Floodplain Development Permit

Doddridge County, WV Floodplain Management

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

Permit: # 15-405

Date Approved: 02/17/2016 **Expires: 02/17/2017**

Issued to: EQT Production Company **POC: Lacoa Corder 304-848-0076**
WEU 51 Well Pad and Access Rd Enhancement

Company Address: 115 Professional Place/P.O. Box 280
Bridgeport, WV 26330

Project Address:

Firm: 120C **Lat/Long:**

Purpose of development: Well Pad, and Access Road Modification

Issued by: George C Eidel, Doddridge County FPM (*or designee*)

_____ **Date: 02/17/2016**

For additional information regarding this permit, please contact
Doddridge County Floodplain Manager at 304.873.2631, or via email at
doddridgecountyfpm@gmail.com
108 Court Street Ste 1; West Union, WV 26456

Doddridge County, West Virginia

RECEIPT NO: 5936 **DATE:** 2015/11/24

FROM: SMITH LAND SURVEYING **AMOUNT:** $ 500.00

FIVE HUNDRED DOLLARS AND 00 CENTS

FOR: #15-405 EQT PRODUCTION WEU 51 PROPOSED WELL PAD & ACCESS ROAD ENHANCEMENT

00000018259 FP-BUILDING PERMITS 020-318 **TOTAL:** $500.00

MICHAEL HEADLEY
SHERIFF &TREASURER

MEC
CLERK

Customer Copy

SLS SMITH LAND SURVEYING, INC.
P.O. BOX 150, GLENVILLE, WV 26351
(304) 462-5634 • FAX (304) 462-5656

LETTER OF TRANSMITTAL

DATE	JOB NO.
11/23/15	8051
ATTENTION: George Eidel	
RE: EQT WEU 51 Re-Permit	

TO: Doddridge County Floodplain Coordinator
118 East Court St.
West Union, WV 26456

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☒ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1			Floodplain Packet for EQT WEU 51 Wells (Application, Site Plans, Flood Analysis, Etc.)
1			$500.00 SLS Check # 18259

THESE ARE TRANSMITTED as checked below:

☒ For approval ☐ Approved as submitted ☐ Resubmit_____copies for approval
☒ For your use ☐ Approved as noted ☐ Submit_____copies for distribution
☐ As requested ☐ Returned for corrections ☐ Return_____corrected prints
☐ For review and comment ☐ _____
☐ FOR BIDS DUE _____ 20_____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS _____

If you have any questions or concerns on this re-application please feel free to call Adam Wilson or Wes Wayne at 304-462-5634. Thank you.

COPY TO SLS Files

8051 WEU 51 Floodplain

SIGNED: Adam Wilson

If enclosures are not as noted, kindly notify us at once.

SLS SMITH LAND SURVEYING, INC.
P.O. BOX 150, GLENVILLE, WV 26351
(304) 462-5634 • FAX (304) 462-5656

LETTER OF TRANSMITTAL

DATE	JOB NO.
2/12/16	8051
ATTENTION: George Eidel	
RE: EQT WEU 51 & OXF 157 Flood Studies	

TO: Doddridge County Floodplain Coordinator
108 Court St., Suite 1
West Union, WV 26456

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☒ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1			Floodplain Study for EQT WEU 51 (CD)
1			Floodplain Study for EQT OXF 157 (CD)

FILED
2016 FEB 16 PM 1:40
BETTY A. ROGERS
COUNTY CLERK
DODDRIDGE COUNTY, WV

THESE ARE TRANSMITTED as checked below:

☒ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☒ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review and comment ☐ _____
☐ FOR BIDS DUE _____ 20____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS _____

If you have any questions or concerns on this information please feel free to call Adam Wilson or Wes Wayne at 304-462-5634. Thank you.

COPY TO SLS Files

Floodplain Info for WEU 51 & OXF 157

SIGNED: Adam Wilson

If enclosures are not as noted, kindly notify us at once.

15-405

PROFESSIONAL ENERGY CONSULTANTS
A DIVISION OF SMITH LAND SURVEYING, INC.

November 23, 2015

Mr. George Eidel
Doddridge County Floodplain Coordinator
118 East Court Street
West Union, WV 26456

Re: EQT Production Company- WEU 51 Proposed Well Pad and Access Road Enhancement

Mr. Eidel,

On behalf of EQT Production Company, LLC, we are applying for a new Doddridge County Floodplain Permit due to the expiration of the existing permit (13-077). EQT has constructed a well pad and access road to aid in the development of Marcellus Shale gas wells. Total project disturbance is approximately 51.8 acres.

The access road passes through a portion of Zone A as indicated on FEMA Panel 54017C0120C. Please see the attached overlay mapping, which shows the limits of disturbance and the access roadway. We have also included the project site plans and hydraulic study for the project. The site plans have changed since the issuance of the first permit. The original permitted action was to install 4 15" CMP (Aluminum) pipes indicated in the attached hydraulic study which would have resulted in a raise to the BFE of no more than 0.96 feet. The new design will incorporate a low water concrete ford instead of the 4 15" CMP's. The low water concrete ford will be installed at the base of the streambed causing no change to occur to the BFE. No downstream properties will be affected. The proposed plans show the removal of the existing temporary steel bridge and the installation of a low water concrete ford. The temporary steel bridge shall be left in place until the low water concrete ford has been installed.

P.O. Box 150, 226 West Main Street, Glenville, WV 26351
T: (304)-462-5634 F: (304)-462-5656

56065 Dilles Bottom Road, Shadyside, OH 43947
T: (740)-671-9911

Included in the attachments are the following: Cover Letter, Site Plans, Stream Crossing Plans, Hydraulic Study, Signed Floodplain Application, and a copy of the previously issued permit (13-077).

If you have any questions, please call.

Adam Wilson
Smith Land Surveying, Inc.
P.O. Box 150
Glenville, WV 26351
(304) 462-5634 awilson@slssurveys.com

EQT Well Site Permit #
WEU 51
13-077

DODDRIDGE COUNTY
FLOODPLAIN DEVELOPMENT PERMIT APPLICATION

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

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

APPLICANT'S SIGNATURE _____

DATE 10/1/13

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: EQT Production Company
ADDRESS: 115 Professional Place P.O. Box 280 Bridgeport, WV 26330
TELEPHONE NUMBER: 304-848-0076

BUILDER'S NAME: EQT Production Company

ADDRESS: 115 Professional Place P.O. Box 280 Bridgeport, WV 26330

TELEPHONE NUMBER: 304-848-0076

ENGINEER'S NAME: Cyrus S. Kump/ Navitus Engineering Inc.

ADDRESS: 151 Windy Hill Lane Winchester, VA 22602

TELEHONE NUMBER: 888-662-4185

PROJECT LOCATION:

NAME OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT) Mary H. Holland Estate of Mary Holland % Jane Holland

ADDRESS OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT) 225 Watching Fork Westfield, NJ 07090

DISTRICT: West Union

DATE/FROM WHOM PROPERTY PURCHASED: Property came out of estate of Mary Holland

LAND BOOK DESCRIPTION: Digital Courthouse- Bluestone 1207.637 Ac Int O&G

DEED BOOK REFERENCE: 286/313

TAX MAP REFERENCE: Tax map 23-04

EXISTING BUILDINGS/USES OF PROPERTY: hunting cabin

NAME OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY N/A

ADDRESS OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY N/A

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

DESCRIPTION OF WORK (CHECK ALL APPLICABLE BOXES)

A. STRUCTURAL DEVELOPMENT

ACTIVITY		STRUCTURAL TYPE	
[]	New Structure	[]	Residential (1 – 4 Family)
[]	Addition	[]	Residential (more than 4 Family)
[]	Alteration	[]	Non-residential (floodproofing)
[]	Relocation	[]	Combined Use (res. & com.)
[]	Demolition	[]	Replacement
[]	Manufactured/Mobil Home		

B. OTHER DEVEOPLMENT ACTIVITIES:

[x] Fill [] Mining [x] Drilling [] Pipelining
[x] Grading
[] Excavation (except for STRUCTURAL DEVELOPMENT checked above)
[] Watercourse Altercation (including dredging and channel modification)
[x] Drainage Improvements (including culvert work)
[x] 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 ½ X 11 INCH SHEET OF PAPER THE SHAPE AND LOCATION OF THE LOT. SHOW THE LOCATION OF THE INTENDED CONSTRUCTION OR LAND USE INDICATING BUILDING SETBACKS, SIZE & HEIGHT. IDENTIFY EXISTING BUILDINGS, STRUCTURES OR LAND USES ON THE PROPERTY.
3. **SIGN AND DATE THE SKETCH.**

ACTUAL TOTAL CONSTRUCTION COSTS OF THE COMPLETE DEVELOPMENT IRRESPECTIVE OF WHETHER ALL OR ANY PART OF THE SUBJECT PROPOSED CONSTRUCTION PROJECT IS WITHIN THE FLOODPLAIN $ 40,000

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: Mary Holland Estate % Jane Hardin
ADDRESS: 225 Watching Fork
Westfield, NJ 07090

NAME: Charles Jr. and Barbara Wellings
ADDRESS: Hc 68 Box 3
West Union, WV 26456

NAME: Pierce Ruth M. & Tom Davies
ADDRESS: 1104 Greenmont Circle
Vienna, WV 26105

NAME: Charles P. Heaster ET AL
ADDRESS: Rr 1 Box 57
West Union, WV 26456

NAME: I. L. Morris
ADDRESS: P.O. Box 397
Glenville, WV 26351

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: James S. Donley
ADDRESS: 1406 Doe Run
West Union, WV 26456

NAME: Mary Farr
ADDRESS: Rt 1 Box 56A
West Union, WV 26456

NAME: Charles P. Heaster
ADDRESS: Rr 1 Box 57
West Union, WV 26456

NAME:
ADDRESS:

E. CONFIRMATION FORM

THE APPLICANT ACKNOWLEDGES, AGREES, AND CONFIRMS THAT HE/IT WILL PAY WITHIN 30 DAYS OF RECEIPT OF INVOICE BY THE COUNTY FOR ALL EXPENSES RELATIVE TO

THE PERMIT APPLICATION PROCESS GREATER THAN THE REQUIRED DEPOSIT FOR EXPENSES INCLUDING:

(A) PERSONAL SERVICE OF PROCESS BY THE DODDRIDGE COUNTY SHERIFF AT THE RATES PERMITTED BY LAW FOR SUCH SERVICE.

(B) SERVICE BY CERTIFIED MAIL RETURN RECEIPT REQUESTED.

(C) PUBLICATION.

(D) COURT REPORTING SERVICES AT ANY HEARINGS REQUESTED BY THE APPLICANT.

(E) CONSULTANTS AND/OR HEARING EXPERTS UTILIZED BY DODDRIDGE COUNTY FLOODPLAIN ADMINISTRATOR/MANAGER OR FLOODPLAIN APPEALS BOARD FOR REVIEW OF MATERIALS AND/OR TESTIMONY REGARDING THE EFFICACY OF GRANTING OR DENYING THE APPLICANT'S FLOODPLAIN PERMIT.

NAME (PRINT): Megan E. Landfried

SIGNATURE: Megan E. Landfried **DATE:** 10/1/13

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: 120

Dated: 10/04/2011

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

[X] Is located in Special Flood Hazard Area.

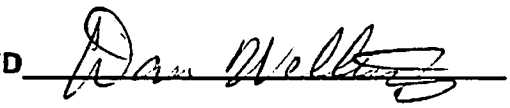
FIRM zone designation A

100-Year flood elevation is: N/A NGVD (MSL)

[X] Unavailable

[] The proposed development is located in a floodway.
FBFM Panel No._____ Dated_____

[] See section 4 for additional instructions.

SIGNED  DATE 11/04/2003

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.

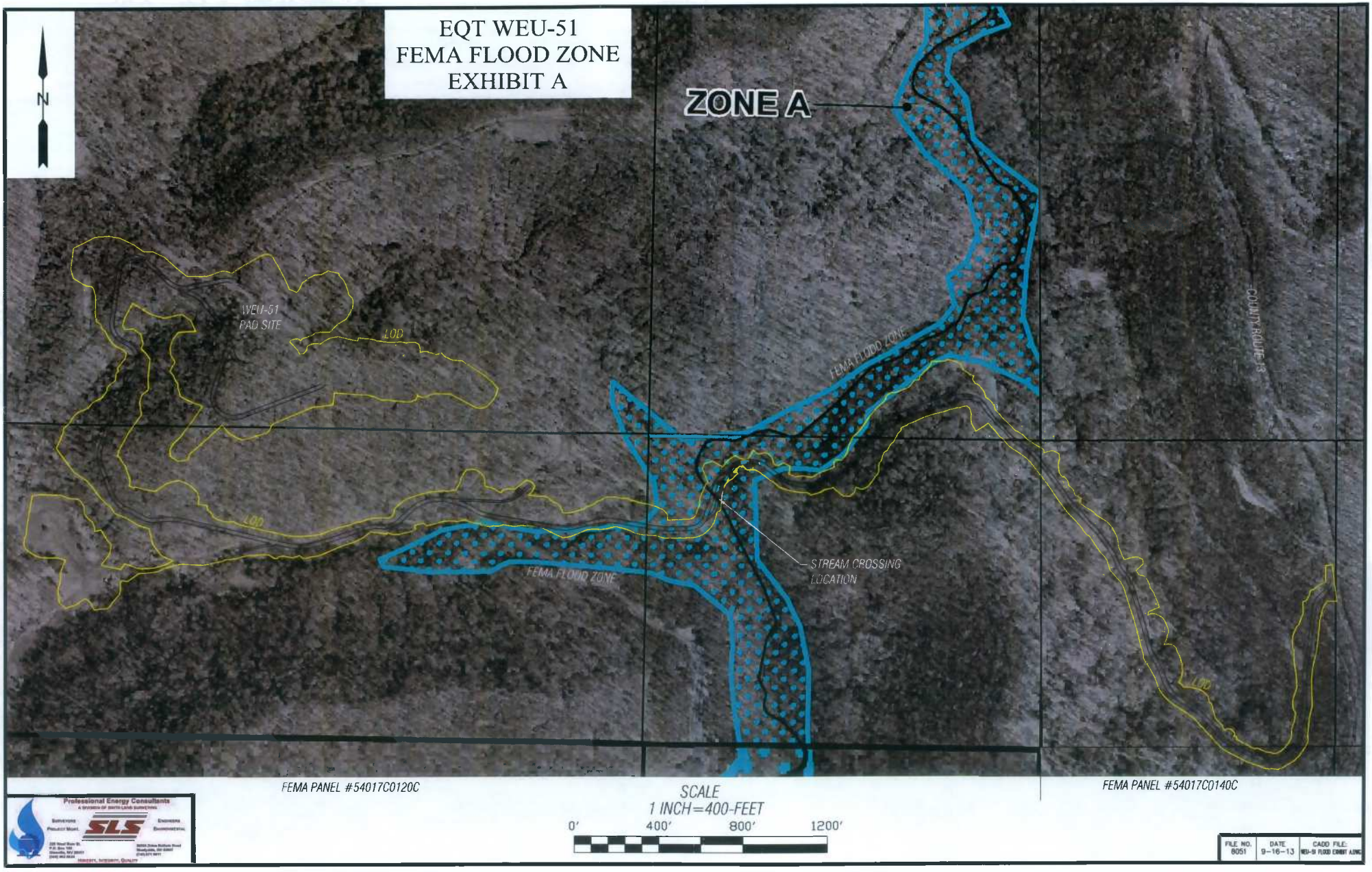
[] Development plans, drawn to scale, and specifications, including where applicable: details for anchoring structures, storage tanks, proposed elevation of lowest floor, (including basement or crawl space), types of water resistant materials used below the first floor, details of flood proffing of utilities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

EQT WEU-51
FEMA FLOOD ZONE
EXHIBIT A



FEMA PANEL #54017C0120C

FEMA PANEL #54017C0140C

SCALE
1 INCH=400-FEET

0′ 400′ 800′ 1200′

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SLS

FILE NO.	DATE	CADD FILE:
8051	9-16-13	WEU-51 FLOOD EXHIBIT A.DWG

Attachment A
Identified and Delineated Stream/Wetland Characteristics and Estimated Impacts
Well Site WEU 51 Expansion
Doddridge County, West Virginia

Stream/Wetland	Stream/Wetland Classification	Impact Type	Stream/Wetland Crossing		Stream Length (ft)/Wetland Acreage within AOI[1]	Bank Full Height (ft)	Bank Full Width (ft)	Proposed Impacts[2] (linear feet)	Estimated Volume of Impacts (ft^3)	Estimated Impacts (yd^3)	Estimated Impacts (ft^2)	Estimated Impacts (acres)
			Latitude (°N)	Longitude (°W)								
Unnamed Tributary No. 1 (UNT 1)	Ephemeral, Non- Relatively Permanent (Non-RPW)	---	No Proposed Impacts		124.18	0.4	2.0	---	---	---	---	---
Unnamed Tributary No. 2 (UNT 2)	Ephemeral, Non-RPW	---	No Proposed Impacts		19.31	0.6	2.0	---	---	---	---	---
Unnamed Tributary No. 3 (UNT 3)	Intermittent, Relatively Permanent (RPW)	Access Road Culvert and Rip-Rap Outlet Protection	39.250279	-80.745673	1,083.49	0.7	4.0	11	30.16	1.12	43.09	0.0010
Unnamed Tributary No. 4 (UNT 4)	Ephemeral, Non-RPW	Access Road Culvert and Rip-Rap Outlet Protection	39.250107	-80.746802	286.26	0.4	3.0	74	88.79	3.29	221.96	0.0051
Unnamed Tributary No. 5 (UNT 5)	Ephemeral, Non-RPW	Access Road Culvert and Rip-Rap Outlet Protection	39.249867	-80.746085	307.49	0.9	3.5	48	152.72	5.66	169.69	0.0039
Unnamed Tributary No. 6 (UNT 6)	Ephemeral, Non-RPW	Access Road Culvert and Rip-Rap Outlet Protection	39.250547	-80.747388	262.64	0.4	2.0	101	80.48	2.98	201.19	0.0046
Unnamed Tributary No. 7 (UNT 7)	Ephemeral, Non-RPW	Access Road Culvert and Rip-Rap Outlet Protection	39.250792	-80.747834	228.17	0.3	1.5	117	52.66	1.95	175.52	0.0040
Unnamed Tributary No. 8 (UNT 8)	Ephemeral, Non-RPW	---	No Proposed Impacts		18.50	0.8	3.0	---	---	---	---	---
Unnamed Tributary No. 9 (UNT 9)	Ephemeral, Non-RPW	Access Road Culvert and Rip-Rap Outlet Protection	39.251202	-80.748104	341.47	0.8	2.0	128	204.14	7.56	255.18	0.0059
Unnamed Tributary No. 10 (UNT 10)	Ephemeral, Non-RPW				160.10	0.1	1.1	35	3.90	0.14	38.98	0.0009
Unnamed Tributary No. 11 (UNT 11)	Ephemeral, Non-RPW				37.17	0.4	1.5	5	3.00	0.11	7.50	0.0002
Unnamed Tributary No. 12 (UNT 12)	Ephemeral, Non-RPW	Access Road Culvert and Rip-Rap Outlet Protection	39.252409	-80.748669	212.25	0.1	1.0	169	16.89	0.63	168.86	0.0039
Unnamed Tributary No. 13 (UNT 13)	Ephemeral, Non-RPW	Access Road Culvert and Rip-Rap Outlet Protection	39.252864	-80.749005	162.05	0.3	1.0	85	25.63	0.95	85.43	0.0020
Unnamed Tributary No. 14 (UNT 14)	Ephemeral, Non-RPW	Access Road Culvert and Rip-Rap Outlet Protection	39.253416	-80.749600	99.18	0.4	1.5	55	33.04	1.22	82.61	0.0019
Unnamed Tributary No. 15 (UNT 15)	Ephemeral, Non-RPW	Access Road Culvert and Rip-Rap Outlet Protection	39.253810	-80.750020	158.25	0.8	1.5	108	129.71	4.80	162.14	0.0037
Unnamed Tributary No. 16 (UNT 16)	Ephemeral, Non-RPW	Access Road Culvert and Rip-Rap Outlet Protection	39.254226	-80.750638	133.81	0.2	1.0	53	10.57	0.39	52.83	0.0012
Unnamed Tributary No. 17 (UNT 17)	Ephemeral, Non-RPW/Potentially Isolated	Access Road Culvert and Rip-Rap Outlet Protection	39.254366	-80.752502	158.67	0.2	1.2	159	38.08	1.41	190.40	0.0044
Unnamed Tributary No. 18 (UNT 18)	Ephemeral, Non-RPW/Potentially Isolated	Access Road Culvert and Rip-Rap Outlet Protection	39.253627	-80.753382	251.49	0.3	2.8	176	147.77	5.47	492.56	0.0113
Bluestone Creek (UNT 19)	Perennial, RPW	Permanent Culvert Outlet Protection/Low Water Crossing and Temporary Bridge Crossing	39.253355	-80.755572	474.82	1.5	10.5	115	1807.19	66.93	1204.79	0.0277
Unnamed Tributary No. 20 (UNT 20)	Intermittent, RPW	---	No Proposed Impacts		124.69	0.2	9.0	---	---	---	---	---
Unnamed Tributary No. 21 (UNT 21)	Intermittent, RPW	---	No Proposed Impacts		786.91	0.4	5.7	---	---	---	---	---
Unnamed Tributary No. 21 (UNT 21)	Perennial, RPW	Access Road Culvert and Rip-Rap Outlet Protection	39.252323	-80.764506	3,149.65	1.2	17.0	190	3881.00	143.74	3234.17	0.0742
Branch of UNT 21 (Split Channel Section)	Ephemeral, Non-RPW				126.78	0.2	3.0	49	29.47	1.09	147.34	0.0034
Unnamed Tributary No. 22 (UNT 22)	Ephemeral, Non-RPW	---	No Proposed Impacts		226.07	0.1	1.0	---	---	---	---	---
Unnamed Tributary No. 23 (UNT 23)	Ephemeral, Non-RPW	---	No Proposed Impacts		212.14	0.2	1.0	---	---	---	---	---

15-405
EQT Production Company - WE U51 Proposed well Pad + Access RD enhancement

DODDRIDGE COUNTY
FLOODPLAIN DEVELOPMENT PERMIT APPLICATION

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

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APPLICANT'S SIGNATURE Becca Corder

DATE 11/19/15

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: EQT Production Company

ADDRESS: 115 Professional Place P.O. Box 280 Bridgeport, WV 26330

TELEPHONE NUMBER: 304-848-0076

BUILDER'S NAME: EQT Production Company

ADDRESS: 115 Professional Place P.O. Box 280 Bridgeport, WV 26330

TELEPHONE NUMBER: 304-848-0076

ENGINEER'S NAME: Cyrus S. Kump/ Navitus Engineering Inc.

