. The hydraulic studies done state that this will be temporary stockpiles of soil in the floodway. The Doddridge County Floodplain Ordinance addresses this issue in Article IV Section 4.1 and also on page 28 thru 30 part E. Fill
- d. No adjacent property owners were notified. The ordinance specifically states that adjacent property owners be notified. ( see page 3 Section 2.2 Definitions A General # 2 )
- e. The cumulative totals of the four floodplain permits are above the one foot rule. The January, 2014 permit application has not yet been granted. We realize that this is still an open issue, but it is crucial to the end result and needs to be considered.
- f. The location of the site is upstream of a municipal water supply. The possibly of pollutants being discharged into the creek may occur. It has already occurred from a well site on this property.
- g. Alteration of the floodway will increase the volume and velocity of the water as it heads downstream during flood events. The possibility of water backing up is also high which will affect residents living upstream.
- h. We feel that until all investigations are completed, ALL activity related to this Floodplain be stopped.
- i. We would like to also state that floodplain permits that have already been issued in this drain field have not been considered as far the cumulative totals for the one foot rule.

**Article VIII Section 8.1 states that once an appeal is filed "the floodplain administrator shall immediately issue a STOP WORK ORDER NOTICE that shall remain in effect until resolution of said appeal" (page 42 of the ordinance).**

Signed,

Doddridge County Watershed Association

Route 2 Box 210A

West Union, West Virginia 26456

**We also request that we be notified of any correspondence and communication that occurs as a result of this appeal with Mark West or their appointed representatives.**



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west virginia department of environmental protection

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Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffinan, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Ms. Louanne Fatora  
Smithton Road  
West Union, WV 26456

Re: Comment Response, State 401 Water Quality Certification, MarkWest Liberty Midstream & Resources, LLC, Sherwood Natural Gas Processing Facility Expansion, unnamed tributaries to Buckeye Creek, near Smithburg, Doddridge County, West Virginia; WQC 130006.

Dear Ms. Fatora:

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on February 24, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

After a review of alternatives and comments received, WVDEP-DWWM issued a 401 Certification for this activity on April 4, 2014. As increased flooding potential was a common concern due to wetland filling, a condition was included in the Certification calling for the stormwater detention ponds, as depicted on the Erosion and Sediment Control Plans, Phase 2, February 11, 2014, for NPDES Permit Number WV0115924, Registration Number WVR 310068, to be designed, constructed and maintained for no increase in runoff from the facility up to a 100 year, 24 hour design storm event. These ponds are to remain in place and be maintained for the life of the facility.

The agency also revisited our prior consultation with the West Virginia Division of Natural Resources to assure mussels in the watershed would be protected. Additionally, we understand the Corps of Engineers evaluated the Hydrology and Hydraulic study provided for the facility. Their evaluation concluded the modeling and results were accurate.

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Ms. Louanne Fatora  
Page 2  
April 4, 2014

Lastly, with regard to sedimentation and use of best management practices to control erosion, MarkWest-Sherwood will be required to follow the terms and conditions in their Construction-Stormwater permit (NPDES Permit Number WV0115924, Registration Number WVR 310068).

A copy of the Certification is enclosed.

Sincerely,



Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

---

Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Ms. Christina Woods  
1585 Broad Run Rd  
Center Point, WV 26339

Re: Comment Response, State 401 Water Quality Certification, MarkWest Liberty Midstream & Resources, LLC, Sherwood Natural Gas Processing Facility Expansion, unnamed tributaries to Buckeye Creek, near Smithburg, Doddridge County, West Virginia; WQC 130006.

Dear Ms. Woods,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on February 19, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

After a review of alternatives and comments received, WVDEP-DWWM issued a 401 Certification for this activity on April 4, 2014. As increased flooding potential was a common concern due to wetland filling, a condition was included in the Certification calling for the stormwater detention ponds, as depicted on the Erosion and Sediment Control Plans, Phase 2, February 11, 2014, for NPDES Permit Number WV0115924, Registration Number WVR 310068, to be designed, constructed and maintained for no increase in runoff from the facility up to a 100 year, 24 hour design storm event. These ponds are to remain in place and be maintained for the life of the facility.

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Promoting a healthy environment.

Ms. Christina Woods  
Page 2  
April 4, 2014

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A copy of the Certification is enclosed.

Sincerely,

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Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

---

Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Ms. Susan Gagnon  
1210 Ramsey's Ridge Rd  
West Union, WV 26456

Re: Comment Response, State 401 Water Quality Certification, MarkWest Liberty Midstream & Resources, LLC, Sherwood Natural Gas Processing Facility Expansion, unnamed tributaries to Buckeye Creek, near Smithburg, Doddridge County, West Virginia; WQC 130006.

Dear Ms. Gagnon,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 11, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

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Promoting a healthy environment.

Ms. Susan Gagnon

Page 2

April 4, 2014

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A copy of the Certification is enclosed.

Sincerely,



Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

---

Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

T Stumpt  
4805 Riggins Run  
West Union, WV 26456

Re: Comment Response, State 401 Water Quality Certification, MarkWest Liberty Midstream & Resources, LLC, Sherwood Natural Gas Processing Facility Expansion, unnamed tributaries to Buckeye Creek, near Smithburg, Doddridge County, West Virginia; WQC 130006.

Dear T Stumpt,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 10, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

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Promoting a healthy environment.

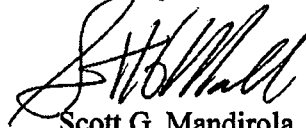
T Stumpt  
Page 2  
April 4, 2014

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A copy of the Certification is enclosed.

Sincerely,

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Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

---

Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Mr. Ed Bean  
566 Bean Hollow Rd  
West Union, WV 26456

Re: Comment Response, State 401 Water  
Quality Certification, MarkWest Liberty  
Midstream & Resources, LLC, Sherwood  
Natural Gas Processing Facility Expansion,  
unnamed tributaries to Buckeye Creek, near  
Smithburg, Doddridge County, West  
Virginia; WQC 130006.

Dear Mr. Bean,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 10, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

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Promoting a healthy environment.



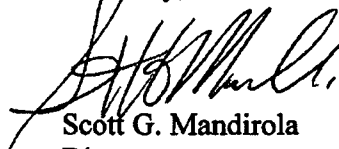
Mr. Ed Bean  
Page 2  
April 4, 2014

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A copy of the Certification is enclosed.

Sincerely,

A handwritten signature in black ink, appearing to read "S. G. Mandirola", is written over the typed name.

Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

---

Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Ms. Tammy Beamer  
235 Faith Rd  
Salem, WV 26456

Re: Comment Response, State 401 Water Quality Certification, MarkWest Liberty Midstream & Resources, LLC, Sherwood Natural Gas Processing Facility Expansion, unnamed tributaries to Buckeye Creek, near Smithburg, Doddridge County, West Virginia; WQC 130006.

Dear Ms. Beamer,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 5, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

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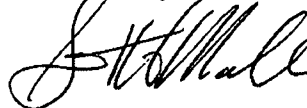
Ms. Tammy Beamer  
Page 2  
April 4, 2014

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Sincerely,

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Scott G. Mandirola  
Director

SGM/wir



---

west virginia department of environmental protection

---

Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

J.D. Geelhaar  
2430 Little Back Run  
New Milton, WV 26411

Re: Comment Response, State 401 Water Quality Certification, MarkWest Liberty Midstream & Resources, LLC, Sherwood Natural Gas Processing Facility Expansion, unnamed tributaries to Buckeye Creek, near Smithburg, Doddridge County, West Virginia; WQC 130006.

Dear J.D. Geelhaar,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 4, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

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Promoting a healthy environment.

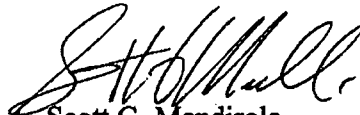
J.D. Geelhaar  
Page 2  
April 4, 2014

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A copy of the Certification is enclosed.

Sincerely,

A handwritten signature in black ink, appearing to read "Scott G. Mandirola". The signature is fluid and cursive, with a large initial "S" and "M".

Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

---

Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Ms. Tina Del Prete  
4805 Riggins Run  
West Union, WV 26456

Re: Comment Response, State 401 Water  
Quality Certification, MarkWest Liberty  
Midstream & Resources, LLC, Sherwood  
Natural Gas Processing Facility Expansion,  
unnamed tributaries to Buckeye Creek, near  
Smithburg, Doddridge County, West  
Virginia; WQC 130006.

Dear Ms. Del Prete,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 4, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

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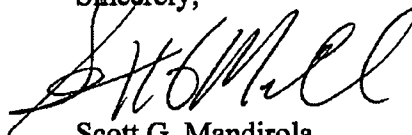
Ms. Tina Del Prete  
Page 2  
April 4, 2014

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A copy of the Certification is enclosed.

Sincerely,

A handwritten signature in black ink, appearing to read "S. Mandirola", written over a horizontal line.

Scott G. Mandirola  
Director

SGM/wir



---

west virginia department of environmental protection

---

Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Ms. Linda Pitts  
366 Allen Run Rd  
West Union, WV 26456

Re: Comment Response, State 401 Water  
Quality Certification, MarkWest Liberty  
Midstream & Resources, LLC, Sherwood  
Natural Gas Processing Facility Expansion,  
unnamed tributaries to Buckeye Creek, near  
Smithburg, Doddridge County, West  
Virginia; WQC 130006.

Dear Ms. Pitts,

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Promoting a healthy environment.



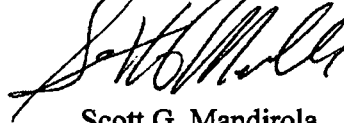
Ms. Linda Pitts  
Page 2  
April 4, 2014

understand the Corps of Engineers evaluated the Hydrology and Hydraulic study provided for the facility. Their evaluation concluded the modeling and results were accurate.

Lastly, with regard to sedimentation and use of best management practices to control erosion, Mark West-Sherwood will be required to follow the terms and conditions in their Construction-Stormwater permit (NPDES Permit Number WV0115924, Registration Number WVR 310068).

A copy of the Certification is enclosed.

Sincerely,

A handwritten signature in black ink, appearing to read "Scott G. Mandirola", written in a cursive style.

Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

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Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Mr. Lyle Roberts  
366 Allen Run Rd  
West Union, WV 26456

Re: Comment Response, State 401 Water  
Quality Certification, MarkWest Liberty  
Midstream & Resources, LLC, Sherwood  
Natural Gas Processing Facility Expansion,  
unnamed tributaries to Buckeye Creek, near  
Smithburg, Doddridge County, West  
Virginia; WQC 130006.

Dear Mr. Roberts,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 4, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

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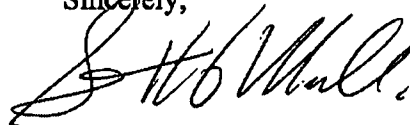
Mr. Lyle Roberts  
Page 2  
April 4, 2014

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Sincerely,

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Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

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Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Mr. Mike Kiplinger  
3525 Smithton Rd  
West Union, WV 26456

Re: Comment Response, State 401 Water  
Quality Certification, MarkWest Liberty  
Midstream & Resources, LLC, Sherwood  
Natural Gas Processing Facility Expansion,  
unnamed tributaries to Buckeye Creek, near  
Smithburg, Doddridge County, West  
Virginia; WQC 130006.

Dear Mr. Kiplinger,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 4, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

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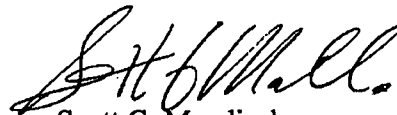
Mr. Mike Kiplinger  
Page 2  
April 4, 2014

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A copy of the Certification is enclosed.

Sincerely,

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Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

---

Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Ms. Linda Ireland  
993 Black Lick Rd  
Salem, WV 26426

Re: Comment Response, State 401 Water  
Quality Certification, MarkWest Liberty  
Midstream & Resources, LLC, Sherwood  
Natural Gas Processing Facility Expansion,  
unnamed tributaries to Buckeye Creek, near  
Smithburg, Doddridge County, West  
Virginia; WQC 130006.

Dear Ms. Ireland,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 4, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

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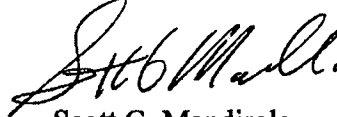
Ms. Linda Ireland  
Page 2  
April 4, 2014

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A copy of the Certification is enclosed.

Sincerely,

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Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

---

Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Ms. Mirijana Beram  
Rt 2 Box 210A  
West Union, WV 26456

Re: Comment Response, State 401 Water Quality Certification, MarkWest Liberty Midstream & Resources, LLC, Sherwood Natural Gas Processing Facility Expansion, unnamed tributaries to Buckeye Creek, near Smithburg, Doddridge County, West Virginia; WQC 130006.

Dear Ms. Beram,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 5, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

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Promoting a healthy environment.



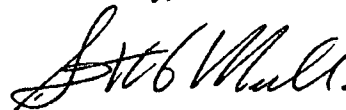
Ms. Mirijana Beram  
Page 2  
April 4, 2014

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A copy of the Certification is enclosed.