ADDRESS: 151 Windy Hill Lane Winchester, VA 22602

TELEHONE NUMBER: 888-662-4185

PROJECT LOCATION:

NAME OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT) Mary H. Holland Estate of Mary Holland % Jane Holland

ADDRESS OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT) 225 Watching Fork Westfield, NJ 07090

DISTRICT: West Union

DATE/FROM WHOM PROPERTY PURCHASED: Property came out of estate of Mary Holland

LAND BOOK DESCRIPTION: Digital Courthouse- Bluestone 1207.637 Ac Int O&G

DEED BOOK REFERENCE: 286/313

TAX MAP REFERENCE: Tax map 23-04

EXISTING BUILDINGS/USES OF PROPERTY: hunting cabin

NAME OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY N/A

ADDRESS OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY N/A

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	[]	Residential (1 – 4 Family)
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[]	Alteration	[]	Non-residential (floodproofing)
[]	Relocation	[]	Combined Use (res. & com.)
[]	Demolition	[]	Replacement
[]	Manufactured/Mobil Home		

B. OTHER DEVEOPLMENT ACTIVITIES:

[x] Fill [] Mining [x] Drilling [] Pipelining

[x] Grading

[] Excavation (except for STRUCTURAL DEVELOPMENT checked above)

[] Watercourse Altercation (including dredging and channel modification)

[x] Drainage Improvements (including culvert work)

[x] 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 ½ X 11 INCH SHEET OF PAPER THE SHAPE AND LOCATION OF THE LOT. SHOW THE LOCATION OF THE INTENDED CONSTRUCTION OR LAND USE INDICATING BUILDING SETBACKS, SIZE & HEIGHT. IDENTIFY EXISTING BUILDINGS, STRUCTURES OR LAND USES ON THE PROPERTY.
3. **SIGN AND DATE THE SKETCH.**

ACTUAL TOTAL CONSTRUCTION COSTS OF THE COMPLETE DEVELOPMENT IRRESPECTIVE OF WHETHER ALL OR ANY PART OF THE SUBJECT PROPOSED CONSTRUCTION PROJECT IS WITHIN THE FLOODPLAIN $ 40,000.00

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: Mary Holland Estate % Jane Hardin
ADDRESS: 225 Watching Fork
Westfield, NJ 07090

NAME: Charles Jr. and Barbara Wellings
ADDRESS: Hc 68 Box 3
West Union, WV 26456

NAME: Pierce Ruth M. & Tom Davies
ADDRESS: 1104 Greenmont Circle
Vienna, WV 26105

NAME: Charles P. Heaster ET AL
ADDRESS: Rr 1 Box 57
West Union, WV 26456

NAME: I. L. Morris
ADDRESS: P.O. Box 397
Glenville, WV 26351

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: James S. Donley
ADDRESS: 1406 Doe Run
West Union, WV 26456

NAME: Mary Farr
ADDRESS: Rt 1 Box 56A
West Union, WV 26456

NAME: Charles P. Heaster
ADDRESS: Rr 1 Box 57
West Union, WV 26456

NAME:
ADDRESS:

E. CONFIRMATION FORM

THE APPLICANT ACKNOWLEDGES, AGREES, AND CONFIRMS THAT HE/IT WILL PAY WITHIN 30 DAYS OF RECEIPT OF INVOICE BY THE COUNTY FOR ALL EXPENSES RELATIVE TO

THE PERMIT APPLICATION PROCESS GREATER THAN THE REQUIRED DEPOSIT FOR EXPENSES INCLUDING:

(A) PERSONAL SERVICE OF PROCESS BY THE DODDRIDGE COUNTY SHERIFF AT THE RATES PERMITTED BY LAW FOR SUCH SERVICE.

(B) SERVICE BY CERTIFIED MAIL RETURN RECEIPT REQUESTED.

(C) PUBLICATION.

(D) COURT REPORTING SERVICES AT ANY HEARINGS REQUESTED BY THE APPLICANT.

(E) CONSULTANTS AND/OR HEARING EXPERTS UTILIZED BY DODDRIDGE COUNTY FLOODPLAIN ADMINISTRATOR/MANAGER OR FLOODPLAIN APPEALS BOARD FOR REVIEW OF MATERIALS AND/OR TESTIMONY REGARDING THE EFFICACY OF GRANTING OR DENYING THE APPLICANT'S FLOODPLAIN PERMIT.

NAME (PRINT): Lacoa Corder

SIGNATURE: Lacoa Corder **DATE:** 11/19/15

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:_____

Dated:_____

[] Is **NOT** located in a Specific Flood Hazard Area (Notify applicant that the application review is complete and **NO FLOOPLAIN 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_____ **DATE**_____

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_____

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

REPLY TO
ATTENTION OF

JAN 28 2014

Regulatory Division
Energy Resource Branch
LRH-2013-01017-OHR- Bluestone Creek
EQT Production Company Well Site WEU 51

PRELIMINARY JURISDICTIONAL DETERMINATION AND
NATIONWIDE PERMIT NO. 14 VERIFICATION

Ms. Megan Landfried
EQT Production Company
115 Professional Place
Bridgeport, West Virginia 26330

Dear Ms. Landfried:

I refer to the Pre-Construction Notification (PCN) received in this office on November 25, 2013, with final PCN revisions received in the office on January 10, 2014 requesting authorization to discharge dredged and/or fill material into waters of the United States in conjunction with the EQT Production Company Well Site WEU 51 Project. The proposed work is located in streams and wetlands of Bluestone Creek. Bluestone Creek is a perennial tributary to Middle Island Creek, a traditional navigable water (TNW) of the United States. The proposed project is located approximately 2.7 aerial miles west of Blandville, Doddridge County, West Virginia. The approximate center coordinates of the site are located at 39.255748°North, 80.763153 °West. The PCN has been assigned the following file number: LRH-2013-01017-OHR- Bluestone Creek. Please reference this number on all future correspondence related to this project.

The United States Army Corps of Engineers (Corps) authority to regulate waters of the United States is based on the definitions and limits of jurisdiction contained in 33 CFR 328 and 33 CFR 329. Section 404 of the Clean Water Act (Section 404) requires a Department of the Army (DA) permit be obtained prior to discharging dredged or fill material into waters of the United States, including wetlands. Section 10 of the Rivers and Harbors Act of 1899 (Section 10) requires a DA permit be obtained for any work in, on, over or under a navigable water.

Based on a review of the PCN report submitted to our office, on-site field verification November 8, 2013, and other data available to us, this office has determined that both jurisdictional and non-jurisdictional waters are present within the delineation boundary; therefore, the enclosed *Well Site WEU 51 JD Map* has been labeled with a preliminary jurisdictional determination (JD) boundary and an approved JD boundary.

Preliminary Jurisdictional Determination Boundary:

Based on a review of the aquatic resources in the PCN, twenty-five (25) streams (4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 24, 6B, 25, 26, 30, 33, 26A, 27A, 28A and 11B) and one wetland (Wetland 2) are located within the proposed project area, as described in Tables 1 and 2 below and as depicted within the preliminary JD boundary of the enclosed Well Site WEU-51-JD-Map. The on-site aquatic resources may be waters of the United States in accordance with the Regulatory Guidance Letter for Jurisdictional Determinations (JDs) issued by the Corps on June 26, 2008 (Regulatory Guidance Letter No. 08-02). As indicated in the guidance, this Preliminary Jurisdictional Determination (PJD) is non-binding and cannot be appealed (33 C.F.R. 331.2) and only provides a written indication that waters of the United States may be present on-site.

You have declined to exercise the option to obtain an approved JD in this instance and at this time. However, for the purpose of the determination of impacts, compensatory mitigation, and other resource protection measures for activities that require authorization from this office, the streams and wetland referenced above will be evaluated as if they are waters of the United States.

Enclosed please find two (2) copies of the PJD form. If you agree with the findings of this PJD and understand your options regarding the same, please sign and date one copy of the PJD form and return it to this office within 30 days of receipt of this letter. You should submit the signed copy to the following address:

United States Army Corps of Engineers
Huntington District
Attn: Energy Resource Branch
502 Eighth Street
Huntington, West Virginia 25701.

Approved Jurisdictional Determination Boundary:

The approved JD boundary contains two (2) isolated, non-jurisdictional wetlands totaling 0.072 acre. The isolated, non-jurisdictional wetlands are located within an existing well pad area and they do not possess a surface hydrologic connection to a water of the United States. Refer to the enclosed *EQT Production Company-WEU Well Site 51 JD - APPROVED JD TABLE* and *WEU Well Site 51 JD Jurisdictional Determination Map* for a detailed summary of non-jurisdictional features. The aforementioned non-jurisdictional determination is based on guidance that became effective on May 29, 1998. This guidance was the result of the United States v. Wilson, 133 F. 3d 251 (4th Cir. 1997). Isolated wetlands and stream reaches may be subject to permitting requirements by the West Virginia Department of Environmental Protection (WVDEP).

If you object to the approved JD, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this determination you

must submit a completed RFA form to the Great Lakes and Ohio River Division Office at the following address:

U.S. Army Corps of Engineers
Great Lakes and Ohio River Division
550 Main Street, Room 10524
Cincinnati, OH 45202-3222
Phone: (513) 684-7261
Fax: (513) 684-2460

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by MAR 29 2014. **It is not necessary to submit an RFA form to the Division office if you do not object to the determination in this letter.**

Based on the information provided, your approved JD delineation is verified. The approved JD is valid for a period of five years from the date of this letter unless new information warrants revision of the delineation prior to the expiration date. The preliminary JD is a non-binding action and has no expiration date (RGL No. 05-02).

Nationwide Permit 12 Verification:

The proposed project, as described in the submitted information, has been reviewed in accordance with Section 404 and Section 10. Based on your description of the proposed work, and other information available to us, it has been determined that this project will not involve activities subject to the requirements of Section 10. However, this project will include the discharge of dredged or fill material into waters of the United States subject to the requirements of Section 404.

In the PCN received in this office on November 25, 2013, and final PCN revisions received in the office on January 10, 2014, you have requested DA authorization to discharge dredged and/or fill material into 2,616 linear feet of 25 streams, and 0.01 acre of one wetland, for the construction of an access road involving 22 single and complete projects, as described in Tables 1 and 2 below. The proposed discharge of dredged and/or fill material into waters of the United States is described attached Table 1.

Based on your description of the proposed work, it has been determined the proposed discharge of dredged and/or fill material into waters of the United States, as described on Tables 1 and 2 enclosed with this letter, for the construction of the Well Site WEU 51 access road Project meets the criteria for authorization under Nationwide Permit Number (NWP) #14 (enclosed) under the February 21, 2012 Federal Register, Notice of Reissuance of NWPs (77 FR 10184) provided you comply with all terms and conditions of the enclosed material. **The enclosed special conditions are hereby included as part of this permit and must be met to validate this authorization.** A copy of this NWP can be found on our website at

http://www.lrh.usace.army.mil/Missions/Regulatory.aspx. Please note that you must comply with all applicable terms and conditions of the enclosed material and the attached special conditions for the authorizations to be valid.

In view of the above, your linear transportation project is authorized subject to the terms and conditions of the enclosed material. It is your responsibility to ensure that your work conforms to all of the environmental management conditions listed within the enclosed material. Please be aware this NWP verification does not obviate the requirement to obtain any state or local assent required by law for the activities.

This verification is valid until the expiration date of the NWPs, unless the NWP authorization is modified, suspended, or revoked. The verification will remain valid if the NWP authorization is reissued without modification or the activity complies with any subsequent modification of the NWP authorization. All of the existing NWPs are scheduled to be modified, reissued, or revoked on March 18, 2017. Prior to this date, it is not necessary to contact this office for re-verification of your project unless the plans for the proposed activity are modified. Furthermore, if you commence or under contract to commence this activity before March 18, 2017, you will have twelve (12) months from the date of the modification or revocation of the NWP to complete the activity under the present terms and conditions of this NWP.

A copy of this NWP and verification letter must be supplied to your project engineer responsible for construction activities. A copy of the verification letter must be kept at the site during construction. Upon completion of the work, the attached certification must be signed and returned to this office. If you have any questions concerning the above, please contact Audrey Richter at (304) 399-5257 or by email at Aurey.M.Richter@usace.army.mil.

Sincerely,

Mark A. Taylor
Chief, Energy Resource Branch

Enclosures

CF: via email (w/out encls)

Mr. Beth Burdette
Potesta & Associates, Inc.
7012 MacCorkle Avenue, SE
Charleston, West Virginia 25304

Table 1-Authorized discharge of dredged and/or fill material into streams associated with the construction of an access road associated with the EQT Production Company Well Site WEU Site 51 Project
LRH-2013-01017-OHR-Bluestone Creek

Stream ID	Flow Regime	Stream Length in LOD (linear feet)	Fill Length of stream (linear feet)	Fill Area of Stream (acre)	Regulated Discharge of Fill Activity
UNT 4	Ephemeral	286.3	74	0.0051	Culvert/Rip-Rap- Access Road Construction
UNT 5	Ephemeral	307.5	48	0.0039	Culvert/Rip-Rap- Access Road Construction
UNT 6	Ephemeral	262.6	101	0.0046	Culvert/Rip-Rap- Access Road Construction
UNT 7	Ephemeral	228.2	117	0.0040	Culvert/Rip-Rap- Access Road Construction
UNT 9	Ephemeral	341.5	128	0.0059	Culvert/Rip-Rap- Access Road Construction
UNT 10	Ephemeral	161.1	35	0.0009	Culvert/Rip-Rap- Access Road Construction
UNT 11	Ephemeral	37.2	5	0.0002	Culvert/Rip-Rap- Access Road Construction
UNT 12	Ephemeral	212.3	169	0.0039	Culvert/Rip-Rap- Access Road Construction
UNT 13	Ephemeral	162.1	85	0.0020	Culvert/Rip-Rap- Access Road Construction
UNT 14	Ephemeral	99.2	55	0.0019	Culvert/Rip-Rap- Access Road Construction
UNT 15	Ephemeral	158.3	108	0.0037	Culvert/Rip-Rap- Access Road Construction
UNT 16	Ephemeral	133.9	53	0.0012	Culvert/Rip-Rap- Access Road Construction
UNT 17	Ephemeral	158.7	159	0.0044	Culvert/- Access Road Construction
UNT 18	Ephemeral	251.5	176	0.0113	Culvert/Rip-Rap- Access Road Construction
Bluestone Creek (Stream 19)	Perennial	474.8	115	0.0277	Permanent Ford- Access Road Construction
UNT 24	Ephemeral	187.0	153	0.0046	Rip-Rap associated with Access Road

					Construction
UNT 6B	Ephemeral	42.5	42	0.0023	Culvert/Rip-Rap- Access Road Construction
UNT 25	Ephemeral	585.4	93	0.0030	Culvert/Rip-Rap- Access Road Construction
UNT 26	Ephemeral	160.3	83	0.0019	Culvert/Rip-Rap- Access Road Construction
UNT 30	Ephemeral	313.62	237	0.0027	Culvert/Rip-Rap- Access Road Construction
UNT 33	Intermittent	129.0	82	0.0026	Culvert/Rip-Rap- Access Road Construction
UNT 26A	Ephemeral	1,071.6	189	0.0174	Culvert/Rip-Rap- Access Road Construction
UNT 27A	Ephemeral	146.0	79	0.0032	Permanent Fill- Access Road Construction
UNT 28A	Ephemeral	164.4	143	0.0045	Culvert/Rip-Rap- Access Road Construction
UNT11B	Ephemeral	90.2	87	0.0046	Permanent Fill- Access Road Construction

Table 2-Authorized discharge of dredged and/or fill material into wetlands associated with the construction of an access road associated with the EQT Production Company Well Site WEU Site 51 Project LRH-2013-01017-OHR-Bluestone Creek

Wetland ID	Classification	Area in LOD (acres)	Fill Area of Wetland (acres)	Regulated Discharge of Fill Activity
Wetland 2	PEM	0.014	0.001	Culvert/Rip-Rap- Access Road Construction

Nationwide Permit 14 Verification Special Conditions
EQT Production Company
Well Site WEU 51 Access Road
LRH-2013-01017-OHR- Bluestone Creek

1. The proposed project site lies within the range of the Indiana bat (*Myotis sodalis*), a Federally-listed endangered species, and within the range of the northern long-eared bat (*Myotis septentrionalis*), a proposed endangered species. To avoid adverse impacts to the Indiana bat and the northern long-eared bat, the permittee shall preserve trees wherever possible. Should suitable habitat be present that cannot be saved during construction activities, these trees should only be cut between November 15 through March 31. If the permittee is unable to adhere to the seasonal tree-cutting restriction, further consultation under Section 7 of the Endangered Species Act will be necessary. The United States Fish and Wildlife Service may be contacted by mail at USFWS West Virginia Field Office, 694 Beverly Pike, Elkins, West Virginia, 26241, or by phone at (304) 636-6586. The permittee must also contact the Regulatory Division in the event adherence to the seasonal tree-cutting restriction cannot be met.

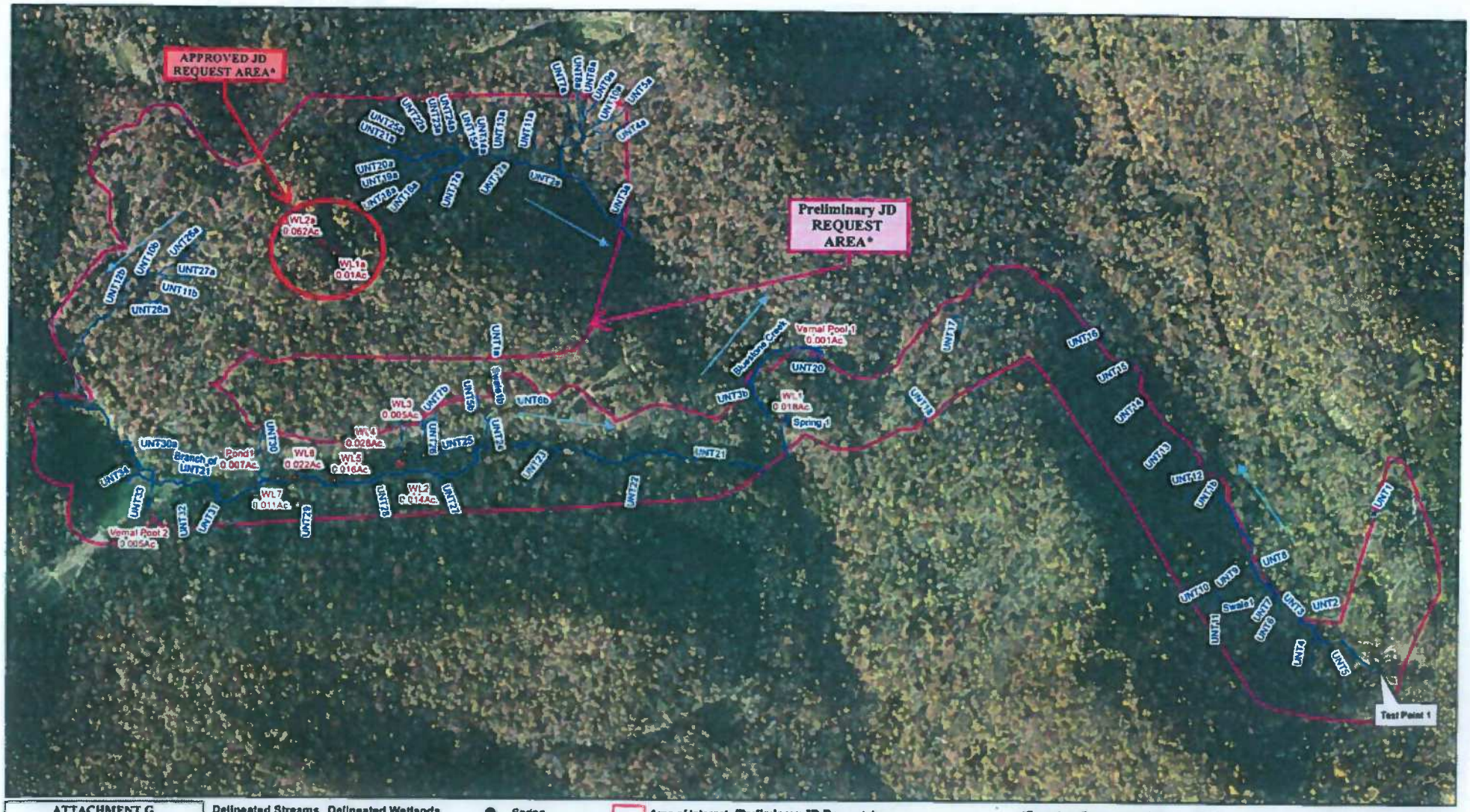
2. Section 7 obligations under Endangered Species Act must be reconsidered if new information reveals impacts of the project that may affect federally listed species or critical habitat in a manner not previously considered, the proposed project is subsequently modified to include activities which were not considered during Section 7 consultation with the United States Fish and Wildlife Service, or new species are listed or critical habitat designated that might be affected by the subject project.

EQT PRODUCTION COMPANY WELL SITE WEU 51 - APPROVED JD TABLE

DA # LRH-2013-01017-OHR

			Jurisdictional					Non-Jurisdictional				
			Streams - linear feet			Wetland	Imp/Pond	Streams/Ditches - linear feet			Wetland	Imp/Pond
Name	RR	JD	per.	int.	eph.	acre	acre	per.	int.	eph.	acre	acre
Wetland 1A		Isolated	—	—	—	—	—	—	—	—	0.010	—
Wetland 2A		Isolated	—	—	—	—	—	—	—	—	0.062	—
		TOTALS:	0.00	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.072	0.000
				0.00					0.00			

*RPW - relatively permanent water
*NRPW - non-relatively permanent water subject to significant nexus determination
*RPWWD - wetland abutting relatively permanent water
*RPWWN - wetland adjacent to a relatively permanent water, and may or may not be abutting or adjacent to a NRPW or NJD
*ISOLATED - isolated/non-jurisdictional water
*NJD - non-jurisdictional water
*UPLAND - features that do not exhibit a stream or water resource, and may or may not be a hydraulic connection for other waters



ATTACHMENT G
APPROVED JD REQUEST* AREA MAP
EQT PRODUCTION
DODDRIDGE COUNTY, WEST VIRGINIA
DATE: SEPTEMBER 9, 2013

Delineated Streams
- Flow Direction
- Swale
- Ephemeral
- Intermittent
- Perennial

Delineated Wetlands
- Palustrine Emergent
- Pond
- Vernal Pool

- Spring
- Upland Test Point
- Wetland Test Point

Area of Interest /Preliminary JD Request Area

*Based on flow accumulation analysis, UNT2a and UNT3b are likely the same stream

Aerial Imagery: 10/8/2011

*Updates Generated 11-12-13 and 1-22-14 by B. Burdette

0 200 400 800 Feet

N W E S

POTESTA

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: EQT Production Company	File Number: 2013-01017	Date: 1/28/2014
Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PRELIMINARY JURISDICTIONAL DETERMINATION (JD): January 28, 2014

B. NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:
Ms. Megan Landfried
EQT Production Company
115 Professional Place
Bridgeport, West Virginia 26330

C. DISTRICT OFFICE, FILE NAME, AND NUMBER:
LRH-2013-01017-OHR-Bluestone Creek, EQT Production Company Well Site WEU 51

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:
State: West Virginia
County: Doddridge County
City: Blandville
Coordinates of site: 39.25537°North, 80.762724°West
Name of nearest waterbody: Bluestone Creek

Identify (estimate) amount of waters in the review area:
Non-wetland waters: 6,165.2 linear feet
Cowardin Class: Riverine
Stream Flow: Perennial, Intermittent, and Ephemeral
Wetlands: None
Cowardin Class: Not applicable

Name of any water bodies on the site that have been identified as Section 10 waters:
None.

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: January 21, 2014
☒ Field Determination. Date(s): November 8, 2013

1. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

☐ Data sheets prepared by the Corps:
☐ Corps navigable waters' study:
☐ U.S. Geological Survey Hydrologic Atlas:
  ☐ USGS NHD data.
  ☐ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). USGS WV-New Milton 24K Quad.
☒ USDA Natural Resources Conservation Service Soil Survey. Web Soil Survey, accessed December, 2013.
☒ National wetlands inventory map(s). USACE ORM NWI dataset, accessed Dec., 2013.
☐ State/Local wetland inventory map(s):
☐ FEMA/FIRM maps:
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Google and bing maps, accessed Dec., 2013.
  or ☒ Other (Name & Date): in the report referenced above.
☐ Previous determination(s). File no. and date of response letter:
☐ Other information (please specify):

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Signature and date of 28 January 2014
Regulatory Project Manager
(REQUIRED)

Megan E Jarc 2/6/14
Signature and date of
person requesting preliminary JD
(REQUIRED, unless obtaining the signature is impracticable)

UNT 6B	Ephemeral	42.5	42	.0023	Culvert/Rip-Rap- Access Road Construction
UNT 25	Ephemeral	585.4	93	0.0030	Culvert/Rip-Rap- Access Road Construction
UNT 26	Ephemeral	160.3	83	0.0019	Culvert/Rip-Rap- Access Road Construction
UNT 30	Ephemeral	313.62	237	0.0027	Culvert/Rip-Rap- Access Road Construction
UNT 33	Intermittent	129.0	82	0.0026	Culvert/Rip-Rap- Access Road Construction
UNT 26A	Ephemeral	1,071.6	189	0.0174	Culvert/Rip-Rap- Access Road Construction
UNT 27A	Ephemeral	146.0	79	0.0032	Permanent Fill- Access Road Construction
UNT 28A	Ephemeral	164.4	143	0.0045	Culvert/Rip-Rap- Access Road Construction
UNT11B	Ephemeral	90.2	87	0.0046	Permanent Fill- Access Road Construction

Table 2 – On-site wetlands associated with the construction of the EQT Production Company Well Site WEU 51. LRH-2013-01017-OHR- Bluestone Creek

Wetland Name	Classification	Area in LOD (acres)	Fill Area of Wetland (acres)	Regulated Discharge of Fill Activity
Wetland 2	PEM	0.014	0.001	Culvert/Rip-Rap- Access Road Construction

Permit Number: LRH-2013-01017-OHR-Bluestone Creek
EQT Production Company Well Site WEU 51 Access Road

Name of Permittee: EQT Production Company

Date of Issuance: January 28, 2014

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address:

Huntington District
U. S. Army Corps of Engineers
502 8th Street
Huntington, West Virginia 25701-2070
Attn: CELRH-RD-E

Please note that your permitted activity is subject to a compliance inspection by an U. S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and conditions of the said permit, and required mitigation was completed in accordance with the permit conditions.

_____

Signature of Permittee Date

PM: A. Richter

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

REPLY TO
ATTENTION OF

FEB 03 2015

Regulatory Division
Energy Resource Branch
LRH-2014-00214-OHR-Bluestone Creek

Ms. Megan Landfried
EQT Production Company
115 Professional Place
Bridgeport, West Virginia 26330

Dear Ms. Landfried:

I refer to the Pre-Construction Notification (PCN) requesting a Department of the Army (DA) authorization to discharge dredged and/or fill material into waters of the United States (U.S.) in association with the construction of the Well Site OXF 157 Access Road Project. The proposed Well Site OXF 157 Access Road Project will include upgrading approximately 1.16 miles (6,122.7 linear feet [lf]) of an existing dirt access road and constructing approximately 0.47 mile (2.503.3 lf) of new access road. The proposed access road will facilitate heavy equipment and large truck traffic required as part to normal drilling operations. On-site waters flow into Bluestone Creek, a tributary Middle Island Creek, a traditional navigable water (TNW) of the U.S. The proposed project would be located approximately 4.7 aerial miles south of West Union, in Doddridge County, West Virginia. The center of the proposed project is located at 39.234468°North, 80.764983°West. The PCN has been assigned the following file number: LRH-2014-00214-OHR-Bluestone Creek. Please reference this number on all future correspondence related to this project.

The U.S. Army Corps of Engineers (Corps) authority to regulate waters of the U.S. is based on the definitions and limits of jurisdiction contained in 33 CFR 328 and 33 CFR 329. Section 404 of the Clean Water Act (Section 404) requires a DA permit be obtained prior to discharging dredged or fill material into waters of the U.S., including wetlands. Section 10 of the Rivers and Harbors Act of 1899 (Section 10) requires a DA permit be obtained for any work in, on, over or under a navigable water.

Based on a review of the aquatic resources in the PCN, fifteen (15) streams (Bluestone Creek and Unnamed tributaries 1, 2, 5, 12, 14, 15, 17, 18, 19, 20, 21, 22, 23, and 24), totaling 1061.87 lf are included in the preliminary jurisdictional determination (PJD), as described in the enclosed PJD form. The on-site aquatic resource may be waters of the U.S. in accordance with the Regulatory Guidance Letter for Jurisdictional Determinations (JDs) issued by the Corps on June 26, 2008 (Regulatory Guidance Letter No. 08-02). As indicated in the guidance, this PJD is non-binding and cannot be appealed (33 CFR 331.2) and only provides a written indication that waters of the U.S. may be present on-site.

You have declined to exercise the option to obtain an approved JD in this instance and at this time. However, for the purposes of the determination of impacts, compensatory mitigation, and other resource protection measures for activities that require authorization from this office, the streams referenced above will be evaluated as if is they are waters of the U.S.

Enclosed please find two (2) copies of the PJD form. If you agree with the findings of this PJD and understand your options regarding the same, please sign and date one copy of the PJD form and return it to this office within 30 days of receipt of this letter. You should submit the signed copy via email to Audrey.M.Richter@usace.army.mil or to the following address:

U.S. Army Corps of Engineers
Huntington District, Regulatory Division
Energy Resource Branch
Attn: Audrey Richter (LRH-2014-00214)
502 Eighth Street
Huntington, West Virginia 25701.

The proposed project, as described in the submitted information, has been reviewed in accordance with Section 404 and Section 10. Based on your description of the proposed work, and other information available to us, it has been determined that this project will not involve activities subject to the requirements of Section 10. However, this project will include the discharge of dredged or fill material into waters of the U.S. subject to the requirements of Section 404.

In the PCN received in this office, you have requested a DA authorization to discharge dredged and/or fill material into 1061.87 lf of stream, involving twelve (12) single and complete projects, associated with the construction of the proposed Well Site OXF 157 Access Road Project, as described in Table 1 enclosed with this letter. To avoid and minimize impacts the Bluestone Creek (perennial stream), project construction will include the use of temporary bridges, at four (4) separate and distant stream crossings. The proposed temporary bridges will be constructed above the ordinary high waters mark (OHW) of Bluestone Creek and will not include a discharge of dredged and/or fill material into waters of the U.S. Upon completion of the well/drilling operations, the temporary bridges will be removed and permanent forded stream crossings will be installed at three (3) separate and distant locations in Bluestone Creek. Bluestone Creek Stream Crossing A will not require a permanent ford crossing. The proposed discharge of dredged and/or fill material into waters of the U.S. is described in Table 1 enclosed with this letter.

Based on your description of the proposed work, it has been determined the proposed discharge of dredged and/or fill material into waters of the U.S., as described on Table 1 enclosed with this letter, for the construction of the Well Site OXF 157 Access Road Project, meets the criteria for authorization under Nationwide Permit (NWP) #14 (enclosed) under the February 21, 2012 Federal Register, Notice of Reissuance of NWPs (77 FR 10184) provided you comply with all terms and conditions of the enclosed material. A copy of this NWP can be found on our website at http://www.lrh.usace.army.mil/Missions/Regulatory.aspx. Please note that you

must comply with all applicable terms and conditions of the enclosed material and the attached special conditions for the authorizations to be valid.

In view of the above, your linear transportation project is authorized subject to the terms and conditions of the enclosed material, including the enclosed special conditions. It is your responsibility to ensure that your work conforms to all of the environmental management conditions listed within the enclosed material. Please be aware this NWP verification does not obviate the requirement to obtain any state or local assent required by law for the activities.

A copy of this NWP and verification letter must be supplied to your project engineer responsible for construction activities. A copy of the verification letter must be kept at the site during construction. Upon completion of the work, the enclosed certification must be signed and returned to this office. If you have any questions concerning the above, please contact Ms. Audrey Richter at (304) 399-5257 or by email at Audrey.M.Richter@usace.army.mil.

Sincerely,

Teresa D. Spagna

Teresa Spagna
Acting Chief, North Branch

Enclosures

CF: (w/out encls)

Ms. Beth Burdette
Potesta & Associates, Inc.
7012 MacCorkle Ave SE
Charleston, West Virginia 25304
sbburdette@potesta.com

Nationwide Permit 14 Verification Special Conditions
EQT Production Company
Well Site OXF 157 Access Road Project
LRH-2014-00214-OHR- Bluestone Creek

1. Should new information regarding the scope and/or impacts of the project become available that was not submitted to this office during our review of the proposal, the permittee will submit written information concerning proposed modification(s) to this office for review and evaluation, as soon as practicable.

2. Section 7 obligations under Endangered Species Act must be reconsidered if new information reveals impacts of the project that may affect federally listed species or critical habitat in a manner not previously considered, the proposed project is subsequently modified to include activities which were not considered during Section 7 consultation with the United States Fish and Wildlife Service, or new species are listed or critical habitat designated that might be affected by the subject project.

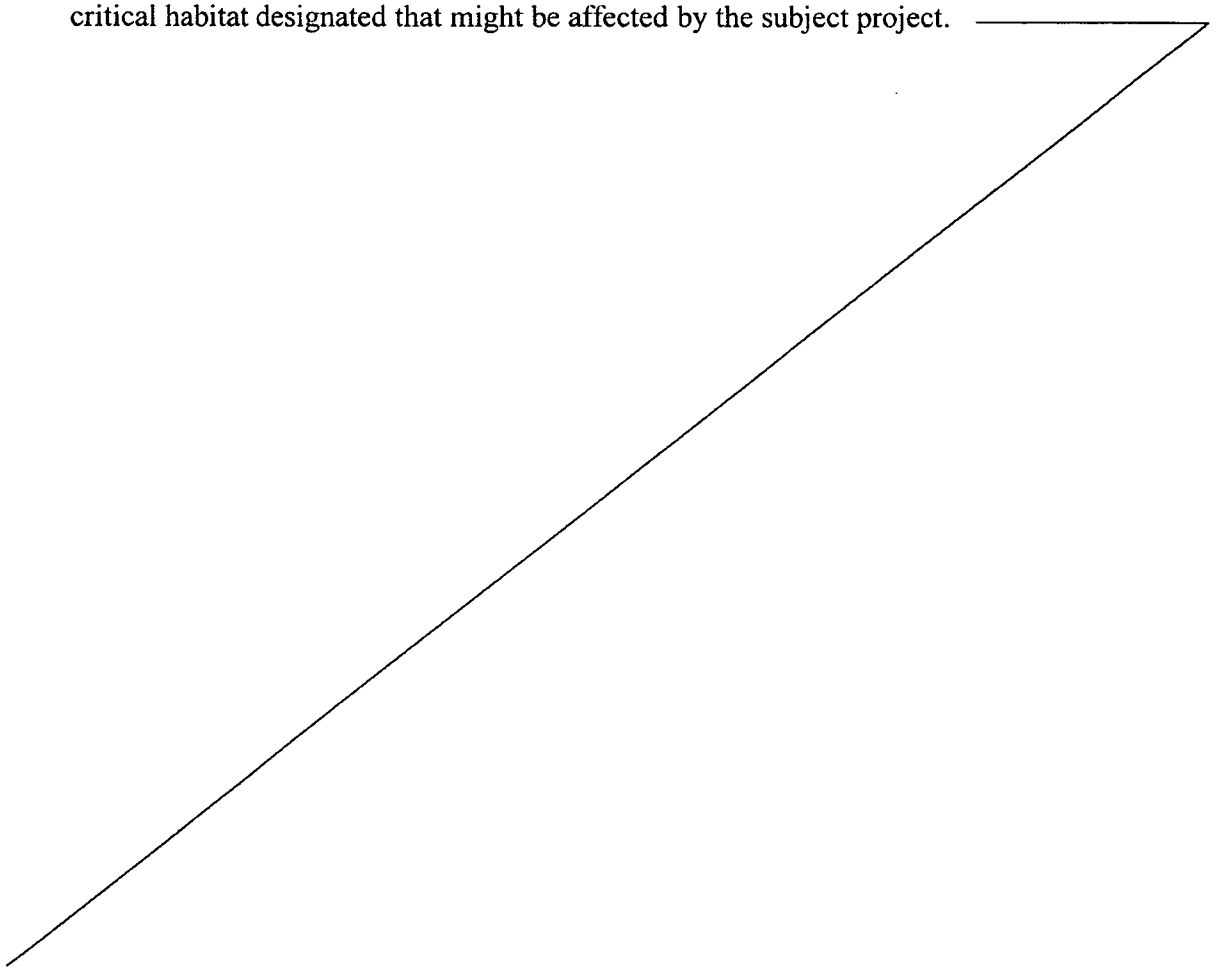


Table 1- Authorized discharge of dredged and/or fill material into waters of the U.S. associated with the construction of the Well Site OXF 157 Access Road Project, LRH-2014-00214-OHR- Bluestone Creek

Water ID	Latitude °N	& Longitude °W	Flow Regime or Cowardin Class	Length (lf) or area (acre) of Fill	Area (ac) of Fill	Other Pertinent Information
Bluestone Creek Crossing B	39.234301	80.764888	Perennial	50	0.0077	Temporary Bridge Outside of OHW/Permanent Ford
Bluestone Creek Crossing C	39.232888	80.763930	Perennial	46	0.0071	Temporary Bridge Outside of OHW/Permanent Ford
Bluestone Creek Crossing D	39.230725	80.763568	Perennial	42	0.0065	Temporary Bridge Outside of OHW/Permanent Ford
UNT 1	39.227652	80.762575	Ephemeral	72.03	0.0020	Existing Culvert- Maintenance/Upgrade/ Riprap Installation
UNT 2	39.228532	80.762594	Intermittent	71.17	0.0059	Existing Culvert- Maintenance/Upgrade/ Riprap Installation
UNT 5	39.230725	80.763568	Ephemeral	110.95	0.0025	Existing Culvert- Maintenance/Upgrade/ Riprap Installation
UNT 12	39.224992	80.763361	Ephemeral	55.00	0.0020	Existing Culvert- Maintenance/Upgrade/ Riprap Installation
UNT 22	39.225063	80.763202	Ephemeral	38.00	0.0022	Access Road- Culvert/riprap installation
UNT 14	39.225468	80.763392	Ephemeral	236.52	0.0065	Existing Culvert- Maintenance/Upgrade/ Riprap Installation
UNT 15	39.225907	80.763333	Ephemeral	32.32	0.0012	Access Road- Culvert/riprap installation
UNT 17	39.227583	80.75968	Ephemeral	25	0.0003	Access Road- Fill placement and riprap installation
UNT 18	39.227725	80.759565	Ephemeral	25	0.0011	Access Road- Fill placement and riprap installation
UNT 19	39.226892	80.760484	Ephemeral	71.38	0.0008	Access Road- Fill- Slope

Table 1- Authorized discharge of dredged and/or fill material into waters of the U.S. associated with the construction of the Well Site OXF 157 Access Road Project, LRH-2014-00214-OHR- Bluestone Creek

UNT 20	39.226798	80.760672	Ephemeral	50.00	0.0034	Access Road- Fill- Slope
UNT 21	39.226383	80.761519	Ephemeral	17.21	0.008	Access Road- Fill- Slope
UNT 23	39.226129	80.763203	Ephemeral	73.67	0.0020	Existing Culvert- Maintenance/Upgrade/ Riprap Installation
UNT 24	39.225183	80.763296	Ephemeral	45.62	0.0010	Access Road- Fill- Slope

Permit Number: LRH-2014-00214-OHR- Bluestone Creek
Well Site OXF 157 Access Road

Name of Permittee: EQT Production Company

Date of Issuance: February 3, 2015

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address:

Huntington District
U. S. Army Corps of Engineers
502 8th Street
Huntington, West Virginia 25701-2070
Attn: CELRH-RD-E

Please note that your permitted activity is subject to a compliance inspection by an U. S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and conditions of the said permit, and required mitigation was completed in accordance with the permit conditions.