Sincerely,

A handwritten signature in black ink, appearing to read "Scott G. Mandirola".

Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

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Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Mr. Wayne Wood  
1585 Broad Run Rd  
Center Point, WV 26339

Re: Comment Response, State 401 Water Quality Certification, MarkWest Liberty Midstream & Resources, LLC, Sherwood Natural Gas Processing Facility Expansion, unnamed tributaries to Buckeye Creek, near Smithburg, Doddridge County, West Virginia; WQC 130006.

Dear Mr. Wood,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 7, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

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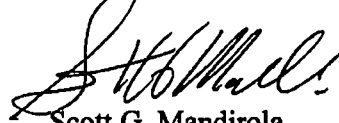
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April 4, 2014

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Sincerely,

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Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

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Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
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Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Jody Mohr  
2328 Miletus Rd  
Salem, WV 26426

Re: Comment Response, State 401 Water Quality Certification, MarkWest Liberty Midstream & Resources, LLC, Sherwood Natural Gas Processing Facility Expansion, unnamed tributaries to Buckeye Creek, near Smithburg, Doddridge County, West Virginia; WQC 130006.

Dear Jody Mohr,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 5, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

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Promoting a healthy environment.

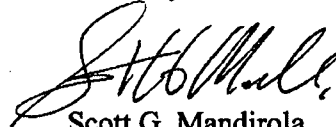
Jody Mohr  
Page 2  
April 4, 2014

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Sincerely,

A handwritten signature in black ink, appearing to read "Scott G. Mandirola". The signature is fluid and cursive, with a large initial "S" and "M".

Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

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Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Mr. Norman Ferrebee  
152 Whippoorwill Ln  
Center Point, WV 26339

Re: Comment Response, State 401 Water  
Quality Certification, MarkWest Liberty  
Midstream & Resources, LLC, Sherwood  
Natural Gas Processing Facility Expansion,  
unnamed tributaries to Buckeye Creek, near  
Smithburg, Doddridge County, West  
Virginia; WQC 130006.

Dear Mr. Ferrebee,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 11, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

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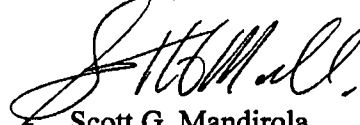
Mr. Norman Ferrebee  
Page 2  
April 4, 2014

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Sincerely,

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Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

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Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Ms. Sara Bean  
566 Bean Hollow  
West Union, WV 26456

Re: Comment Response, State 401 Water  
Quality Certification, MarkWest Liberty  
Midstream & Resources, LLC, Sherwood  
Natural Gas Processing Facility Expansion,  
unnamed tributaries to Buckeye Creek, near  
Smithburg, Doddridge County, West  
Virginia; WQC 130006.

Dear Ms. Bean,

The West Virginia Department of Environmental Protection – Division of Water and Waste Management (WVDEP-DWWM) is responding to your comment received on March 10, 2014 relative to the proposed MarkWest Sherwood plant expansion in Doddridge County.

I regret to inform you that your request to have a hearing has been denied. Your request for a hearing was not made within the timelines prescribed in state law (§47CSR5A-5.1.a). As an alternative, the agency did allow for the submission of comment outside the formal comment period and those comments were evaluated in the Certification review process.

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Promoting a healthy environment.



Ms. Sara Bean  
Page 2  
April 4, 2014

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Sincerely,



Scott G. Mandirola  
Director

SGM/wir



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west virginia department of environmental protection

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Division of Water and Waste Management  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Telephone Number: (304) 926-0495  
Fax Number: (304) 926-0496

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
dep.wv.gov

April 4, 2014

Ms. Ginger Mullins  
Chief, Regulatory Branch  
Huntington District, Corps of Engineers  
502 Eighth Street  
Huntington, West Virginia 25701-2070

Re: State 401 Water Quality Certification,  
Public Notice No. 2011-753-OHR,  
MarkWest Liberty Midstream & Resources,  
LLC, Sherwood Natural Gas Processing  
Facility Expansion, unnamed tributaries to  
Buckeye Creek, near Smithburg, Doddridge  
County, West Virginia; WQC 130006.

Dear Ms. Mullins:

The West Virginia Department of Environmental Protection-Division of Water and Waste Management (WVDEP-DWWM), in conjunction with the West Virginia Division of Natural Resources - Wildlife Resources Section (WVDNR-WRS), has completed review of the above-referenced project.

The applicant proposes to impact a total of 2052 linear feet (lf) of stream (1470 lf intermittent and 582 lf ephemeral), 6.21 acres of palustrine emergent wetland and 2.838 acres of palustrine open water wetland in conjunction with the expansion of a natural gas processing facility. The wetlands and 62 lf of ephemeral stream will be completely filled by the proposed discharges, while 1,990 lf of stream impacts are associated with the installation of culverts.

The purpose of the project is to expand the existing Sherwood Natural Gas Processing Facility to meet the incoming demand of raw natural gas. The existing facility was designed to process 600 million standard cubic feet per day, and the expansion will allow the facility to process 1 billion standard cubic feet per day. The project will encompass approximately 75.90 acres.

Utilizing the West Virginia Stream and Wetland Valuation Metric resulted in a total of 1483.45 stream debits and 15.26 wetland debits. To compensate for impacts resulting from this

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Ms. Ginger Mullins

Page 2

April 4, 2014

project, the applicant has proposed to use the West Virginia Department of Environmental Protection In-Lieu Fee (ILF) program.

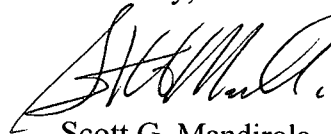
In order to comply with the state's water quality certification and water quality standards regulations the following special conditions must be met:

Special Conditions:

1. Prior to impacts, the applicant will purchase 1483.45 stream credits and 15.26 wetland credits from the ILF program.
2. The stormwater detention ponds as depicted on the Erosion and Sediment Control Plans, Phase 2, February 11, 2014, for NPDES Permit Number WV0115924, Registration Number WVR 310068, shall be designed, constructed and maintained for no increase in runoff from the facility up to the 100 year, 24 hour design storm event. These ponds shall remain in place and be maintained for the life of the facility.

State 401 Certification, as required by the Clean Water Act, is granted subject to the above special conditions and the attached 401 standard conditions. Certification shall be effective fifteen (15) days after receipt unless appealed under title 47, Series 5A, Section 7 of the Code of State Regulations, State Certification of Activities Requiring a Federal Permit. The appeal must be in writing and set forth the action complained of and the grounds upon which the appeal is based. It should be directed to: Director, Division of Water and Waste Management, West Virginia Department of Environmental Protection, 601 57<sup>th</sup> Street SE, Charleston, West Virginia 25304: ATTENTION: 401 Certification Program.