Signature of Permittee Date

PM: A. Richter

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PRELIMINARY JURISDICTIONAL DETERMINATION (JD): February 3, 2015

B. NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:
Ms. Megan Landfried
EQT Production Company
115 Professional Place
Bridgeport, West Virginia 26330

C. DISTRICT OFFICE, FILE NAME, AND NUMBER:
LRH-2014-00214-OHR-Bluestone Creek, EQT Production Company- Well Site OXF 157 Access Road Project

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:
State: West Virginia
County: Doddridge County
City: West Union
Coordinates of site: 39.234468°North, 80.764983°West

Name of nearest waterbody: Bluestone Creek

Identify (estimate) amount of waters in the review area:
Non-wetland waters: 1061.87 linear feet
Cowardin Class: Riverine
Stream Flow: Ephemeral, Intermittent, and Perennial
Wetlands: Not applicable
Cowardin Class: Not applicable

Name of any water bodies on the site that have been identified as Section 10 waters:
None.

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: February 2, 2015
☐ Field Determination. Date(s):

1. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable.
This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: In report entitled: "*Nationwide Permit 14 for Linear Transportation Projects, EQT Production Company, Well Site OXF 157, Doddridge County, West Virginia*"

☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.

- ☒ Office concurs with data sheets/delineation report.
- ☐ Office does not concur with data sheets/delineation report.

☐ Data sheets prepared by the Corps:

☐ Corps navigable waters' study:

☒ U.S. Geological Survey Hydrologic Atlas:
☒ USGS NHD data. USACE ORM USGS NHD dataset
☐ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). USGS WV-Oxford 24K Quad.
☒ USDA Natural Resources Conservation Service Soil Survey. Web Soil Survey.
☒ National wetlands inventory map(s). USACE ORM NWI dataset
☐ State/Local wetland inventory map(s):
☐ FEMA/FIRM maps:
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Google and bing map..
or ☒ Other (Name & Date): in the report referenced above.
☐ Previous determination(s). File no. and date of response letter:
☐ Other information (please specify):

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

3Feb2015
Signature and date of
Regulatory Project Manager
(REQUIRED)

Lacoa Corder 2/6/15
Signature and date of
person requesting preliminary JD
(REQUIRED, unless obtaining the
signature is impracticable)

Table 1 – On-site Aquatic Resources associated with the construction of EQT Production Company- Well Site OXF 157 Access Road Project, LRH-2014-00214-OHR-Bluestone Creek

Waters ID	Latitude (°N)	Longitude (°W)	Flow Regime	Length (lf) of Stream within the AOI	Class of aquatic resource
Bluestone Creek	39.230725	-80.763568	Perennial	150.00	non-section 10 – non-wetland
UNT 1	39.227652	-80.762575	Ephemeral	72.03	non-section 10 – non-wetland
UNT 2	39.228532	80.762594	Ephemeral	71.17	non-section 10 – non-wetland
UNT 5	39.230725	80.763568	Ephemeral	110.95	non-section 10 – non-wetland
UNT 12	39.224992	80.763361	Ephemeral	55.00	non-section 10 – wetland
UNT 22	39.225063	80.763202	Ephemeral	38.00	non-section 10 – non-wetland
UNT 14	39.225468	80.763392	Ephemeral	236.52	non-section 10 – non-wetland
UNT 15	39.225907	80.763333	Ephemeral	32.32	non-section 10 – non-wetland
UNT 17	39.227583	80.75968	Ephemeral	25.00	non-section 10 – non-wetland
UNT 18	39.227725	80.759565	Ephemeral	25.00	non-section 10 – non-wetland
UNT 19	39.226892	80.760484	Ephemeral	71.38	non-section 10 – non-wetland

UNT 20	39.226798	80.760672	Ephemeral	50.00	non-section 10 – non-wetland
UNT 21	39.226383	80.761519	Ephemeral	17.21	non-section 10 – non-wetland
UNT 23	39.226129	80.763203	Ephemeral	73.67	non-section 10 – non-wetland
UNT 24	39.225183	80.763296	Ephemeral	45.62	non-section 10 – non-wetland

Issuance Date: March 19, 2012
Expiration Date: March 18, 2017

NWP # 14

NATIONWIDE PERMITS FOR THE STATE OF WEST VIRGINIA

CORPS OF ENGINEERS REGULATORY PROGRAM
ISSUANCE OF NATIONWIDE PERMITS

On February 21, 2012, the Corps of Engineers published, in the Federal Register, the final rule for the administration of its nationwide permit program regulations under the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act, and the Marine Protection, Research and Sanctuaries Act. The rule became effective on March 19, 2012.

An integral part of the Corps' regulatory program is the concept of nationwide permits (NWPs) for minor activities. NWPs are activity specific, and are designed to relieve some of the administrative burdens associated with permit processing for both the applicant and the Federal government. The NWPs, published in the February 21, 2012, Federal Register, Issuance of Nationwide Permits (77 FR 10184), are issued by the Chief of Engineers, and are intended to apply throughout the entire United States and its territories. The Corps Districts representing West Virginia have imposed regional conditions on the NWPs that are applicable throughout the entire state. For convenience, all NWPs with the appropriate regional, general and special conditions are attached.

In response to the Federal Register Notice (77 FR 10184), the West Virginia Department of Environmental Protection (WVDEP) has issued 401 water quality certification, pending compliance with certain conditions and/or limitations, for the following NWPs: 3, 4, 5, 6, 7, 12, 13, 14, 16, 18, 19, 20, 21, 22, 25, 27, 29, 30, 31, 32, 33, 36, 37, 38, 39, 40, 41, 42, 45, 46, 48, 49, 50 and 51.

An individual State Water Quality Certification is required for the following NWPs: 15, 17, 23, 34 and 43. Certification response is not applicable to NWPs: 1, 2, 8, 9, 10, 11, 24, 26, 28, 35, 44, 47, and 52.

Authorization for discharges covered by NWPs is denied without prejudice if: (1) the State Certification has been denied; or (2) the discharge is not in compliance with conditions imposed in the State Certification. Applicants wishing to conduct such discharges must first obtain either an individual water quality certificate or waiver from:

Director
West Virginia Department of Environmental Protection
601 57th Street
Charleston, West Virginia 25304

Some NWPs require advance notification. The notification must be made in writing as early as possible prior to commencing the proposed activity. The notification procedures are located under General Condition 31. The notification to the Corps can be made concurrently with the request for individual state certification, if required. The District Engineer may require an individual permit for any activity determined to have more than minimal adverse environmental effects, individually or cumulatively, or would be contrary to the public interest.

The NWPs provide a simplified, expeditious means of project authorization under various authorities of the Corps. We encourage prospective permit applicants to consider the advantages of nationwide permit authorization during the preliminary design of their projects. Assistance and further information regarding all aspects of the Corps regulatory program may be obtained by contacting:

HUNTINGTON DISTRICT

Name: Ginger Mullins, Chief, Regulatory Division
Address: U.S. Army Corps of Engineers, Huntington District
502 Eighth Street
Huntington, West Virginia 25701-2070
Phone: 304-399-5710

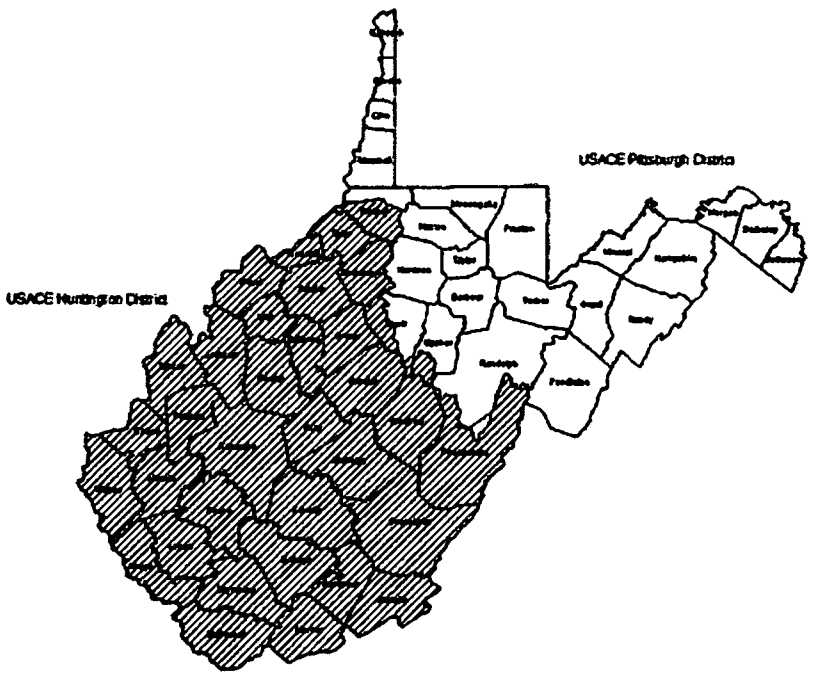
PITTSBURGH DISTRICT

Name: Scott Hans, Chief Regulatory Branch
Address: U.S. Army Corps of Engineers, Pittsburgh District
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, Pennsylvania 15222-4186
Phone: 412-395-7154

Attached is a map showing the district boundaries for the State of West Virginia.

Ginger Mullins, Chief
Regulatory Division

Corps Districts and Navigable Streams in The State of West Virginia



Huntington District

1. Ohio River.....Total Length in State
2. Kanawha River.....Total Length
3. New River.....Total Length in State
4. Big Sandy River.....Total Length
5. Tug Fork.....58 Miles
6. Elk River.....139 Miles
7. Gauley River.....75 Miles
8. Guyandotte River.....122 Miles
9. Little Kanawha River.....130.75 Miles
10. Greenbrier River.....150.50 Miles
11. Coal River.....57.90 Miles

Pittsburgh District

1. Ohio River.....Total Length in State
12. Monongahela River.....Total Length in State
13. Tygart River.....7 Miles
14. West Fork.....74 Miles
15. Shenandoah River.....Total Length in State
16. Potomac River.....Total Length in State

A. U.S. Army Corps of Engineers Nationwide Permit #14 for Linear Transportation Projects in West Virginia

Activities required for the construction, expansion, modification, or improvement of linear transportation projects (e.g., roads, highways, railways, trails, airport runways, and taxiways) in waters of the United States. For linear transportation projects in non-tidal waters, the discharge cannot cause the loss of greater than 1/2-acre of waters of the United States. For linear transportation projects in tidal waters, the discharge cannot cause the loss of greater than 1/3-acre of waters of the United States. Any stream channel modification, including bank stabilization, is limited to the minimum necessary to construct or protect the linear transportation project; such modifications must be in the immediate vicinity of the project.

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

This NWP cannot be used to authorize non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if: (1) the loss of waters of the United States exceeds 1/10-acre; or (2) there is a discharge in a special aquatic site, including wetlands. (See general condition 31.) **(Sections 10 and 404)**

Note: Some discharges for the construction of farm roads or forest roads, or temporary roads for moving mining equipment, may qualify for an exemption under Section 404(f) of the Clean Water Act (see 33 CFR 323.4).

B. Specific Regional Conditions for Nationwide Permit #14:

- Notification is required for all activities in Section 10 streams.
- Notification is required for discharges causing the loss of greater than 100 feet of perennial, intermittent, and ephemeral stream.
- Notification is required for all vented (culverted) low water crossings.
- All activities shall be constructed in a manner to withstand expected bankfull events and shall consist of clean and coarse non-erodable materials with 15% or less of like fines.
- Compensatory mitigation will be required for discharges causing the loss of greater than 1/10 acre of wetlands. In addition, compensatory mitigation will be required for the loss of greater than 300 linear feet of perennial, intermittent, and ephemeral streams unless the applicant demonstrates that adverse effects of the project are minimal without mitigation. In such cases, the applicant may submit

for the DE's consideration justification explaining why compensatory mitigation should not be required.

C. West Virginia 401 Water Quality Certification Special Conditions for Nationwide Permit #14:

For activities involving a discharge, the West Virginia 401 Water Quality Certification Standard Conditions apply.

A. Individual State Water Quality Certification is required for perennial and intermittent stream impacts greater than 300 linear feet.

B. Activities associated with temporary access fills, temporary cofferdams or other discharges related to accessing the stream for maintenance 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.

C. Pipe, box, and arched culvert crossings:

a. The volume of fill for culverted structures is limited to the amount required to achieve transportation purpose.

b. The inlet/outlets must be designed in such a manner as to maintain substrate in the bottom of the culvert (culverts installed in bedrock streams do not need to be countersunk). Countersinking the culvert to the sub-pavement of the streambed, backwatering or the use of a bottomless culvert will generally fulfill this requirement.

c. If fills associated with the crossing extend onto the floodplain the use of floodplain culverts is strongly encouraged.

D. The volume of fill for a bridge abutment or piers below the ordinary high water mark is not to exceed 200 cubic yards for a single bridge project.

E. Individual State Water Quality Certification is required for an activity impacting greater than 200 linear feet on one or more of the streams listed in West Virginia State Certification, Standard Condition 15.

D. U.S. Army Corps of Engineers Nationwide Permit General Conditions Applicable to ALL NWPs

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/or

Coastal Zone Management Act consistency for an NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR §§ 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR § 330.5 relating to the modification, suspension, or revocation of any NWP authorization.

1. Navigation. (a) No activity may cause more than a minimal adverse effect on navigation.

(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. Aquatic Life Movements. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species.

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

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

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

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

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

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

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

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

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

12. Soil Erosion and Sediment Controls. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow.

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

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

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

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

River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service).

17. Tribal Rights. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

18. Endangered Species. (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless Section 7 consultation addressing the effects of the proposed activity has been completed.

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will review the documentation and determine whether it is sufficient to address ESA compliance for the NWP activity, or whether additional ESA consultation is necessary.

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

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

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

actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(f) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the U.S. FWS and NMFS or their world wide web pages at http://www.fws.gov/ or http://www.fws.gov/ipac and http://www.noaa.gov/fisheries.html respectively.

19. Migratory Birds and Bald and Golden Eagles. The permittee is responsible for obtaining any "take" permits required under the U.S. Fish and Wildlife Service's regulations governing compliance with the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act. The permittee should contact the appropriate local office of the U.S. Fish and Wildlife Service to determine if such "take" permits are required for a particular activity.

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

(b) Federal permittees should follow their own procedures for complying with the requirements of Section 106 of the National Historic Preservation Act. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will review the documentation and determine whether it is sufficient to address section 106 compliance for the NWP activity, or whether additional section 106 consultation is necessary

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the authorized activity may have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties may be affected by the proposed work or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic resources can be sought from the State Historic Preservation Officer or Tribal Historic Preservation Officer, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of Section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted and these efforts, the district engineer shall determine whether the proposed activity has the potential to cause an effect on the historic properties. Where the non-Federal applicant has identified historic properties on which the activity may have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects or that consultation under Section 106 of the NHPA has been completed.

(d) The district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA Section 106 consultation is required.

Section 106 consultation is not required when the Corps determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR §800.3(a)). If NHPA section 106 consultation is required and will occur, the district engineer will notify the non-Federal applicant that he or she cannot begin work until Section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(e) Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

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

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

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

(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, and 38, notification is required in accordance with general condition 31, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

23. Mitigation. The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that adverse effects on the aquatic environment are minimal:

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

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse effects of the proposed activity are minimal, and provides a project-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in minimal adverse effects on the aquatic environment. Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in minimal adverse effects on the aquatic environment.

(2) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, wetland restoration should be the first compensatory mitigation option considered.

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

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

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

(d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation, such as stream rehabilitation, enhancement, or preservation, to ensure that the activity results in minimal adverse effects on the aquatic environment.

(e) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it

cannot be used to authorize any project resulting in the loss of greater than 1/2-acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that a project already meeting the established acreage limits also satisfies the minimal impact requirement associated with the NWPs.

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

(g) Permittees may propose the use of mitigation banks, in-lieu fee programs, or separate permittee-responsible mitigation. For activities resulting in the loss of marine or estuarine resources, permittee-responsible compensatory mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

(h) Where certain functions and services of waters of the United States are permanently adversely affected, such as the conversion of a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse effects of the project to the minimal level.

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

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

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

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

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

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

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

_____

(Transferee)

_____

(Date)

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

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

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

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

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

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

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

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

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

(2) Location of the proposed project;

(3) A description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause, including the anticipated amount of loss of water of the United States expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. The description should be sufficiently detailed to allow the district engineer to determine that the adverse effects of the project will be minimal and to determine the need for compensatory mitigation. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the project and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

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

(5) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse effects are minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(6) If any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, for non-Federal applicants the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed work or utilize the designated critical habitat that may be affected by the proposed work. Federal applicants must provide documentation demonstrating compliance with the Endangered Species Act; and

(7) For an activity that may affect a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, for non-Federal applicants the PCN must state which historic property may be affected by the proposed work or include a vicinity map indicating the location of the historic property. Federal applicants must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.

(c) Form of Pre-Construction Notification: The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is a PCN and must include all of the information required in paragraphs (b)(1) through (7) of this general condition. A letter containing the required information may also be used.

(d) Agency Coordination: (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the project's adverse environmental effects to a minimal level.

(2) For all NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States, for NWP 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52 activities that require pre-construction notification and will result in the loss of greater than 300 linear feet of intermittent and ephemeral stream bed, and for all NWP 48 activities that require pre-construction notification, the district engineer will immediately provide (e.g., via e-mail, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (U.S. FWS, state natural resource or water quality agency, EPA, State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Office (THPO), and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to telephone or fax the district engineer notice that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure the net adverse environmental effects to the aquatic environment of the proposed activity are minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

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

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

E. Regional General Conditions

Regional General Condition 1

Full Agency Pre-construction Notification: In an effort to expedite full agency permit review it is requested that all pre-construction notifications (PCNs) submitted for activities requesting a waiver and for those activities resulting in the loss of greater than ½ acre of waters of the United States (U.S.), include one original hard copy and five (5) additional copies of the PCN package. Applicants are encouraged to submit the five agency copies in electronic format as CDs, in order to minimize the use of paper and postage resources.

Regional General Condition 2

Pre-Construction Notification Submittals: In addition to the PCN requirements listed in NWP General Condition 31, all PCNs should include the following information:

- Graphic illustrations on 8 1/2" x 11" paper. The illustrations must clearly depict the project boundaries, including all elements and phases of the proposed project. Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity Map (a location map such as the U.S. Geological Survey (USGS) 7.5 Minute Series topographical map is highly encouraged), a Plan View and a Typical Cross-Section Map. Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view or cross-section). In addition, each illustration should be identified with a figure or attachment number and the project Latitude and Longitude.

- A written description of the proposed project including acreage(s) of waters of the U.S. (according to aquatic resource type) proposed to be directly or indirectly affected as a result of the proposed project, the linear footage of proposed direct and indirect stream impacts associated with the project, and cubic yards of fill proposed to be discharged.

- A description of the ways in which the project has been designed to avoid and minimize adverse impacts to waters of the U.S.

- Information concerning whether the proposed activity would affect any historic properties listed, determined to be eligible, or which they have reason to believe may be eligible, for listing on the National Register of Historic Places.

- Basic information about the general project area (encompassing a search radius of 2 miles centered on the project area) including USGS 7.5' series topographic maps, National Register of Historic Places (NRHP) files including Historic Districts, and county atlases, histories and/or any historic USGS 15' series topographic map(s), brief description of the terrain and topography of the project area, acreage of the project area, proximity of the project area to major waterways, past land uses in the project area, and any past cultural resources studies or coordination for the project area, if available, along with photographs, keyed to mapping, showing the project area and any buildings or structures on adjacent parcels.

- The submittal of ground photographs to illustrate current conditions of the overall project site and impact site is highly encouraged.

Regional General Condition 3

Compensatory Mitigation: Compensatory mitigation will typically be required as indicated in accordance the terms and conditions of the NWPs in addition to all General and Regional conditions for projects with impacts that result in the conversion of a water of the U.S. to uplands or the conversion of one aquatic resource type to another.

Regional General Condition 4

Passage of Aquatic Life: Culverted crossings should be sized in a manner that allow the passage of aquatic life and freely pass bankfull flows. The only exception to this requirement would involve culvert placement in bedrock and/or extremely high gradient streams, in which countersinking of culverts is determined not to be practicable. In the event proposed crossings do not meet these criteria, compensatory mitigation may be required.

Regional General Condition 5

Endangered Species: Federally listed endangered species, subject to Section 7 of the Endangered Species Act, are located in nearly every county within West Virginia. As part of the PCN process, the district engineer (DE) will assume responsibility for determining project-related effects to endangered species. For projects that do not require a PCN, it is the applicant's responsibility to ensure that all elements of a proposed single and complete project comply with Section 7 of the Endangered Species Act.