Sincerely,



Scott G. Mandirola  
Director

SGM/wir

cc: Mr. Rick Lowry  
MarkWest Liberty Midstream & Resources, LLC  
4600 J. Barry Court, Suite 500  
Canonsburg, Pennsylvania 15317  
U.S. Environmental Protection Agency - Jessica Martinsen  
U.S. Fish and Wildlife Service - Laura Hill  
WVDNR-Wildlife Resources Section, Elkins - Roger Anderson  
WVDEP - Glenn McLernon  
WVDEP - Bradley Swiger

# CME

ENGINEERING

301-689-1700  
Fax: 301-689-5177

February 28, 2014

Mr. Dan Wellings, PS  
Doddridge County Floodplain Manager  
HC 68 Box 5  
West Union, West Virginia 26456

RE: Sherwood 4 and 5 Natural Gas Processing Plant  
Mark West Liberty Midstream and Resources, LLC  
Doddridge County, West Virginia

FILED  
2014 MAR -3 AM 10:25  
BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

Mr. Wellings:

As requested, CME Engineering LP (CME) has reviewed the hydraulic study prepared by Civil & Environmental Consultants (CEC) relating to the Mark West Midstream and Resources, LLC (Mark West) Sherwood 4 and 5 Natural Gas Processing Plant. Mark West proposes to construct temporary stockpiles within the floodplain of Buckeye Creek.

CME finds that the hydraulic study prepared by CEC was performed within standard engineering practice and appears to be in compliance with the Doddridge County Floodplain Ordinance. Section 7.2.B of the Doddridge County Ordinance states " All permits and plans shall be approved only after it has been determined that the proposed work to be undertaken will be in conformance with the requirements of this Ordinance, State and Federal Laws, Ordinances, and Regulations." It is the responsibility of the permittee (Mark West) to obtain all required permits. Therefore, CME recommends conditional approval of the application pending receipt of any and all required federal or state permits.

CME appreciates the opportunity to assist Doddridge County on this project. Please contact me if you have any questions.

Sincerely,



Kevin L. Yoder, P.E., SIT  
Project Director II  
CME Management LLC  
General partner of CME Engineering LP

CC: Mark Stanley, CME  
CME File 0875-S010

**FLOODPLAIN PERMIT APPLICATION  
PUBLIC MEETING  
FOR  
MARKWEST SHERWOOD FACILITY**

Notice is hereby given to the public and those concerned area residents whom have sent a properly and timely filed objection to the Doddridge County Clerk of the County Commission's Office , many anonymously, to the granting or denying of the **MARKWEST** Doddridge County Floodplain application #13-103.

There will be a public meeting prior to granting or denying **MARKWEST** Doddridge County Floodplain Application #13-103 for **additional temporary stockpiles** of earth to be located in the FEMA designated special flood hazard area for construction of Sherwood Plant 4 & 5. Said public meeting will occur as part of the regularly scheduled **February 18, 2014 Doddridge County Commissioners meeting beginning at 6 PM at the Doddridge County Courthouse.**

Evidence will be taken or given by interested persons or parties.

This is **NOT** a forum on **MARKWEST** or the gas industry. Evidence will be limited to the impact of granting or denying additional temporary stockpiles of earth in the FEMA designated floodplain as it relates to the **DODDRIDGE COUNTY FLOODPLAIN ORDINANCE.**

Dan Wellings, PS

Doddridge County Floodplain Manager

FILED

TO: Clerk of the County Court

118 E. Court St.

West Union, WV 26456

ATT: Beth A. Rogers, Doddridge County Clerk

Ralph Sandora, acting Doddridge County Flood Plain Manager

2014 FEB 27 AM 11:55

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

In regard to: Floodplain Permit Application – Mark West Liberty Sherwood Processing  
plant 4&5 #13-103

And also: Floodplain Permit Application – Mark West Liberty Sherwood Processing  
plant 4&5 # 14-123

Please do not approve any permit application for flood plain work from Mark West Sherwood  
Processing Plant.

- o This project already has applications on file with the Army Corp of Engineers and the WVDEP water and waste management division, 401 Permitting. This application is

for burying crucial head water streams and the fill of many connecting wetland areas that cascade downhill toward Buckeye Creek. This permitting has NOT been approved yet, and the Army Corp of Engineers and WVDEP 401 permitting will continue to accept public comment on this project, AND ask for a public hearing until March 7, 2014

According to the flood plain ordinance,

#### 4.4 C of Floodplain Ordinance:

C. Any development and/or use of land shall be permitted provided that all such uses, activities and/or development shall be undertaken in strict compliance with the flood-proofing and related provisions contained herein and in all other applicable Federal and State Laws, ordinances and regulations.

Section 4.5 Alteration or relocation of a stream

A. Whenever a developer intends to alter or relocate a stream within the Floodplain Area the developer shall notify in writing, by certified mail, Doddridge County's Floodplain Administrator, the State Coordinating Office, any adjacent communities and any adjacent property owners of all such intended activities prior to the alteration or relocation of the stream. Copies of all required notifications must be submitted to the Federal Emergency Management Agency. In addition prior to issuing the local permit the Floodplain Administrator shall

require copies of all necessary permits from those governmental agencies from which Federal or State Law requires approval.

**TO reiterate – NO PERMITS HAVE BEEN ISSUED YET FROM FEDERAL & STATE REGULATORS.**

Thank you for not approving these flood plain permit applications.

If any prior flood plain permits for this particular project has been granted, it would have been granted in violation of this flood plain ordinance and need to be revoked. Please recheck your records as to this issue.

Thank you,



MaryAnne Daggett

New Milton, WV 26411

Stanley and Louise Crossman  
233 Sisk Lane  
Salem, WV 26426-6034

Dan Wellings, Doddridge County Floodplain Manager

January 30, 2014

In regard to: Floodplain Permit application – Mark West Liberty Sherwood  
Processing Plant 4&5 #13-103

FILED

2014 FEB -3 AM 11:43

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

No further flood plain permits should be considered for this area. This floodplain has already been altered beyond what is reasonable.

This floodplain handles significant flood waters, allowing waters to spread out during heavy rain preventing damage to both upstream and downstream landowners.

The allowance of more fill in the historical floodplain will restrict waters from spreading out. In conjunction with the continued development resulting in the loss of trees and vegetation, which takes up excess water during heavy rains, landowners will experience more damage.

Landowners experiencing increased flooding and damage from this site as a result of continued permitting could possibly hold the floodplain manager and the Doddridge County Commissioners liable.

We have used the sample letter printed in the Herald Record 1/21/2014 as it expresses our concerns better than we could.

Our home is located approx. ½ mile ENE of the subject property.

We also ask that we be notified if our comments are forwarded to Mark West Liberty-Sherwood Processing Plant.

Thank you for NOT APPROVING the floodplain permit.

Stan and Louise Crossman, 233 Sisk Lane, Salem WV 26426 304-782-3935

*Stan Crossman*  
*Louise Crossman*



TO: Clerk of the County Court  
118 E. Court St.  
West Union, WV 26456

ATT: Beth A. Rogers, Doddridge County Clerk  
Dan Wellings, Doddridge County FloodPlain Manager

DATE: January 19, 2014

In regard to: Floodplain Permit Application - Mark West  
Liberty Sherwood Processing  
plant 4&5 #13-103

No further flood plain permits for alterations should  
be considered for this area.

- This floodplain has already been altered beyond what is reasonable
- This floodplain handles significant flood waters, allowing waters to spread out during heavy rain preventing flood damage to both upstream and downstream landowners.
- The allowance of more fill in this historical floodplain will restrict waters from spreading out. In conjunction with the continued development resulting in the loss of trees and vegetation, which takes up excess water during heavy rainfall, nearby landowners will experience more damage.
- Landowners experiencing increased flooding and damage to their properties upstream and downstream from this site as a result of continued permitting, might possibly hold the floodplain manager and Doddridge County commissioners liable.

I also ask that I be notified if my comments are forwarded to Mark West Liberty-Sherwood Processing Plant.

Thank you for NOT approving this floodplain permit.

Name: SALLY COCKEY

Address: 699 Retriever Run Rd

City & State West Union, WV 26456

Phone number: 304-873-1256

TO: Clerk of the County Court  
118 E. Court St.  
West Union, WV 26456

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

FROM: Jonette Kirkwood  
203 Court St.  
West Union, WV 26456

RE: Flood plain Permit Application – Mark West Liberty Sherwood Processing  
plant 4&5 #13-103

FILED

2014 JAN 24 PM 1:16

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

No new flood plain permits or extensions for alterations should even be considered for this area.

- Extreme changes have already been made in this area.
- This flood plain needs to handle significant flood waters, allowing waters to spread out during heavy rain preventing flood damage to both upstream and downstream landowners.
- More fill in this historical flood plain will restrict waters from spreading out, causing nearby landowners more damage.
- The further development will result in the loss of more trees and other vegetation which takes up excess water during heavy rainfall. This will also contribute to the damage experienced by nearby landowners.
- Landowners experiencing increased flooding and damage to their properties upstream and downstream from this site as a result of continued permitting, might possibly hold the flood plain manager and Doddridge County commissioners liable.
- With the flood plain so significantly changed, the boundaries of the flood plain upstream and downstream from this area are likely to change also, putting land and homes into the flood plain that are not now.
- Increased activity in this area, because it is upstream from the municipal water supply for the town of West Union, increases the possibility of polluting the town's water supply.

In light of the recent events polluting the Elk River and the water supply to nine counties, extra thought should be given to this matter and to all requests to alter and/or create potential hazards in our flood plains. As John Unger, state Senate Majority Leader, said "Here is the public debate where people need to weigh in - should we protect everyone's water no matter where they live in West Virginia and who they are, or should we cherry pick which ones to protect and not protect others?"

I ask that a public meeting - with plenty of lead time and an evening setting - be held to discuss this permit application. This is no small thing and it effects the entire county. All should have the opportunity to be informed and voice an opinion in a public forum.

I ask that I be notified if my information is shared with Mark West Liberty Sherwood Processing plant. I also want a copy of any information supplied by the Mark West Liberty Sherwood Processing plant.

Thank you for your cooperation.

FILED

2014 JAN 24 PM 1:16

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

Clerk of the County Court  
118 East Court St.  
West Union WV 26456

FILED

2014 JAN 24 PM 12:04

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

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

1/22/2014

IN RE:  
Floodplain Permit Application – Mark West Liberty Sherwood Processing Plant 4&5, #13-103

No further floodplain permits for alterations should be considered for this area. This floodplain has already been altered beyond what is reasonable.

This floodplain handles significant flood waters, allowing waters to spread out during heavy rain, preventing flood damage to both upstream and downstream landowners. The allowance of more fill in this historical floodplain will restrict waters from spreading out. With the continued development of this floodplain, the resulting loss of trees and vegetation, which takes up excess water during heavy rainfall, nearby landowners will experience more damage.

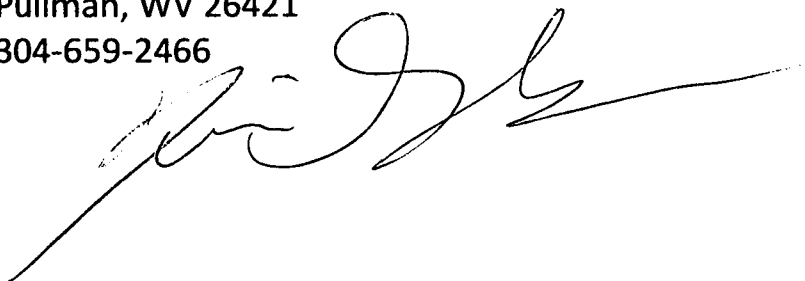
Landowners experiencing increased flooding and damage to their properties upstream and downstream from this site as a result of continued permitting, might possibly hold the floodplain manager and Doddridge County Commission liable.

I also ask that I be notified if my comments are forwarded to Mark West Liberty – Sherwood Processing Plant.

Thank you for not approving this flood plain permit.

Sincerely

Jim Shreves  
3770 Oxford Road  
Pullman, WV 26421  
304-659-2466



Clerk of the County Court  
118 East Court St.  
West Union WV 26456

FILED

2014 JAN 24 PM 12: 04

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

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

1/22/2014

IN RE:  
Floodplain Permit Application – Mark West Liberty Sherwood Processing Plant 4&5, #13-103

No further floodplain permits for alterations should be considered for this area. This floodplain has already been altered beyond what is reasonable.

This floodplain handles significant flood waters, allowing waters to spread out during heavy rain, preventing flood damage to both upstream and downstream landowners. The allowance of more fill in this historical floodplain will restrict waters from spreading out. With the continued development of this floodplain, the resulting loss of trees and vegetation, which takes up excess water during heavy rainfall, nearby landowners will experience more damage.

Landowners experiencing increased flooding and damage to their properties upstream and downstream from this site as a result of continued permitting, might possibly hold the floodplain manager and Doddridge County Commission liable.

I also ask that I be notified if my comments are forwarded to Mark West Liberty – Sherwood Processing Plant.

Thank you for not approving this flood plain permit.