Regional General Condition 6

Endangered Species Habitat: Due to the potential presence of endangered species or their habitats applicants are required to provide notification to the U.S. Fish and Wildlife Service Elkins Field Office, 694 Beverly Pike, Elkins, West Virginia 26241, for any work in the waterways listed in Appendix A. This appendix will be update as new species are listed by the U.S. Fish and Wildlife Service.

Regional General Condition 7

All PCNs involving work in the below listed waters require notification to the National Park Service and/or the Forest Service.

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

Regional General Condition 8

West Virginia Natural Stream Preservation Act: In accordance with the West Virginia Natural Stream Preservation Act, the following streams or rivers are protected from activities that would impound, divert or flood the body of water:

West Virginia Natural Stream Preservation Act

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

Regional General Condition 9

Tier 3 Protected Waters: All PCNs involving work in Tier 3 Protected Waters (West Virginia Code of State Regulations, Requirements Governing Water Quality Standards, Title 47, Series 2) shall include prior written notification to the West Virginia Department of Environmental Protection, Division of Water and Waste Management. Tier 3 Protected Waters include, but are not limited to, all streams and rivers within the boundaries of Wilderness Areas designated by The Wilderness Act (16 U.S.C. §1131 et seq.) within the State, all Federally designated rivers under the "Wild and Scenic Rivers Act", 16 U.S.C. §1271 et seq.; all streams and other bodies of water in state parks which are high quality waters or naturally reproducing trout streams; waters in national parks and forests which are high quality waters or naturally reproducing trout streams; waters designated under the "National Parks and Recreation Act of 1978", as amended; and pursuant to subsection 7.1 of 60CSR5, those waters whose unique character, ecological or recreational value, or pristine nature constitutes a valuable national or state resource.

Regional General Condition 10

Archeological Sites and Human Remains: In the event any archeological sites or human remains are uncovered during construction, the permittee shall cease all work immediately and contact the appropriate Corps District office, the West Virginia Division of Culture and History at 304-558-0240 and the appropriate county Sheriff's Office.

F. West Virginia Department of Environmental Protection 401 Water Quality Certification Standard Conditions Applicable to ALL NWPs

The following are West Virginia's Section 401 Water Quality Certification standard and special conditions that apply to the Nationwide Permits 1-52 as published on February 21, 2012 in Part III of the *Federal Register* (77 FR 10184), by the U.S. Army Corps of Engineers. These conditions must be implemented into any activity authorized by a U.S Army Corps of Engineers

Nationwide Permit(s). The State's certification of these Nationwide Permit activities does not replace the need for the applicant proposing an activity under the Nationwide Permit Program from obtaining other applicable permits/authorizations from the West Virginia Department of Environmental Protection and/or the Division of Natural Resources. Each permittee shall, if they do not understand or are not aware of applicable Nationwide Permit conditions, contact the Corps of Engineers prior to conducting any activity authorized by a Nationwide Permit in order to be advised of applicable conditions These 401 Water Quality Certifications, with all attendant standard conditions and special conditions, are applicable to Corps of Engineers Civil Works Projects in West Virginia.

1. The permittee will investigate for the presence of water supply intakes or other activities within 1/2 mile downstream, which may be affected by suspended solids and turbidity increases caused by work in the watercourse. The permittee will give notice to operators of any such water supply intakes and such other water quality dependent activities as necessary before beginning work in the watercourse in sufficient time to allow preparation for any change in water quality.

2. Excavation, dredging or filling in the watercourse will be done only to the extent necessary to achieve the project's purpose.

3. Spoil materials from the watercourse or onshore operations, including sludge deposits, will not be dumped in the watercourse, or deposited in wetlands or other areas where the deposit may adversely affect the surface or ground waters of the state.

4. The permittee will employ measures to prevent or control spills from fuels, lubricants or any other materials used in connection with construction and restrict them from entering the watercourse. Storage areas for chemicals, explosives, lubricants, equipment fuels, etc., as well as equipment refueling areas, must include containment measures (e.g., liner systems, dikes, etc.) to ensure that spillage of any material will not contact surface or ground waters. Storage areas and refueling areas shall be a minimum distance of 100 feet from any surface water body. All spills shall be promptly reported to the State Center for Pollution, Toxic Chemical and Oil Spills, 1-800-642-3074.

5. 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.

6. Runoff from any storage areas or spills will not be allowed to enter storm sewers without acceptable removal of solids, oils and toxic compounds. Discharges from retention/detention ponds must comply with permit requirements of the National Pollutant Discharge Elimination System permit program of the West Virginia Department of Environmental Protection, Division of Water and Waste Management.

7. 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.

8. Concrete will not be permitted to enter the watercourse unless contained by tightly sealed forms or cells. Concrete handling equipment shall not discharge waste washwater into wetlands or watercourses at any time without adequate wastewater treatment as approved by the West Virginia Department of Environmental Protection, Division of Water and Waste Management.

9. In stream work in designated warm water streams and their adjacent tributaries during the fish spawning season, April - June and trout waters and their adjacent tributaries during the trout water fish spawning season September 15-March 31st requires a spawning season waiver from the West Virginia Division of Natural Resources, Wildlife Resources Section. For information about specific stream designations contact DEP's Water Quality Standards Section at 304-926-0495. The Wildlife Resources Section, Trout Fisheries Program at 304-637-0245 or Warm Water fisheries Program 304-558-2771 should be contacted if a waiver is needed. In stream work may occur during the respective spawning season in ephemeral waters without a waiver if all reasonable measures are taken to minimize turbidity and sedimentation downstream associated with the proposed project.

10. 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.

11. 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.

12. The permittee will comply with water quality standards as contained in the West Virginia Code of State Regulations, Requirements Governing Water Quality Standards, Title 47, Series 2.

13. Stream activities permitted under the Nationwide Permit 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

14. The deposit of dredged or fill materials in island back channels, embayments or stream mouths on Section 10 Rivers is not certified for any of the Nationwide Permits. Stream mouth is defined as the area extending 100 feet upstream and 100 feet downstream on receiving streams that are classified as a Section 10 stream.

15. This Standard Condition requires prior written authorization from the West Virginia Department of Environmental Protection, Division of Water and Waste Management for use of any of the Nationwide Permits for all work in Outstanding National Resource Waters listed within Section A below. Prior written notification to the West Virginia Department of Environmental Protection, Division of Water and Waste Management, is required for use of Nationwide Permits 3, 6, 7, 12, 13, 14, 16, 17, 18, 19, 27, 29, 33, 39, 40, 41, 42, 45, and 48 in any of the streams listed in Sections B and C as follows, except as may be provided for in the individual nationwide permit:

    A. Tier 3 Protection– West Virginia Code of State Regulations, Requirements Governing Water Quality Standards, Title 47, Series 2. **Outstanding National Resource Waters:** Outstanding National Resource Waters include, but are not limited to, all streams and rivers within the boundaries of Wilderness Areas designated by The Wilderness Act (16 U.S.C. §1131 et seq.) within the State, all Federally designated rivers under the "Wild and Scenic Rivers Act", 16 U.S.C. §1271 et seq.; all streams and other bodies of water in state parks which are high quality waters or naturally reproducing trout streams; waters in national parks and forests which are high quality waters or naturally reproducing trout streams; waters designated under the "National Parks and Recreation Act of 1978", as amended; and pursuant to subsection 7.1 of 60CSR5, those waters whose unique character, ecological or recreational value, or pristine nature constitutes a valuable national or state resource. The listing of Tier 3 streams is located at: http://www.dep.wv.gov/WWE/Programs/wqs/Documents/Tier%203%20Info/WV_Tier_3_Maps_20101006.pdf

B. All naturally reproducing trout streams in the following counties; Barbour, Fayette, Grant, Greenbrier, Hampshire, Hardy, Mercer, Mineral, Monroe, Nicholas, Pendleton, Pocahontas, Preston, Raleigh, Randolph, Summers, Tucker, Upshur and Webster. For information about specific streams contact Wildlife Resource Section, Trout Fisheries Program at 304-637-0245;

C. 'West Virginia Natural Stream Preservation Act' - The following streams or rivers are protected from activities that would impound, divert or flood the body of water: Greenbrier River from its confluence with Knapps Creek to its confluence with the New River, Anthony Creek from its headwaters to its confluence with the Greenbrier River, Cranberry River from its headwaters to its confluence with the Gauley River, Birch River from Cora Brown Bridge in Nicholas County to the confluence of the river with the Elk River, and New River from its confluence with the Greenbrier River to its confluence with the Gauley River.

16. Wetland and Stream Mitigation guidelines – The discharge of fill material into a stream or wetland is authorized based upon the following criteria:

1. One-tenth to ½ acre of wetland impact requires a Pre-Construction Notice (PCN) and plan for mitigation to be submitted to the Corps of Engineers along with the proposed plan for mitigation provided to the state for approval.

2. The amount of fill in a wetland, wetland complex or wetland system without mitigation is not to cumulatively exceed 1/10 acre.

3. "West Virginia Stream Wetland Valuation Metric" (SWVM) will be used to assist with the determination of required mitigation. The metric is available at the Huntington and Pittsburgh Army Corps of Engineers web sites:

In all instances, mitigation for all impacts incurred through use of these Nationwide Permits must first be directed to elimination of the impacts, then minimization of the impacts and lastly through compensatory mitigation. In many cases, the environmentally preferable compensatory mitigation may be provided through approved mitigation banks or the West Virginia in-lieu fee program. Permittee responsible compensatory mitigation may be performed using the methods of: restoration, enhancement, establishment and in certain circumstances preservation. In general, the required compensatory mitigation should be located in the same watershed as the impact site, and located where it is most likely to successfully replace lost functions and services as the impacted site. However, the use of mitigation banks or in-lieu fee for in-kind replacement is not restricted to the major watershed in which the impact has occurred until such time as mitigation banks or in-lieu projects are developed in each major watershed.

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

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

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

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

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

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

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

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

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

All wetlands acquired, using the acquisition method of mitigation, will either be deeded to the West Virginia Division of Natural Resources' Public Land Corporation for management by the Wildlife Resources Section or placed under a conservation easement and be protected from disturbance by the permittee or their designee. Third party oversight of the conservation easement by a non-profit conservation organization is preferred.

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

17 Streams with Mussel populations.

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

B. The following list of streams are known to have mussel populations which are established as a protected "no take" species by the state or contain protected habitat of mussels on the Federal Endangered Species list. Applicants wishing to conduct projects in these streams are strongly encouraged to contact the Wildlife Resources Section, Wildlife Diversity Program with a detailed project description and an accurate project location. For further information please contact the Wildlife Resources Section, Wildlife Diversity program at 304-637-0245.

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

HUNTINGTON DISTRICT

James River Drainage
- J-1 Potts Creek
- J-1-E South Fork Potts Creek
- J-3 Cove Creek

Big Sandy River Drainage
- BS Big Sandy River
- BST Tug Fork River

Kanawha River Drainage
- K Kanawha River
- K-1 Crooked Creek
- K-12 Thirteenmile Creek
- K-14 Sixteenmile Creek
- K-21 Buffalo Creek
- K-22 Hurricane Creek
- K-22-F Mill Creek (Tackett Branch ?)
- K-24 Little Hurricane Creek
- K-26 Guano Creek
- KC Coal River
- KC-10 Little Coal River
- KE Elk River

- KE-23 Big Sandy Creek
- KE-23-N Granny Creek
- KE-23-Q-.5 Hollywood Trace Fork
- KE-31 King Shoals Run
- KE-37 Laurel Creek
- KE-74 Strange Creek
- KE-76 Birch River
- KE-9 Little Sandy Creek
- KN New River
- KN-51 Indian Creek
- KNB Bluestone River
- KNG Greenbrier River
- KNG-18 Wolf Creek
- KNG-22 Muddy Creek
- KNG-22-B Mill Creek
- KNG-23 Second Creek
- KNG-53 Knapp Creek
- KNG-61 Clover Creek (Cloverlick Creek)
- KNG-66 Sitlington Creek
- KNG-68 Deer Creek
- KNG-79 West Fork Greenbrier River
- KP Pocatalico River
- KP-17 Pocatalico Creek (Left Fork)
- KP-17-B Middle Fork Pocatalico Creek
- KP-33-E Cox Fork
- KP-39 Big Lick
- KP-41 Rush Creek
- KP-45 Cranes Nest Run

Little Kanawha River Drainage
- LK Little Kanawha River
- LK- 86 Sand Fork
- LK-11 Slate Creek
- LK-23 Tucker Creek
- LK-25 Reedy Creek
- LK-25-? Left Fork Reedy Creek
- LK-25-R Middle Fork Reedy Creek
- LK-31 Spring Creek
- LK-31-AA Right Fork Spring Creek
- LK-31-Z Left Fork Spring Creek
- LK-39 Straight Creek
- LK-40 Leading Creek
- LK-45 Yellow Creek
- LK-53 Pine Creek
- LK-66 Tanner Creek

LK-72	Cedar Creek
LK-75	Leading Creek
LK-75-K	Cove Creek
LK-75-N	Fink Creek
LK-86	Sand Fork
LK-94	Oil Creek
LK-95	Saltlick Creek
LKH	Hughes River
LKH-10	North Fork Hughes River
LKH-10-C	Gillespie Run
LKH-10-G	Devilhole Creek
LKH-10-J	Addis Run
LKH-10-R	Bonds Creek
LKH-4	Goose Creek
LKH-9	South Fork Hughes River
LKH-9-AA	Middle Fork South Fork Hughes River
LKH-9-J	Indian Creek
LKH-9-M	Leatherbark Creek
LKH-9-R	Spruce Creek
LKH-9-W	Slab Creek
LKH-9-X	Bone Creek
LKH-9-Y	Otterslide Creek
LKS	Steer Creek
LKS-10	Left Fork Steer Creek
LKS-9	Right Fork Steer Creek
LKW	West Fork Little Kanawha River
LKW-15	Henry's Fork
LKW-15-F	Laurel Run
LKW-15-J	Beech Fork
LKW-31	Left Fork West Fork Little Kanawha River
	Guyandotte River Drainage
OG	Guyandotte River
OG	Barboursville Lake
OG-14	Charley's Creek
OG-24	TwOMile Creek
OGM	Mud River
OGM-12-A	Kilgore Creek
OGM-20	Trace Fork
OGM-22	Buffalo Creek
OGM-25	Middle Fork Mud River
OGM-33	Big Laurel Creek
	Middle Island Creek Drainage
OMI	Middle Island Creek
OMI-4	McKim Creek
OMI-9	Sugar Creek

OMI-21	Sancho Creek
OMI-23	Point Pleasant Creek
OMI-23-A	Pursley Creek
OMI-23-B	Elk Fork
OMI-29	Indian Creek
OMI-30	McElroy Creek
OMI-40	Arnold Creek
OMI-43	Bluestone Creek
OMI-46	Meathouse Fork
OMI-46-E	Toms Fork
OMI-46-J	Indian Fork
OMI-47	Buckeye Creek
OMI-46-E	Toms Fork
OMI-46-J	Indian Fork
OMI-47	Buckeye Creek
	Ohio River Direct Drainage
O	Ohio River
O-2	Twelvepole Creek
O-2-H	Beech Fork
O-2-P	West Fork Twelvepole Creek
O-2-Q	East Fork Twelvepole Creek
O-9	Guyan Creek
O-30-A	Tombleson Run embayment
O-31	Little Mill Creek
O-32	Mill Creek
O-32-D	Cow run
O-32-H	Parchment Creek
O-32-L-7	Grasslick Creek
O-32-L-8	Bear Fork
O-32-M	Elk Fork
O-32-N	Little Mill Creek
O-36	Sandy Creek
O-36-D	Crooked Fork
O-36-J	Left Fork Sandy Creek
O-36-J-5	Nesselroad Run
O-38	Little Sandy Creek
O-43-D	Little Pond Creek
O-44	Lee Creek
O-44-A	South Fork Lee Creek
O-44-B	North Fork Lee Creek

PITTSBURGH DISTRICT

	Ohio River Direct Drainage
	Ohio River
O-57	French Creek
O-69	Fishing Creek
O-69-N	South Fork Fishing Creek
O-69-O	North Fork Fishing Creek
O-77	Fish Creek
O-77-J	Valley Run
O-77-O	WV Fork Fish Creek
O-77-O-8	Long Drain Creek
O-88	Wheeling Creek
O-88-D-2	Middle Wheeling Creek
O-88-L	Turkey Run
O-88-O	Enlow Fork
O-88-O-?	Dunkard Fork
O-92	Buffalo Creek
	Cheat River Drainage
M	Monongahela River
M-1	Dunkard Creek
M-1-?	Blacks Run
M-1-C	Days Run
M-1-E	Miracle Run
M-1-E-?	Right Branch Miracle Run
M-1-F	WV Fk Dunkard
M-1-F-6	North Fork WV Fork Dunkard Creek
M-1-F-6-A	Camp Run
M-1-F-7	South Fork WV Fork Dunkard Creek
MT	Tygart Valley River
MW	West Fork River
MW-13	Tenmile Creek upstream of Little Tenmile
MW-13-I-4	Jacob's Fork
MW-13-I-4	Salem Fork
MW-2	Booths Creek
MW-21	Elk Creek
MW-21-G	Brushy Fork of Elk Creek
MW-21-M	Gnatty Creek
MW-29	Isaacs Creek
MW-31	Hackers Creek
MW-31-C	Jesse Run
MW-32	Kincheloe Creek
MW-36	Freemans Creek
MW-36-D	Right Fork Freemans Creek
MW-38	Stonecoal Creek

MW-55	Right Fork West Fork River
MC-60-D	Blackwater River
MC-60-D-10	Sand Run
MC-60-D-8-A ?	Glade Run
MC-60-K-16	West Fork Glady
P	Potomac River Drainage
P-4-M	Mill Creek
P-6	Back Creek
P-9	Sleepy Creek
PC	Cacapon River
PC-24	Lost River
PC-7	North River
PNB-4	Patterson Creek
PNB-4-EE	North Fork Patterson Creek (below dam near mouth)
PSB	South Branch Potomac River
PSB-21	South Fork South Branch

18. Isolated Wetlands.

In some cases, the Corps of Engineers may determine that an activity will not impact waters of the United States because the water is an isolated wetland, and therefore does not require a 404 permit. However, under West Virginia State code (§§22-11-3(23)) isolated wetlands are designated waters of the State. Accordingly, any applicant proposing to impact an isolated wetland must contact the West Virginia Department of Environmental Protection, Division of Water and Waste Management to obtain all necessary approvals for activities impacting any isolated wetlands.

APPENDIX A

Streams with potential presence of Federally listed threatened and endangered species or their habitat

HUNTINGTON DISTRICT:

1. Big Sandy Creek; Kanawha County: Snuffbox.
2. Bluestone River; Mercer and Summers counties (Bluestone Gorge to slackwater of Bluestone Reservoir): Virginia spiraea.
3. Cedar Creek; Braxton and Gilmer counties: Snuffbox.
4. Cove Creek; Monroe County: James spinymussel.
5. Elk River; Braxton, Clay, and Kanawha counties (Sutton Dam to slackwater below Coonskin Park), including the lower one-half mile reaches of its tributaries Birch River, Blue Creek, and Laurel Creek: Clubshell, Pink mucket pearlymussel, Northern riffleshell, Rayed bean, and Snuffbox. The Elk River also contains the Diamond darter (candidate).
6. Fishing Creek; Wetzel County: Snuffbox.
7. Gauley River; Fayette and Nicholas counties (Summersville Dam to Swiss): Virginia spiraea.
8. Greenbrier River; Greenbrier and Pocahontas counties: Virginia spiraea.
9. Henry Fork; Calhoun and Roane counties: Snuffbox.
10. Hughes River; Ritchie and Wirt counties, including the lower one-half mile reach of its tributary Goose Creek: Snuffbox.
11. Kanawha River; Fayette, Kanawha, Mason, and Putnam counties: Fanshell, Pink mucket pearlymussel, Sheepnose, Spectaclecase, and Tubercled-blossum pearlymussel.
12. Leading Creek; Gilmer and Lewis counties, including the lower one-half mile reach of its tributary Fink Creek: Snuffbox.
13. Little Kanawha River; Braxton, Calhoun, Gilmer, Wirt, and Wood counties, including the lower one-half mile reaches of its tributaries Leading Creek (Calhoun Co., different stream than 5.d. above), Pine Creek, Sand Fork, Slate Creek, Straight Creek, Tanner Creek, Tucker Creek, and Walker Creek: Snuffbox.