Sincerely



Eva Shreves  
3770 Oxford Road  
Pullman, WV 26421  
304-659-2466

FILED

2014 JAN 24 AM 9:45

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

TO: Clerk of the County Court  
118 E. Court St.  
West Union, WV 26456

ATT: Beth A. Rogers, Doddridge County Clerk  
Dan Wellings, Doddridge County FloodPlain Manager

DATE: January 21, 2014

In regard to: Floodplain Permit Application – Mark West Liberty  
Sherwood Processing  
**plant 4&5 #13-103**

No further flood plain permits for alterations should be considered for this area.

- This floodplain has already been altered beyond what is reasonable
- This floodplain handles significant flood waters, allowing waters to spread out during heavy rain preventing flood damage to both upstream and downstream landowners.
- The allowance of more fill in this historical floodplain will restrict waters from spreading out. In conjunction with the continued development resulting in the loss of trees and vegetation, which takes up excess water during heavy rainfall, nearby landowners will experience more damage.
- Landowners experiencing increased flooding and damage to their properties upstream and downstream from this site as a result of continued permitting, might possibly hold the floodplain manager and Doddridge County commissioners liable.

I also ask that I be notified if my comments are forwarded to Mark West Liberty-Sherwood Processing Plant.

Thank you for NOT approving this floodplain permit.

Name: [furstpless@iolinc.net](mailto:furstpless@iolinc.net)

Address: Stillhouse Road

City & State: Salem, WV 26426

Phone number:

Thank You!!

Name withheld due to safety concerns



**FILED**

2014 JAN 22 PM 2:15

BETH ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

**TO: Clerk of the County Court  
118 E. Court St.  
West Union, WV 26456**

**ATT: Beth A. Rogers, Doddridge County Clerk  
Dan Wellings, Doddridge County FloodPlain Manager**

**January 20, 2014**

**In regard to: Floodplain Permit Application – Mark West Liberty Sherwood Processing plant 4&5 #13-103**

**No further flood plain permits for alterations should be considered for this area.**

**This floodplain has already been altered beyond what is reasonable  
This floodplain handles significant flood waters, allowing waters to spread out during heavy rain preventing flood damage to both upstream and downstream landowners.  
The allowance of more fill in this historical floodplain will restrict waters from spreading out. In conjunction with the continued development resulting in the loss of trees and vegetation, which takes up excess water during heavy rainfall, nearby landowners will experience more damage.  
Landowners experiencing increased flooding and damage to their properties upstream and downstream from this site as a result of continued permitting, might possibly hold the floodplain manager and Doddridge County commissioners liable.**

**I also ask that I be notified if my comments are forwarded to Mark West Liberty-Sherwood Processing Plant.**

**Thank you for NOT approving this floodplain permit.**

**Name: Jody Mohr** 

**Address: 2328 Milletus Road**

**City & State: Salem, WV 26426**

**Phone number: 304-782-4019**

**WATER IS LIFE.....LET'S PROTECT IT!!!**

1/22/14

Fax:  
304-873-1840

Please deliver to  
Beth Rogers

Thank you!

1:55pm

fax confirmation  
will serve as  
copy of receipt

TO: Clerk of the County Court  
118 E. Court St.  
West Union, WV 26456

FILED

2014 JAN 22 PM 1:21

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

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

In regard to: Floodplain Permit Application – Mark West Liberty Sherwood Processing  
plant 4&5 #13-103

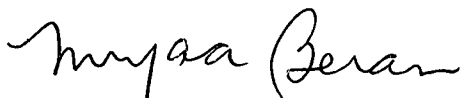
No further flood plain permits for alterations should be considered for this area.

- This flood plain has already been altered beyond what is reasonable
- This floodplain handles significant flood waters, allowing waters to spread out during heavy rain preventing flood damage to both upstream and downstream landowners.
- The allowance of more fill in this historical floodplain will restrict waters from spreading out. In conjunction with the continued development resulting in the loss of trees and vegetation, which takes up excess water during heavy rainfall, nearby landowners will experience more damage.
- Landowners experiencing increased flooding and damage to their properties upstream and downstream from this site as a result of continued permitting, might possibly hold the flood plain manager and Doddridge County commissioners liable.
- This location is upstream of the municipal water supply for the town of West Union. Activity in this flood region increases the potential for polluting the water supply for the town.

I ask that I be notified if my information is shared with Mark West Liberty Sherwood Processing plant. I also want copies of any information that Mark West Liberty Sherwood Processing plant is supplying.

I want to also request that a public meeting be held to discuss this permit application. The magnitude of the work being done at this site affects the whole County and we should all have an opportunity to voice our concerns in a public forum.

Thank you for NOT approving this flood plain permit.



Mirijana Beram  
615 Riggins Run Rd  
West Union, WV 26456

Jan 22, 2014

TO: Clerk of the County Court  
118 E. Court St.  
West Union, WV 26456

ATT: Beth A. Rogers, Doddridge County Clerk  
Dan Wellings, Doddridge County FloodPlain Manager

DATE: 1/21/14

In regard to: Floodplain Permit Application – Mark West Liberty Sherwood Processing  
plant 4&5 #13-103

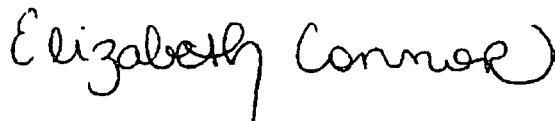
**No further flood plain permits for alterations should be considered for this area.**

Especially in light of the recent water contamination suffered by the residents of southern West Virginia, careful consideration should be given to the floodplain manager and county commissioners' responsibility to protect the well-being of county residents and exercise responsible management our public resources.

This floodplain has already been altered beyond what is reasonable. This floodplain handles significant flood waters, allowing waters to spread out during heavy rain preventing flood damage to both upstream and downstream landowners. The allowance of more fill in this historical floodplain will restrict waters from spreading out. In conjunction with the continued development resulting in the loss of trees and vegetation, which takes up excess water during heavy rainfall, nearby landowners will experience more damage. Landowners experiencing increased flooding and damage to their properties upstream and downstream from this site as a result of continued permitting, might possibly hold the floodplain manager and Doddridge County commissioners liable.

I also ask that I be notified if my comments are forwarded to Mark West Liberty-Sherwood Processing Plant.

Thank you for NOT approving this floodplain permit.



Elizabeth Connor

501 Brush Run Rd

West Union, WV 26456

503.333.8261

FILED

2014 JAN 22 PM 1:21

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

TO: Clerk of the County Court  
118 E. Court St.  
West Union, WV 26456

FILED

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

2014 JAN 22 PM 1:22

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

In regard to: Floodplain Permit Application – Mark West Liberty Sherwood Processing  
plant 4&5 #13-103

No further flood plain permits for alterations should be considered for this area.