14. Marsh Fork River including Dingess Branch and Millers Camp Branch and associated palustrine emergent and scrub-shrub wetlands; Raleigh County: Virginia spiraea.
15. McElroy Creek; Doddridge and Tyler counties: Snuffbox.
16. Meadow River; Fayette, Greenbrier, and Nicholas counties. Virginia spiraea.
17. Meathouse Fork of Middle Island Creek; Doddridge County, including the lower one-half mile reaches of it tributary Toms Fork: Clubshell and Snuffbox.
18. Middle Island Creek; Doddridge, Pleasants, and Tyler counties, including the lower one-half mile reaches of its tributaries Arnold Creek, Bluestone Creek, Buckeye Creek, Indian Creek, McKim Creek, Point Pleasant Creek, and Sancho Creek: Clubshell, Rayed bean, and Snuffbox.
19. New River (Lower); Fayette County (Route 19 to Gauley Bridge): Virginia spiraea.
20. North Fork Hughes River; Ritchie and Wirt counties, including the lower one-half mile reaches of its tributaries Addis Run, Bonds Creek, Devilhole Creek, and Gillespie Run: Snuffbox.
21. Ohio River; Cabell, Jackson, Mason Pleasants, Tyler, Wetzel, and Wood counties: Fanshell, Pink mucket pearlymussel, Sheepnose, and Snuffbox.
22. Potts Creek and South Fork of Potts Creek; Monroe County: James spinymussel.
23. Reedy Creek; Roane and Wirt counties: Snuffbox.
24. South Fork Hughes River; Doddridge, Ritchie, and Wirt counties, including the lower one-half mile reaches of its tributaries Bone Creek, Indian Creek, Leatherbark Creek, Otterslide Creek, Slab Creek, and Spruce Creek: Clubshell and Snuffbox.
25. Spring Creek; Roane and Wirt counties: Snuffbox.
26. Steer Creek; Calhoun and Gilmer counties: Snuffbox.
27. Sugar Creek; Pleasants County: Snuffbox.
28. West Fork Little Kanawha River; Calhoun, Roane, and Wirt counties. Snuffbox.

PITTSBURGH DISTRICT

29. Back Creek; Berkeley County: Harperella.
30. Cacapon River; Morgan County: Harperella.

The Doddridge Independent

The Doddridge Independent

PUBLISHER'S CERTIFICATE

I, Michael D. Zorn, Publisher of The Doddridge Independent, A newspaper of general circulation published in the town of West Union, Doddridge County, West Virginia, do hereby certify that:

Permit Application # 15-405
Please take notice that on the 30th day of October, 2015
EQT Production Company
filed an application for a Floodplain Permit to develop land located at or about:
WEU 51 Proposed Well Pad and Access Road Enhancement
Location: Bluestone Creek/ 39.252992/80.755244
Received: 11/24/2015
Announced: 12/01/2015
Publication Date: Week of 11/23/15
20-Day Comment Period Window (from Commission Meeting) 12/21/2015
90-Day Approval Window (from date of receipt) N/A
Project Description: Low Water Concrete Ford

was published in The Doddridge Independent
2 times commencing on Friday, November 27, 2015 and
Ending on Friday, December 4, 2015 at the request of:

George Eidel, Doddridge County Floodplain Manager& Doddridge County Commission

Given under my hand this Monday, December 7, 2015

The publisher's fee for said publication is:

$ 25.27 1st Run/$ 18.95 Subsequent Runs
This Legal Ad Total: $ 44.22

Michael D. Zorn
Publisher of The Doddridge Independent

Subscribed to and sworn to before me on
this date: 12/7/15

Notary Public in and for Doddridge County
My Commission expires on
The 17th day of May 2017

OFFICIAL SEAL
NOTARY PUBLIC
STATE OF WEST VIRGINIA
[illegible]

Public Notice • Legal Notice

Doddridge County
Permit Application # 15-405
Please take notice that on the 30th day of October, 2015
EQT Production Company
filed an application for a Floodplain Permit to develop land located at or about:
WEU 51 Proposed Well Pad and Access Road Enhancement
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Publication Date: Week of 11/23/15
20-Day Comment Period Window (from Commission Meeting) 12/21/2015
90-Day Approval Window (from date of receipt) N/A
Project Description: Low Water Concrete Ford
The Application is on file with the Clerk of the County Court and may be inspected or copied during regular business hours. As this project is outside the FEMA identified floodplain of Doddridge County, Doddridge County Floodplain Management has no regulatory authority. Any interested persons who desire to comment shall present the same in writing by November 30 , 2015, delivered to:
Clerk of the County Court
118 E. Court Street, West Union, WV 26456
Beth A Rogers, Doddridge County Clerk
George Eidel. Doddridge County Flood Plain Manager
11/27 - 12/04

EQT WEU 51 CONCRETE FORD
EQT PRODUCTION COMPANY

SITUATED ON THE WATERS OF BLUESTONE CREEK
IN WEST UNION DISTRICT, DODDRIDGE COUNTY, WV

LOCATION COORDINATES

EQT WEU 51 CONCRETE FORD
LATITUDE: 39.252992 LONGITUDE: 80.755244 (NAD 83)

ENTRANCE PERMIT

EQT PRODUCTION COMPANY WILL OBTAIN AN ENCROACHMENT PERMIT (FORM MM-109) FROM THE WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS, PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITIES.

MISS UTILITY STATEMENT

MISS UTILITY OF WEST VIRGINIA WAS NOTED FOR THE LOCATING OF UTILITIES PRIOR TO THIS PROJECT DESIGN; TICKET #1324866542.
IN ADDITION, MISS UTILITY WILL BE CONTACTED PRIOR TO START OF THE PROJECT.

MISS Utility of West Virginia
1-800-245-4848
West Virginia State Law
(Section XIV, Chapter 24-C)
Requires that you call two business days before you dig in the state of West Virginia.
IT'S THE LAW!!

ENVIRONMENTAL NOTES

A WETLAND DELINEATION WAS PERFORMED BY POTESTA & ASSOCIATES TO REVIEW THE SITE FOR WATERS AND WETLANDS THAT ARE MOST LIKELY WITHIN THE REGULATORY PURVIEW OF THE U.S. ARMY CORPS OF ENGINEERS (USACE) AND/OR THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (WVDEP). THE SEPTEMBER 9, 2013 REPORT FOR EQT 51 PREPARED BY POTESTA & ASSOCIATES, INC., SUMMARIZES THE RESULTS OF THE FIELD DELINEATION. THE REPORT DOES NOT, IN ANY WAY, REPRESENT A JURISDICTIONAL DETERMINATION OF THE LANDWARD LIMITS OF WATERS AND WETLANDS WHICH MAY BE REGULATED BY THE USACE OR THE WVDEP. IT IS STRONGLY RECOMMENDED THAT THE AFORMENTIONED AGENCIES BE CONSULTED IN AN EFFORT TO GAIN WRITTEN CONFIRMATION OF THE DELINEATION DESCRIBED BY THIS REPORT PRIOR TO ENGAGING CONSTRUCTION ON THE PROPERTY DESCRIBED HEREIN. THE DEVELOPER SHALL OBTAIN THE APPROPRIATE PERMITS FROM THE FEDERAL AND/OR STATE REGULATORY AGENCIES PRIOR TO ANY PROPOSED IMPACTS TO WATERS OF THE U.S., INCLUDING WETLAND FILLS AND STREAM CROSSINGS.

GEOTECHNICAL NOTES

A SUBSURFACE GEOTECHNICAL INVESTIGATION HAS NOT BEEN PERFORMED AT THIS SITE.

DESIGN NOTES

CONCRETE PAVEMENT DESIGN BASED ON SOIL TYPE ML WITH A CALIFORNIA BEARING RATIO OF 2. PAVEMENT DESIGN WAS BASED OFF OF AN ADT # 100 VEHICLES PER DAY WITH 50% TRUCKS.

NEW MILTON, OXFORD, SMITHBURG AND WEST UNION QUADRANGLE
WEST VIRGINIA
7.5 MINUTE SERIES

2000' 0' 2000'

NORTH

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

LIST OF DRAWINGS	
SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	CONCRETE FORD SITE PLAN
3	TYPICAL SECTIONS
4	SLAB 1 - 11' LENGTH
5	SLAB 2 - 15' LENGTH
6	SLAB 3 - 15' LENGTH
7	SLAB 4 - 15' LENGTH
8-10	DETAILS
11	QUANTITIES & REBAR SCHEDULE

LEGEND	
AS-BUILT INDEX CONTOUR	
AS-BUILD INTERMEDIATE CONTOUR	890
EX. GAS LINE	G
COMPOST FILTER SOCK	CF
EX. GAS LINE RISER	
EX. GAS LINE MARKER	
EX. GAS WELL	
EX. STREAM	
EX. WETLAND	
EX. CULVERT	
PROP. CONCRETE FORD	
EX. RIP RAP APRON	
PROP. RIP RAP APRON	
REMOVAL OF STONE	

ENGINEER

STANTEC CONSULTING,INC.
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: (304) 367-9401

SURVEYOR

SMITH LAND SURVEYING, INC.
PO BOX 150
226 WEST MAIN STREET
GLENVILLE, WV 26351
PHONE: (304) 462-5634

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

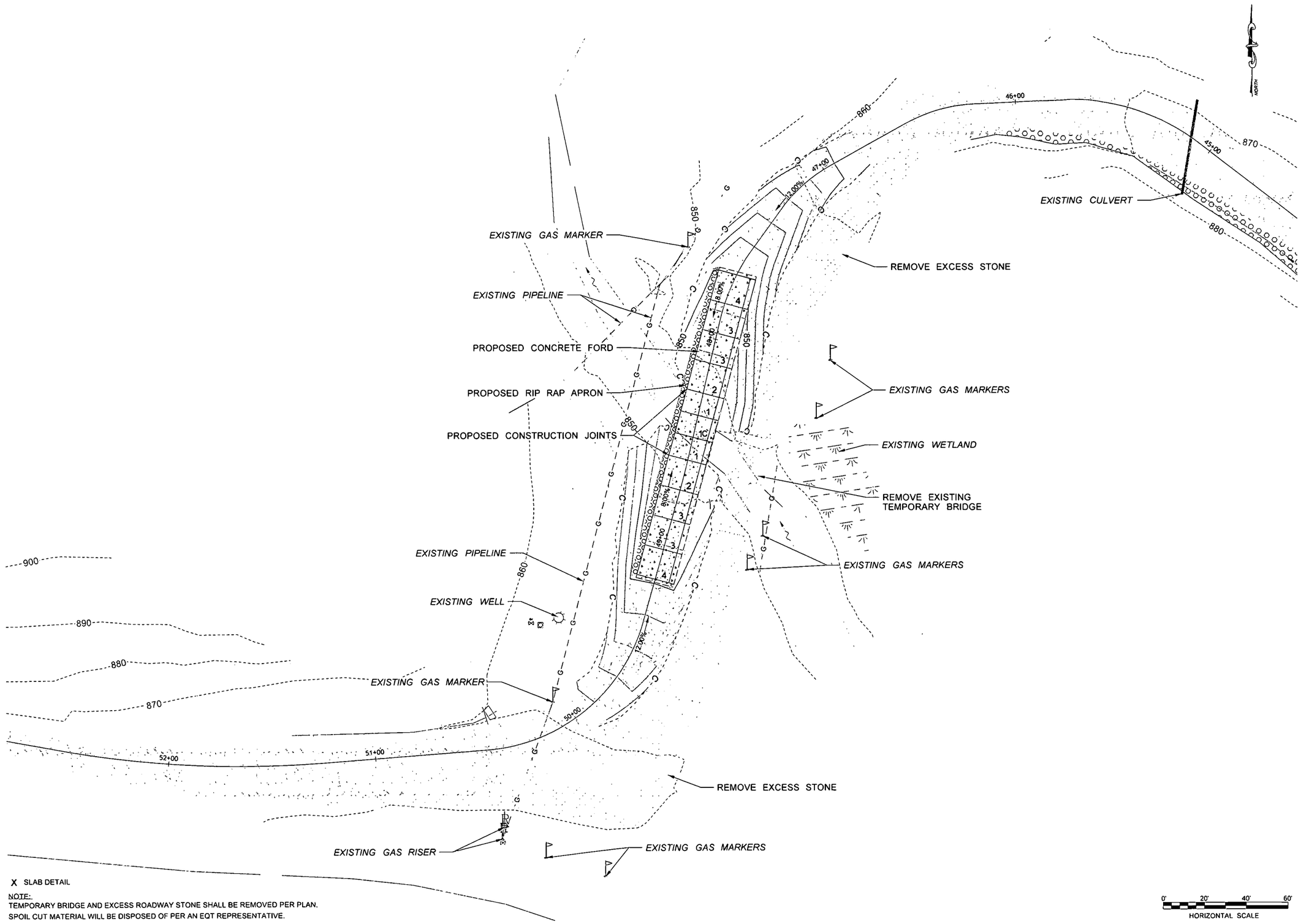
Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS ENGINEERS ENVIRONMENTAL
PROJECT MGMT.
226 West Main St.
P.O. Box 150
Glenville, WV 26351
(304) 462-5634
5650 Dike Bottom Road
Shadyside, OH 43947
(740) 671-9911
HONESTY, INTEGRITY, QUALITY

STEPHEN G. JOHNSON
STATE OF WEST VIRGINIA
NO. 15000
PROFESSIONAL ENGINEER
10/13/2015

THIS DOCUMENT WAS PREPARED BY STANTEC FOR: EQT PRODUCTION COMPANY

TITLE SHEET
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 10/13/2015
SCALE: AS SHOWN
DESIGNED BY:SGJ
FILE NO.:SLS-8051
SHEET 1 OF 11
REV:



X SLAB DETAIL

NOTE:
TEMPORARY BRIDGE AND EXCESS ROADWAY STONE SHALL BE REMOVED PER PLAN.
SPOIL CUT MATERIAL WILL BE DISPOSED OF PER AN EQT REPRESENTATIVE.

Stantec

111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

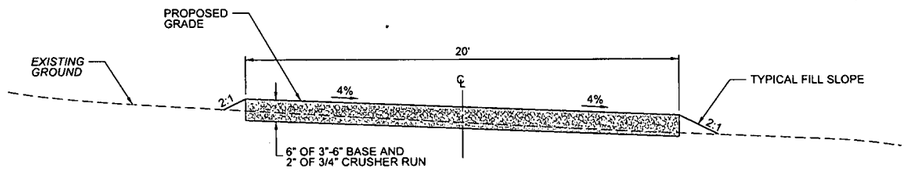
Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYOR: SLS
PROJECT MGMT.: ENGINEERS ENVIRONMENTAL
229 West Main St. P.O. Box 150 Salem, WV 26426 (304) 782-3331
3900 Dillon Buffalo Road Steubenville, OH 43947 (740) 677-9411
HONESTY, INTEGRITY, QUALITY

STEPHEN G. JOHNSON REGISTERED NO. 15678 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

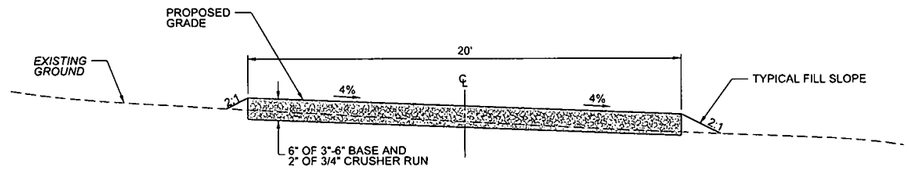
STREAM CROSSING PLAN SHEET
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 10/13/2015
SCALE: AS SHOWN
DESIGNED BY:SGJ
FILE NO.:SLS-8051
SHEET 2 OF 11
REV:



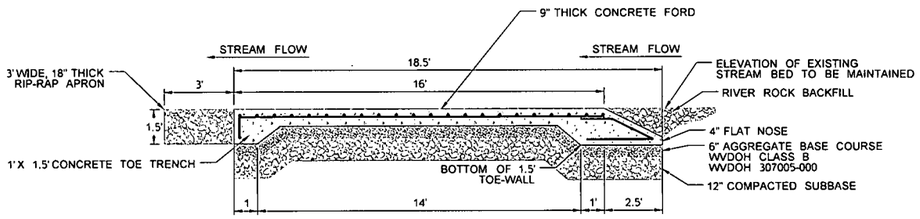
MAIN ACCESS ROAD TYPICAL SECTION - BEFORE FORD

NOT TO SCALE



MAIN ACCESS ROAD TYPICAL SECTION - AFTER FORD

NOT TO SCALE

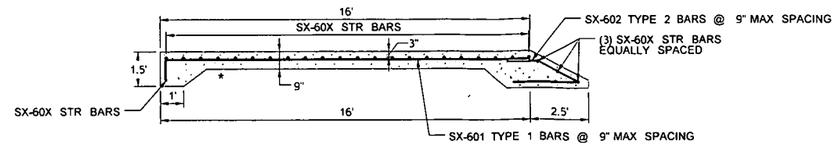


CONCRETE FORD TYPICAL SECTION

NOT TO SCALE

NOTES

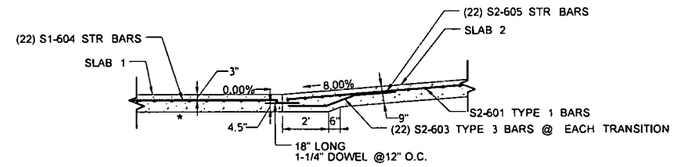
1. CONCRETE SHALL BE fc= 4000'PSI, 6% Ê 1% AIR CONTENT, WITH A 4" SLUMP.
2. CONSTRUCTION JOINTS SHALL BE SEALED BY CAULKING.
3. CONTROL JOINTS SHALL BE SAW CUT PER DETAIL.
4. FRESH CONCRETE SHALL BE PROTECTED FROM RAINS, FLOWING WATER AND MECHANICAL DAMAGE FOR A PERIOD OF FOUR (4) DAYS.
5. THE FINISHED SURFACE OF THE CONCRETE FORD TRAVEL LANE SHALL BE ROUGHENED.
6. ALL REINFORCING BAR SHALL BE ASTM A-615, GRADE 60.
7. EXCAVATE DOWN A MINIMUM OF 1'-6" BELOW THE BOTTOM OF THE SURFACE SLAB FOUNDATION. THE ENTIRE AREA UNDER THE SLAB MUST BE EXCAVATED. THE EXPOSED SUBGRADE SHALL BE VERIFIED OR COMPACTED (IF REQUIRED) TO 95% OF THE MAXIMUM DRY DENSITY AT (+/-)2% OF OPTIMUM MOISTURE CONTENT ACCORDING TO ASTM D1557 (MODIFIED PROCTOR). 12" LAYER OF SUBBASE PLACED IN 6" LIFTS AND COMPACTED, AND 6" LAYER OF REQUIRED BASE COURSE PLACED AND COMPACTED.