- This flood plain has already been altered beyond what is reasonable
- This floodplain handles significant flood waters, allowing waters to spread out during heavy rain preventing flood damage to both upstream and downstream landowners.
- The allowance of more fill in this historical floodplain will restrict waters from spreading out. In conjunction with the continued development resulting in the loss of trees and vegetation, which takes up excess water during heavy rainfall, nearby landowners will experience more damage.
- Landowners experiencing increased flooding and damage to their properties upstream and downstream from this site as a result of continued permitting, might possibly hold the flood plain manager and Doddridge County commissioners liable.

Thank you for not approving this flood plain permit.

Name: Louanne Fatora Louanne Fatora

Address: 3839 Smithton Rd. West Union, WV 26456

Phone number: 970-389-5451

Date: 1/20/14

TO: Clerk of the County Court  
118 E. Court St.  
West Union, WV 26456

FILED

2014 JAN 22 PM 1:22

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

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

In regard to: Floodplain Permit Application – Mark West Liberty Sherwood Processing  
plant 4&5 #13-103

No further flood plain permits for alterations should be considered for this area.

- This flood plain has already been altered beyond what is reasonable
- This floodplain handles significant flood waters, allowing waters to spread out during heavy rain preventing flood damage to both upstream and downstream landowners.
- The allowance of more fill in this historical floodplain will restrict waters from spreading out. In conjunction with the continued development resulting in the loss of trees and vegetation, which takes up excess water during heavy rainfall, nearby landowners will experience more damage.
- Landowners experiencing increased flooding and damage to their properties upstream and downstream from this site as a result of continued permitting, might possibly hold the flood plain manager and Doddridge County commissioners liable.

Thank you for not approving this flood plain permit.

Name\_\_Carol Cottrill  
Address:3839 Smithton Road  
West Union,Wv 26456  
Phone number:\_304-873-2636

Date:\_1-20-2014

Jan 21, 2014

To Ms. Beth A. Rogers, Doddridge Co. Clerk  
Mr. Dan Williams, Floodplain Manager

Re: Floodplain permit application  
Mark West Liberty Sherwood Processing  
Plant 4+5 # 13-103

2014 JAN 22 PM 12:01  
DODDRIE COUNTY, WV  
FILED

This floodplain permit should not be  
issued. This area has already been  
built up, <sup>possibly</sup> more than is acceptable to  
prevent flooding damage up and down-  
stream. The siting of this plant upstream  
of West Union's water intake is, of course,  
also problematic.

Thank you for not approving this floodplain  
permit.

Susan Cleaver  
1625 Nazareth Farm Rd.  
Center Point  
Salen, WV 26426  
304-782-3771

Date: April 7, 2014

Filed 4-7-14 @ 7:07 PM

To: Doddridge County Floodplain Appeals Board (Shirley Williams, Gregory Robinson & Ralph Sandora)

Re: Appeal for Floodplain permit 13-103 that was issued to Mark West Liberty Sherwood Processing plant on March 18, 2014

We appeal the decision by the interim floodplain manager that was issued to Mark West on March 18, 2014. The floodplain permit was granted by Mr. Ralph Sandora, filling in as the Floodplain Manager, at the County Commission meeting on March 18, 2013.

Our reasons for filing this appeal are as follows:

- a. We feel that allowing storage of temporary fill in the floodway will adversely affect the health of our watershed.
- b. Additional permits from the USACE and WV DEP are required prior to the issuance of the floodplain permit. As of today, these permits have not been issued. Mark West neglected to notify County officials that the additional permits had been applied for or granted. See page 33 Section 7.2 item E which states "any permit required of any other governmental agencies, whether state or federal or local, that requires site approval, shall be filed with the County Clerk, date/time stamped and filed with the official Floodplain Permit application prior to final issuance of said permit and prior to start of construction."
- c. The hydraulic studies done state that this will be temporary stockpiles of soil in the floodway. The Doddridge County Floodplain Ordinance addresses this issue in Article IV Section 4.1 and also on page 28 thru 30 part E. Fill
- d. No adjacent property owners were notified. The ordinance specifically states that adjacent property owners be notified. ( see page 3 Section 2.2 Definitions A General # 2 )
- e. The cumulative totals of the four floodplain permits are above the one foot rule. The January, 2014 permit application has not yet been granted. We realize that this is still an open issue, but it is crucial to the end result and needs to be considered.
- f. The location of the site is upstream of a municipal water supply. The possibility of pollutants being discharged into the creek may occur. It has already occurred from a well site on this property.
- g. Alteration of the floodway will increase the volume and velocity of the water as it heads downstream during flood events. The possibility of water backing up is also high which will affect residents living upstream.
- h. We feel that until all investigations are completed, ALL activity related to this Floodplain be stopped.
- i. We would like to also state that floodplain permits that have already been issued in this drain field have not been considered as far the cumulative totals for the one foot rule.

**Article VIII Section 8.1 states that once an appeal is filed "the floodplain administrator shall immediately issue a STOP WORK ORDER NOTICE that shall remain in effect until resolution of said appeal" (page 42 of the ordinance).**

Signed,

**Doddridge County Watershed Association**

Route 2 Box 210A

West Union, West Virginia 26456

**We also request that we be notified of any correspondence and communication that occurs as a result of this appeal with Mark West or their appointed representatives.**



Filed 4-4-2014  
1:19 PM

TO: Clerk of the County Court  
118 E. Court St.  
West Union, WV 26456

ATT: Beth A. Rogers, Doddridge County Clerk  
Doddridge County Commission as the Floodplain Appeals Board

FROM: Jonette Kirkwood  
203 Court St.  
West Union, WV 26456  
March 28, 2014

RE: The approval of the Floodplain Permit – Mark West Liberty Sherwood Processing  
#13-103

I am appealing to the Doddridge County Commission in its role as the Floodplain Appeals Board to rescind the decision of Ralph Sandora, acting Floodplain Administrator, in regard to the permit application from Mark West Liberty Sherwood Processing, #13-103.

It clearly states in the Doddridge County Floodplain Ordinance that permits “shall be approved only after it has been determined that the proposed work to be undertaken will be in conformance with the requirements of this Ordinance, State, and Federal Laws, ordinances and regulations”. The work proposed by this permit requires that permits also be granted by FEMA and the DEP. Without permits for this work being previously granted by these agencies, it is in violation of Section 7.2, Part B of the Doddridge County Floodplain Ordinance to approve the permit.

The decision should be immediately rescinded, and reconsidered only when and if the required approval from FEMA and the DEP has been shown to have been granted.