TYPICAL SECTION A-A

NOT TO SCALE

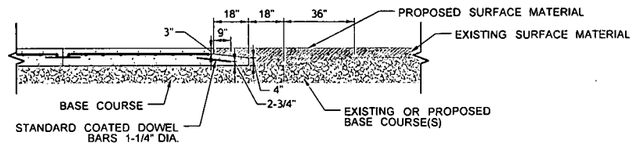
* NOTE: BASE COURSE AND SUBBASE NOT SHOWN FOR CLARITY



GRADE CHANGE DETAIL

NOT TO SCALE

* NOTE: BASE COURSE AND SUBBASE NOT SHOWN FOR CLARITY



END TRANSITION DETAIL

NOT TO SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

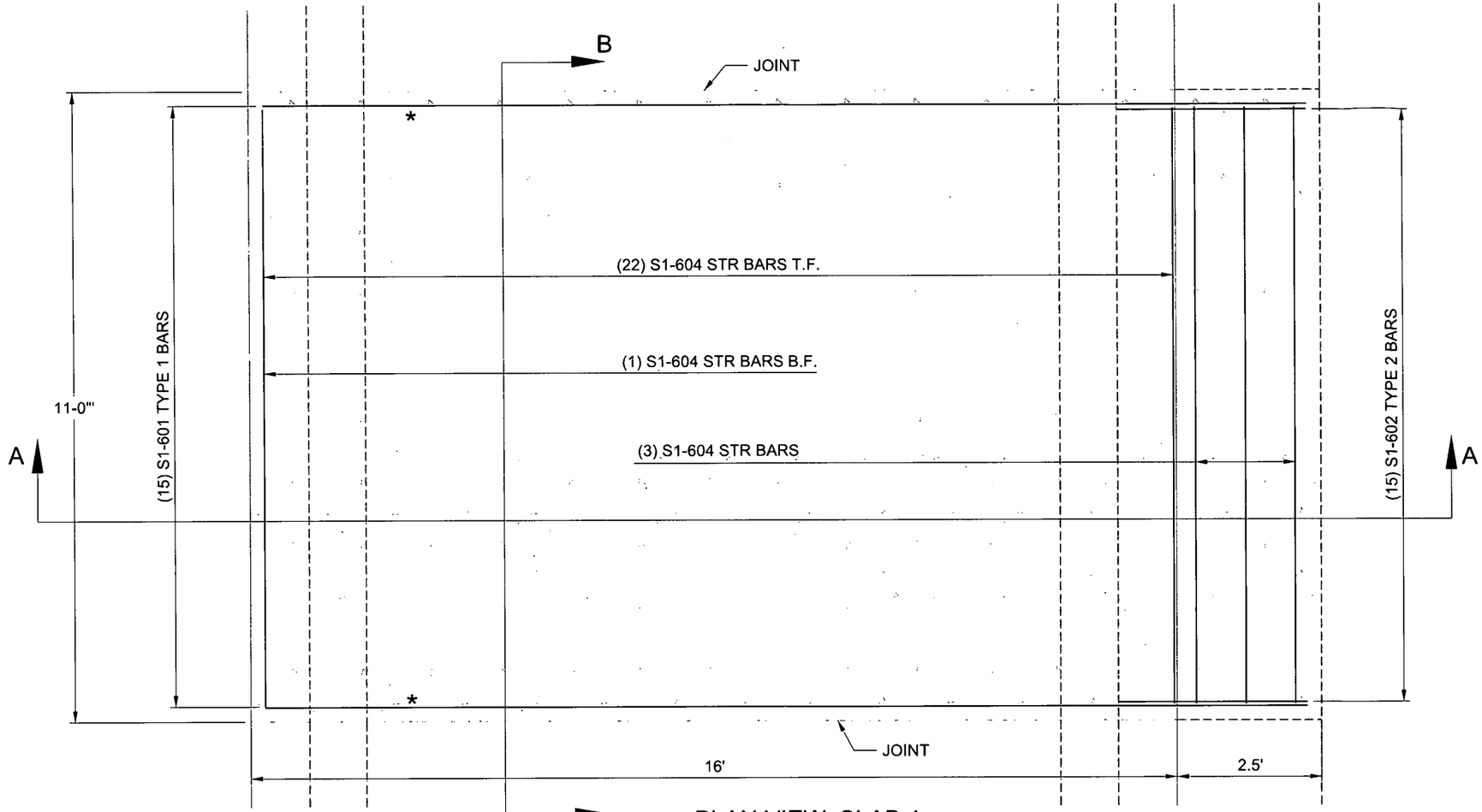
Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
ENGINEERS:
ENVIRONMENTAL
SURVEYORS:
PROJECT MGMT.
2000 Dunn Drive, Bethel Park
Washington, PA 15317
(724) 941-7077
SLS
239 West Main St.
P.O. Box 190
Salem, WV 26426
(304) 782-1866
HONESTY, INTEGRITY, QUALITY

STEPHEN C. JOHNSON
REGISTERED
NO. 15628
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

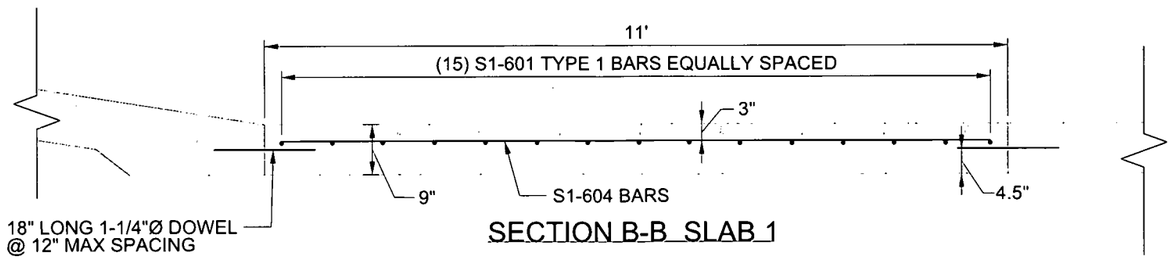
THIS DOCUMENT WAS
PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

TYPICAL SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

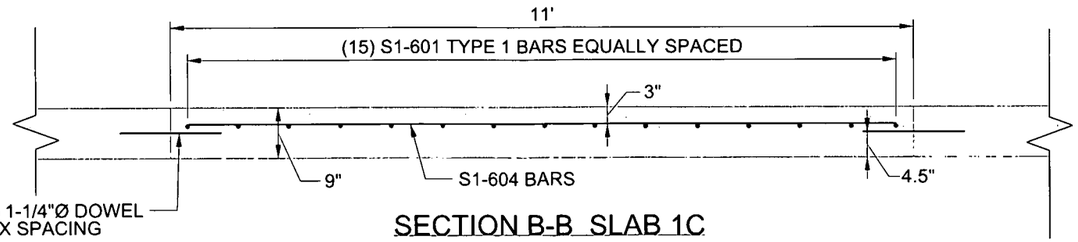
DATE:	10/13/2015
SCALE:	AS SHOWN
DESIGNED BY:	SGJ
FILE NO.:	SLS-8051
SHEET	3 OF 11
REV:	



PLAN VIEW SLAB 1



SECTION B-B SLAB 1



SECTION B-B SLAB 1C

BAR TYPE SX-60_
X=SLAB TYPE

★ DOWELS NOT SHOWN FOR CLARITY

0' 1' 2' 3'
HORIZONTAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0461

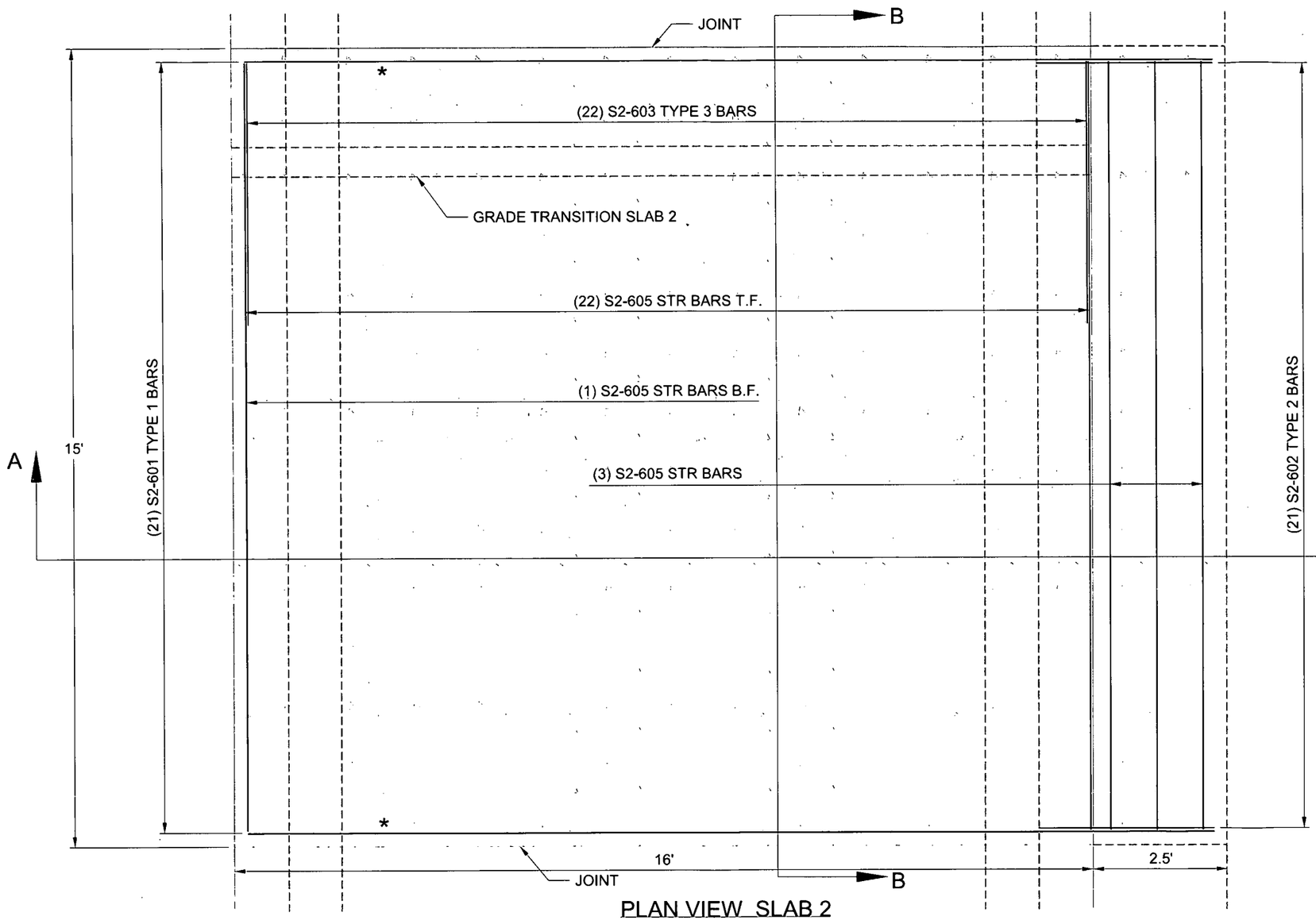
Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS: PROJECT MGMT. ENGINEERS: ENVIRONMENTAL
SLS
226 Third Main St. P.O. Box 1560 Glenville, WV 26351 (304) 462-5634
22603 Dille, Bolton Road Shadyside, OH 43947 (740) 671-1777
HONESTY, INTEGRITY, QUALITY

STEPHEN G. JOHNSON
REGISTERED
NO. 15628
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

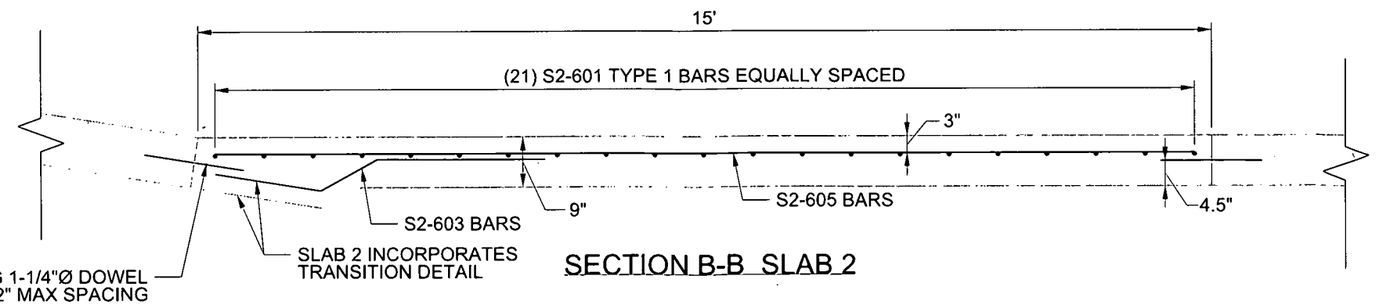
THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

SLAB 1 - 11'LENGTH
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 10/13/2015
SCALE: AS SHOWN
DESIGNED BY:SGJ
FILE NO.:SLS-8051
SHEET 4 OF 11
REV:



PLAN VIEW SLAB 2



SECTION B-B SLAB 2

BAR TYPE SX-60_
X=SLAB TYPE

* DOWELS NOT SHOWN FOR CLARITY

0' 1' 2' 3'
HORIZONTAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE 304-367-0401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
Surveyors (Engineers)
Project Mgmt. (Environmental)
SLS
2668 Ohio Bottom Road
Ravenswood, OH 45767
(740) 377-4717
139 West Main St.
Clarksburg, WV 26301
(304) 623-3564
HONESTY, INTEGRITY, QUALITY

STEPHEN C. JOHNSON
REGISTERED
NO. 15628
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

SLAB 2 - 15' LENGTH
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE:	10/13/2015
SCALE:	AS SHOWN
DESIGNED BY:	SGJ
FILE NO.:	SLS-8051
SHEET	5 OF 11
REV:	

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Color_D_black.TBL
ENERGY_ANSI_D_PDF.stl

10/13/2015
WVDOH_CE_DOT_2006 (SURVEY FEET)
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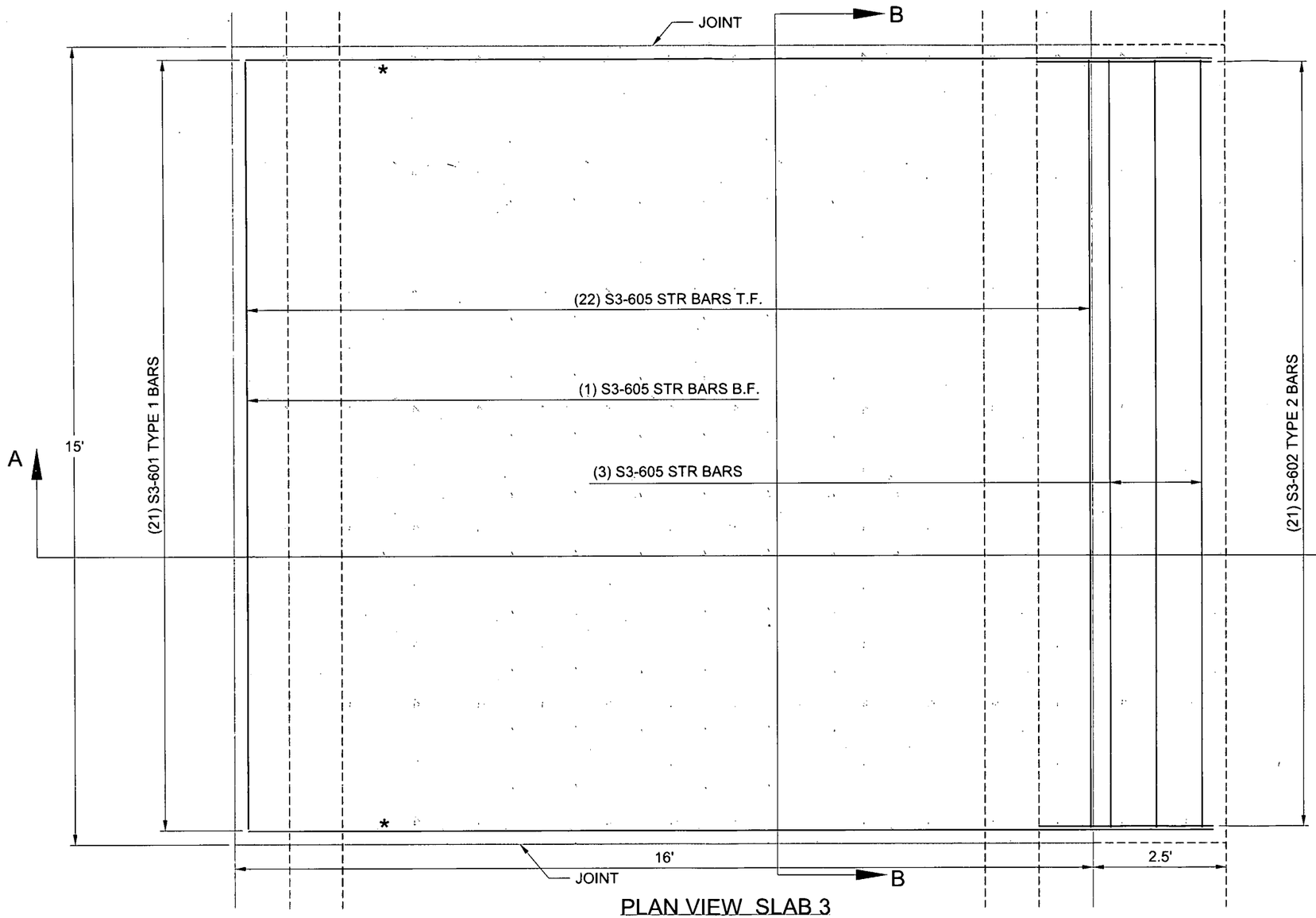
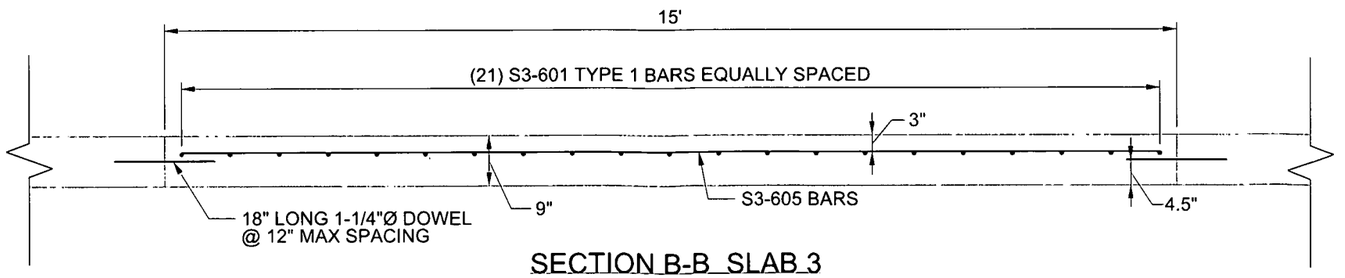


PLAN VIEW SLAB 3



SECTION B-B SLAB 3

BAR TYPE SX-60_
X=SLAB TYPE

★ DOWELS NOT SHOWN FOR CLARITY

0' 1' 2' 3'
HORIZONTAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

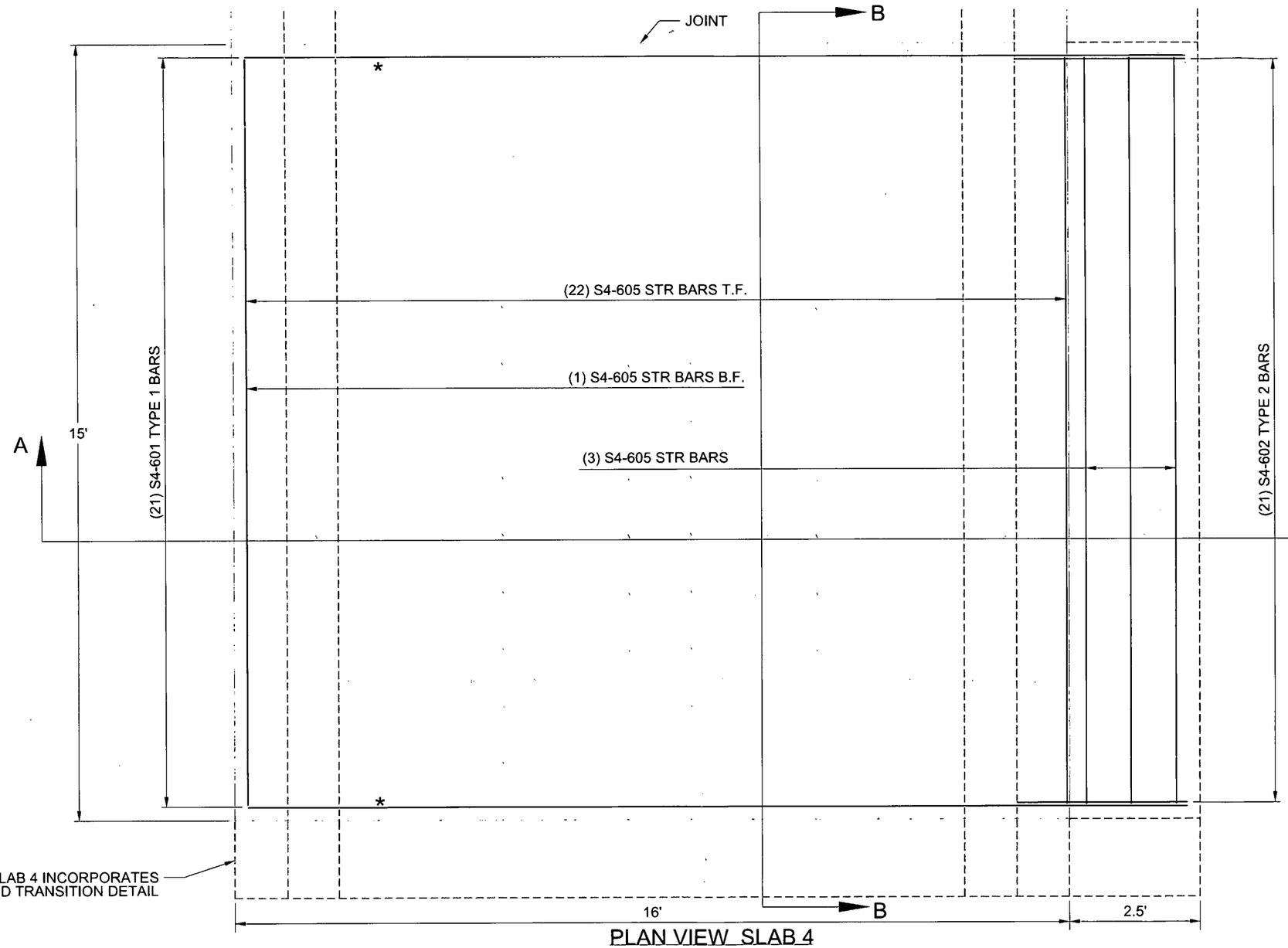
Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS: SLS ENGINEERS, ENVIRONMENTAL
PROJECT MGMT.
128 West Main St.
P.O. Box 1560
Clarksburg, WV 26301
(304) 623-3868
(Redacted)
HONESTY, INTEGRITY, QUALITY

STEPHEN C. JOHNSON
REGISTERED
NO. 15628
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