As a resident of West Union, I am very concerned about our water source as well as increased downstream flooding. The recent events in Charleston should serve as a warning of what long term and catastrophic issues may result when those in authority ignore the very rules put in place to avoid such developments.

This may have been an oversight on the part of Mr. Sandora, but it needs to be corrected. A stop work order would be required to be sure no damage is done until this issue is properly settled.

I thank you for reconsidering the legality of this decision.

*Jonette Kirkwood*

TO: Clerk of the County Court  
118 E. Court St.  
West Union, WV 26456

ATT: Beth A. Rogers, Doddridge County Clerk  
Dan Wellings, Doddridge County Floodplain Manager

January 21, 2014

In regard to: Floodplain Permit Application – Mark West Liberty Sherwood Processing  
plant 4&5 #13-103

No further flood plain permits for alterations should be considered for this area.

This floodplain has already been altered beyond what is reasonable.

This floodplain handles significant flood waters, allowing waters to spread out during heavy rain  
preventing flood damage to both upstream and downstream landowners.

The allowance of more fill in this historical floodplain will restrict waters from spreading out. In  
conjunction with the continued development resulting in the loss of trees and vegetation, which takes  
up excess water during heavy rainfall, nearby landowners will experience more damage.

Landowners experiencing increased flooding and damage to their properties upstream and downstream  
from this site as a result of continued permitting, might possibly hold the floodplain manager and  
Doddridge County commissioners liable.

I also ask that I be notified if my comments are forwarded to Mark West Liberty-Sherwood Processing  
Plant.

Thank you for NOT approving this floodplain permit.

*Christina Woods*

Christina Woods  
1585 Broad Run Road  
Center Point, WV 26339

304-782-3054

WATER IS LIFE.....LET'S PROTECT IT!!!

FILED  
2014 JAN 22 AM 11:52  
DODDRIDGE COUNTY, WV

FILED

Notes

2  
letters  
enclosed

TO: Clerk of the County Court  
118 E. Court St.  
West Union, WV 26456

ATT: Beth A. Rogers, Doddridge County Clerk  
Dan Wellings, Doddridge County Floodplain Manager

January 21, 2014

In regard to: Floodplain Permit Application – Mark West Liberty Sherwood Processing  
plant 4&5 #13-103

No further flood plain permits for alterations should be considered for this area.

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conjunction with the continued development resulting in the loss of trees and vegetation, which takes  
up excess water during heavy rainfall, nearby landowners will experience more damage.

Landowners experiencing increased flooding and damage to their properties upstream and downstream  
from this site as a result of continued permitting, might possibly hold the floodplain manager and  
Doddridge County commissioners liable.

I also ask that I be notified if my comments are forwarded to Mark West Liberty-Sherwood Processing  
Plant.

Thank you for NOT approving this floodplain permit.



Wayne Woods  
1585 Broad Run Road  
Center Point, WV 26339

304-782-3054

WATER IS LIFE.....LET'S PROTECT IT!!!

FILED  
2014 JAN 22 AM 11:52  
RECEIVED  
CLERK  
DODDRIDGE COUNTY, WV

Jan 20, 2014

Dear Ms. Rogers + Mr. Wellings,

In Regard  
to Flood plain permit application, Merck  
West Liberty Sherwood processing plant  
# & 5 # 13-103.

Please do not issue this permit.  
It will put the lives of the people  
in West Union in more peril than  
they already are. We do not need  
more potential pollutants upstream  
of the town's water inlet.

Sincerely,

Doug Geelhaar



Mr. J. Douglas Geelhaar  
2430 Little Buck Run, Box 154  
New Milton, WV 26411-6149

★ PROUD SUPPORTER OF THE USO ★

Attention:

Beth A. Rogers, Doddridge County Clerk  
FAN Wellings, Doddridge Floodplain Manager

DODDRIDGE COUNTY  
CLERK  
OFFICE

2014 JAN 22 AM 11:56

FILED

1/21/14

In regard to permit application - MARK  
West Sherwood Processing Plant 4 and 5 #13-103

No further flood plain permit or alterations  
should be considered for this area

The flood plain has already been altered beyond  
what is reasonable. This flood plain handles  
significant waters, allowing waters to spread  
out during heavy rain preventing flood damage  
to both ~~upstream~~ upstream and down stream  
land owners.

The allowance of more fill in this historical  
flood plain will restrict water from spreading out.  
In conjunction with the continued development  
resulting in the loss of trees and vegetation, which  
takes up water during heavy rain fall, nearby  
land owners will experience more damage

Land owners experiencing increased  
flooding and damage to their properties upstream  
and down stream from this site as a result  
of continued permitting might possibly hold  
the flood plain manager and Doddridge  
County Commissioners liable

I ASK THAT I be contacted if my  
comments are forwarded to MARK West Liberty -  
Sherwood Processing Plant.

I also ask that you hold a public  
meeting discussing this permit

Thank you for NOT Approving this  
Flood permit  
(PLEASE TURN OVER)

Respectfully,

TWA Del Prete  
4865 Riggins Run Rd  
West Union, WV 26456  
304-782-2096

T. Stumpf  
4805 Riggins Run  
W. Union, WV 26456  
3047822096

FILED



Civil & Environmental Consultants, Inc.

April 18, 2014

2014 APR 22 PM 12: 08

Mr. Edwin Wriston, Floodplain Manager  
Doddridge County Commission  
118 East Court Street  
West Union, WV 26456

BETH A. ROGERS  
COUNTY CLERK  
DODDRIDGE COUNTY, WV

Dear Mr. Wriston:

Subject: Sherwood Gas Processing Plant 4/5  
218 Swisher Lane  
West Union, WV 26456  
**Floodplain Permit #13-103**  
CEC Project 110-811.5001

MarkWest Liberty Midstream & Resources, LLC (MarkWest) was issued Floodplain Permit #13-103 on March 4, 2014 for Sherwood Gas Processing Plants 4 and 5, and for additional temporary stockpile construction required for the construction of said plants.

Please consider this letter as official notification that all work within the floodplain area associated with Floodplain Permit #13-103 has been completed. On behalf of MarkWest we respectfully request that this permit be closed and a Certificate of Compliance be issued as per the requirements of Section 7.8.D of the Doddridge County Floodplain Ordinance.

Please contact us at 412-429-2324 if you have any questions.

Very truly yours,

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.

Edward J. Fink, P.E., CPESC, CPSWQ  
Project Manager

Richard P. Celender, C.E.T., CPESC, CPSWQ  
Principal

Enclosures

110-811.5001-L-Plants-4-5-Compliance-4-18-14/P