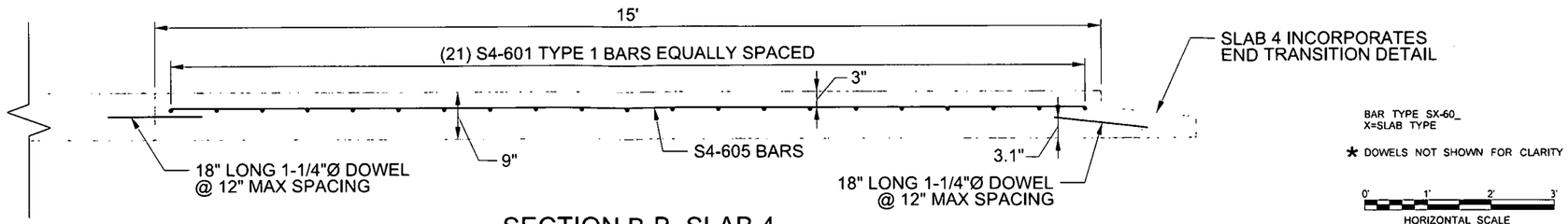
THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

SLAB 3 - 15' LENGTH
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 10/13/2015
SCALE: AS SHOWN
DESIGNED BY:SGJ
FILE NO.:SLS-8051
SHEET 6 OF 11
REV:



PLAN VIEW SLAB 4



SECTION B-B SLAB 4

BAR TYPE SX-60_
X=SLAB TYPE

* DOWELS NOT SHOWN FOR CLARITY

0' 1' 2' 3'
HORIZONTAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-363-0400

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS PROJECT MGMT. ENGINEERS ENVIRONMENTAL
SLS
229 West Main St.
P.O. Box 150
Glenville, WV 26351
(304) 462-5634
2002 Ohio Skyline Road
Suite 200
Zanesville, OH 43701
(740) 677-9411
HONESTY, INTEGRITY, QUALITY

STEPHEN G. JOHNSON
REGISTERED
NO. 15628
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

SLAB 4 - 15' LENGTH
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

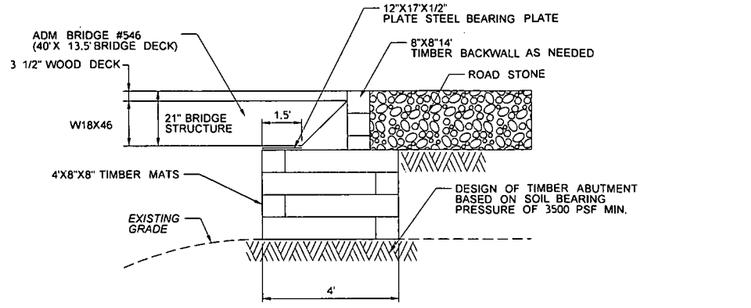
DATE: 10/13/2015
SCALE: AS SHOWN
DESIGNED BY:SGJ
FILE NO.:SLS-8051
SHEET 7 OF 11
REV:

GENERAL STREAM CROSSING NOTES:

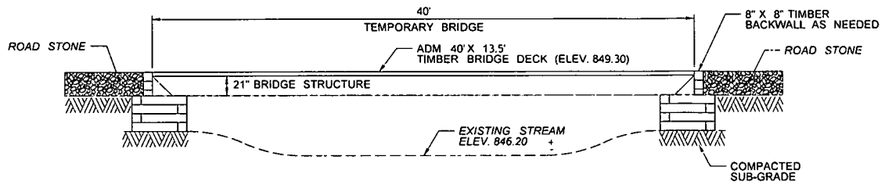
1. CLEARING AND EXCAVATION OF THE STREAMBED AND BANKS SHALL BE KEPT TO A MINIMUM.
2. FILTER CLOTH SHALL BE PLACED ON THE STREAMBED AND STREAM BANKS PRIOR TO PLACEMENT OF THE CONCRETE FORD AND AGGREGATE. THE FILTER CLOTH SHALL COVER THE STREAMBED AND EXTEND A MINIMUM OF SIX INCHES AND A MAXIMUM OF ONE FOOT BEYOND THE END OF THE FORD AND BEDDING MATERIAL.
3. A PUMP AROUND SYSTEM SHALL BE CONSTRUCTED ACROSS THE ROADWAY ON EITHER SIDE OF THE STREAM CROSSING AS DIRECTED.
4. APPROPRIATE PERIMETER CONTROLS SUCH AS COMPOST FILTER SOCK, SUPER SILT FENCE AND / OR SEDIMENT TRAPS SHALL BE EMPLOYED ALONG THE BANKS AND PARALLEL TO THE STREAMBED.
5. STREAMBED MATERIAL IS NOT TO BE USED AS FILL.
6. GREEN CONCRETE SHALL NOT BE PLACED IN CONTACT WITH FLOWING WATER.
7. DURING ROUTINE MAINTENANCE DO NOT GRADE MUD AND DEBRIS OVER THE SIDES OF THE CROSSING INTO THE STREAM.
8. THE CROSSING MUST BE INSPECTED AFTER EVERY RAIN EVENT OF 0.5 INCHES OR MORE AND ONCE A WEEK TO ENSURE THAT THE CONCRETE, RIP-RAP APRON, STREAMBED, AND STREAM BANKS ARE MAINTAINED AND NOT DAMAGED. NEVER ALLOW THE CROSSING TO BECOME OBSTRUCTED WITH DEBRIS AND REMOVE ANY OBSTRUCTIONS IMMEDIATELY.
9. GEOTEXTILE FABRIC SHALL MEETS THE TENSILE STRENGTH REQUIREMENTS OF 180 LBS PER ASTM D 4632, MULLEN BURSTING REQUIREMENTS OF 80 LBS PER ASTM D 4833.
10. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT 28 DAYS.
11. STORM RUNOFF MAY DEPOSIT DEBRIS AT THE CROSSING LOCATION WHICH WILL NEED TO BE REMOVED.

PUMP AROUND NOTES:

1. CONSTRUCTION SHOULD BE PERFORMED DURING LOW FLOW PERIODS.
2. PUMP(S) SHOULD BE SUFFICIENTLY LARGE TO PUMP THE ENTIRE STREAM FLOW AROUND THE SITE.
3. THE COFFERDAM CONSTRUCTED MUST BE IMPERVIOUS TO WATER.
4. THE INLET TO THE PUMP(S) IS TO BE SUSPENDED ABOVE THE STREAMBED IN ORDER TO PREVENT SUCKING MUD AND SEDIMENT.
5. THE DISCHARGE POINT MUST BE STABILIZED WITH ROCK TO DISPERSE THE ENERGY AND PREVENT EROSION.

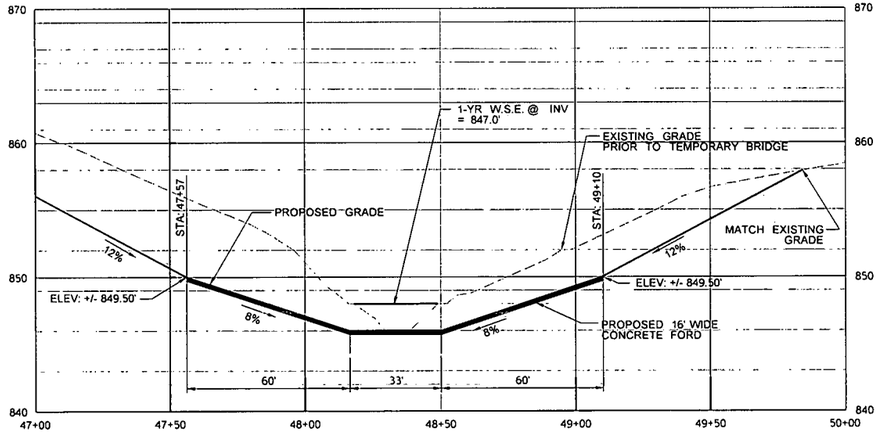


ABUTMENT DETAILS



TEMPORARY BRIDGE DETAIL

NTS



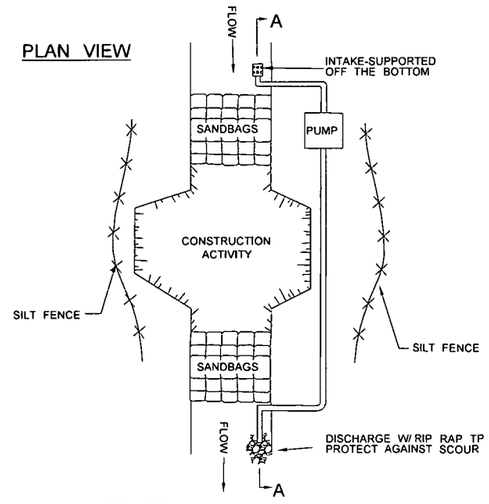
NOTE: SEE PLAN SHEET 2 OF 11 FOR A PLAN VIEW DETAIL OF THE FORD CROSSING

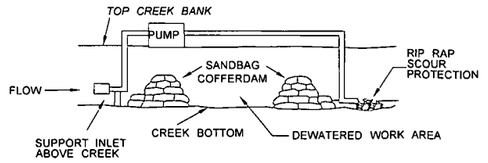
CROSS SECTION

SCALE: HORIZ. 1" = 25' VERT. 1" = 5'

PUMP AROUND

PLAN VIEW





SECTION A-A

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9451

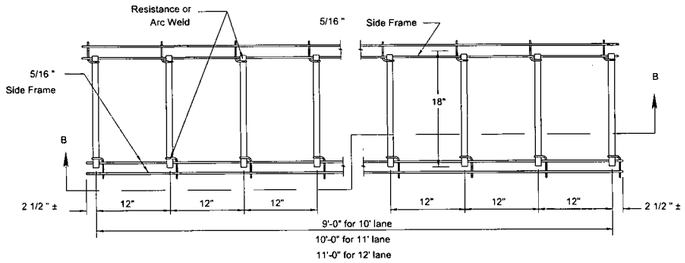
Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS / PROJECT MGMT. — ENGINEERS, (ENVIRONMENTAL)
SLS
223 West Main St.
P.O. Box 1539
Clarksburg, WV 26301
(304) 622-3536
20000 Clifton Station Road
Manassas, VA 20111
(703) 257-1234
HONESTY, INTEGRITY, QUALITY

STEPHEN G. JOHNSON
REGISTERED
NO. 15628
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

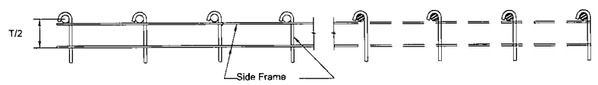
THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

CONSTRUCTION DETAILS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

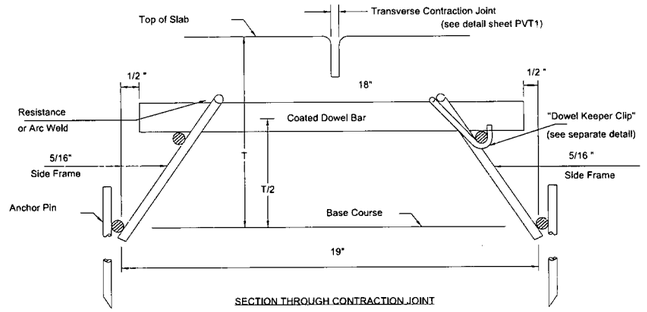
DATE: 10/13/2015
SCALE: AS SHOWN
DESIGNED BY: SGJ
FILE NO.: SLS-8051
SHEET 8 OF 11
REV:



PLAN OF DOWEL UNIT FOR CONTRACTION JOINT



SECTION B-B



SECTION THROUGH CONTRACTION JOINT

PAVEMENT JOINT DETAILS ADAPTED FROM WEST VIRGINIA DOH STANDARD DRAWINGS AND STANDARD SPECIFICATIONS. SEE DOH DRAWINGS AND SPECIFICATIONS FOR FOR ADDITIONAL DETAILS.

All dowel bars shall have a Department approved coating and shall meet the requirements of Section 709.15 of the Specifications. Dowel bar uncoated diameter to be 1/8 of the pavement thickness with minimum diameter of 1 1/4 " . Dowel bars to be 18" long and spaced on 1' c:c.

The units are to be shop assembled as to dowels, side frames, and center frames, and shipped nested.

The units are to be fabricated to fit the crown of the base course.

Wire used in the expansion and contraction joint load transfer units shall have a minimum ultimate tensile strength of 50,000 P.S.I..

The expansion joint load transfer unit detailed herein shall specially designated locations only.

Anchor pins are to be 1/2 " round bars and 16" minimum length to hold the unit rigidly in place. A minimum of 8 pins per unit shall be used.

Tie bolts shall meet the requirements of Section 709.7 of the Specifications.

Tie bolts shall be placed on 30" centers(max.)

Tie bolts shall be placed 15" from each end of form.

Metal channel shall run the full length of forms.

1-1/4" diameter tie bars; 30" long, placed longitudinally on 12" centers (max.), and centered across a longitudinal joint are required if width exceeds 16'.

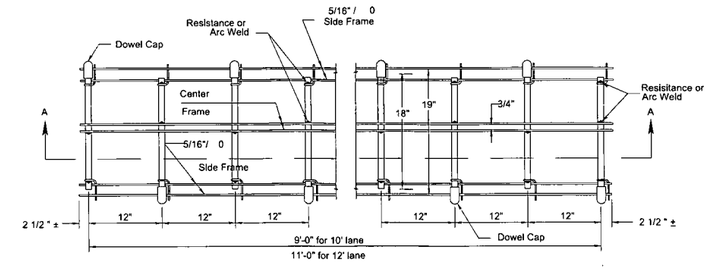
The longitudinal tie bolt assembly for slip-form paving shall consist of one sleeve nut, one 8" long hook bolt or J bolt, and 12" long alternate hook bolt. As an initial step in installing this assembly, the 12" long alternate hook bolt, with sleeve nut attached, shall be positioned in its proper location in the pavement by appropriate slip-form paving of the bolt assemblies.

Typical tie bolt assemblies are shown herein. Minor variations in details and dimensional tolerances are permitted; however, minimum values specified herein shall be complied with. All tie bars and J or Hook Bolt Assemblies shall be epoxy coated in accordance with section 709.1 of the Standard Specifications. equipment.

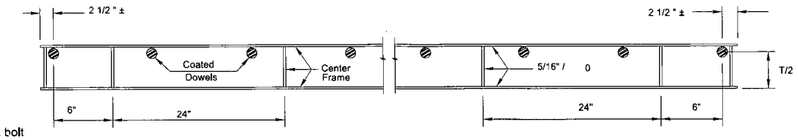
For additional details and requirements concerning dowel bars and dowel baskets for Type A & B Joints, see Sheet 10 or WVDOH Standard Sheet PVT4.

Type D Longitudinal Joint may be used as an alternate to Type E Longitudinal Joint for lane-at-time construction . When so used, the construction joint between lanes shall be keyed as shown for Type E Joint. Type F joint is not intended, in lane-at-a-time construction, as an alternate to Type D or E Longitudinal Joints between main-line pavement slabs. For additional details and requirements concerning Types D and E Joints and the keyway for Type F Joint, see Standard Sheet PVT3, Longitudinal Tie Bolt Assembly.

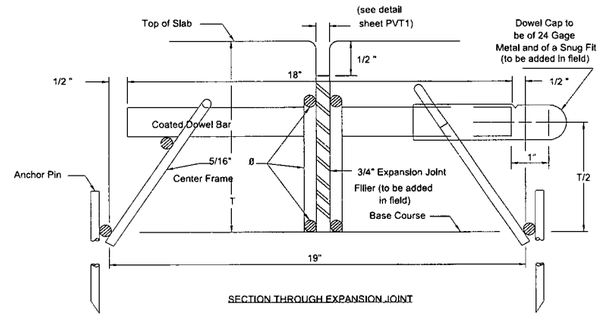
The shape shown for preformed elastomeric seals must conform to the requirements of 708.2 of the Specifications, in addition to the 1-1/4" (normal) width requirement, to be acceptable.



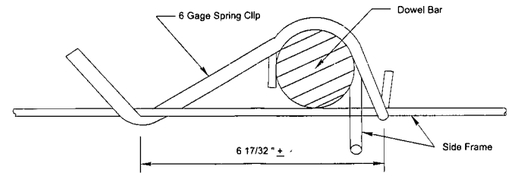
PLAN OF DOWEL UNIT FOR EXPANSION JOINT
(JOINT FILLER NOT SHOWN)



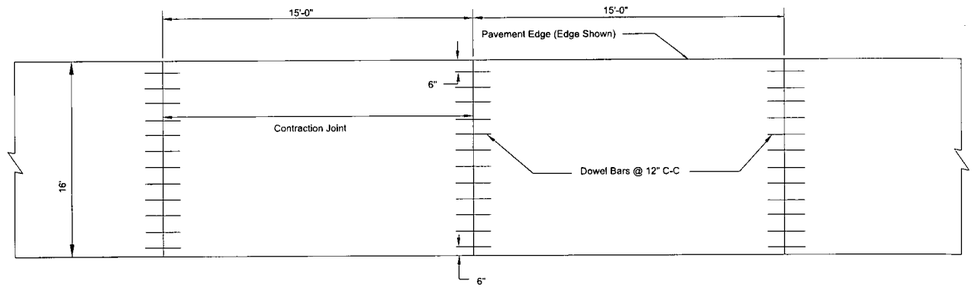
SECTION A-A



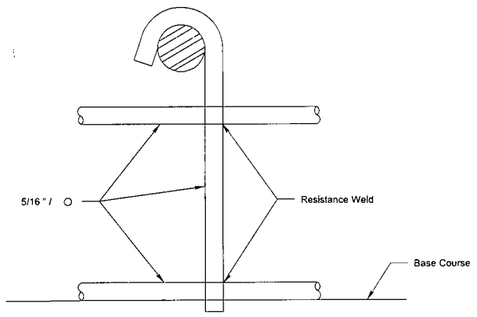
SECTION THROUGH EXPANSION JOINT



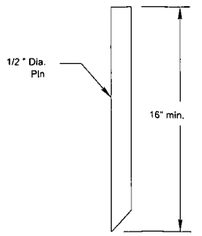
DOWEL KEEPER CLIP
(4 TO EACH CONTRACTION JOINT ASSEMBLY)



TYPICAL JOINT LAYOUT FOR CONCRETE PAVEMENT



SIDE FRAME DETAIL



ANCHOR PIN

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

"Professional Energy Consultants"
A DIVISION OF SMITH LAND SURVEYING

STEPHEN C. JOHNSON
REGISTERED
NO. 15628
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

CONSTRUCTION DETAILS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 10/13/2015
SCALE: AS SHOWN
DESIGNED BY:SGJ
FILE NO.:SLS-8051
SHEET 9 OF 11
REV:

EQT WEU 51 MATERIAL QUANTITIES CONCRETE FORD CROSSING				
ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM TOTAL
1.0 EXCAVATION	1,440	CY	$	$
2.0 AGGREGATE SURFACING			$	$
2.a. 8" OF 3"-6" STONE BASE (VARIABLE DEPTH)	132	TONS	$	$
2.b. 2" OF 3/4" CRUSHER RUN	35	TONS	$	$
2.c. GEOTEXTILE	337	SY	$	$
3.0 WATER PUMP AROUND	1	LS	$	$
4.0 CONCRETE FORD			$	$
4.a. 4,000 PSI CONCRETE	96	CY	$	$
4.b. 12" SUBBASE	194	TONS	$	$
4.c. 6" WVDOH CLASS B BASE COURSE	94	TONS	$	$
4.d. GEOTEXTILE	315	SY	$	$
4.e. RIP RAP	45	TONS	$	$
4.f. #6 REBAR	13,276	LB	$	$
4.g.1-1/4" DOWEL BARS	1,316	LB	$	$
5.0 REMOVE EXISTING BRIDGE AND EXCAVATE EXCESS STONE	1	LS	$	$

*NOTE: CONSTRUCTION JOINT WORK AND MATERIALS ARE INCIDENTAL TO THE CY PRICE FOR CONCRETE

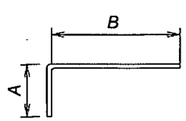
SLAB TYPE 1, 11'x16' FLAT						(2) TYPE 1 SLABS						
MARK	TYPE	LENGTH (EACH)		NUMBER REQ'D	SLAB TOTAL WEIGHT (LBS) 602001-001	TOTAL WEIGHT (LBS) 602001-001	DIMENSIONS A		B		C	
		FT	IN				FT	IN	FT	IN	FT	IN
S1-601	1	16	6	15	371.7	743.5	1	0	15	6		
S1-602	2	6	2	15	138.9	277.9	1	2	2	0	3	0
S1-604	STR	10	6	26	410.0	820.1						
1-1/4" DOWEL	STR	1	6	17	109.7	219.3						

SLAB TYPE 1C, 11'x16' FLAT						(1) TYPE 1C SLAB						
MARK	TYPE	LENGTH (EACH)		NUMBER REQ'D	SLAB TOTAL WEIGHT (LBS) 602001-001	TOTAL WEIGHT (LBS) 602001-001	DIMENSIONS A		B		C	
		FT	IN				FT	IN	FT	IN	FT	IN
S1-601	1	16	6	15	371.7	371.7	1	0	15	6		
S1-602	2	6	2	15	138.9	138.9	1	2	2	0	3	0
S1-604	STR	10	6	26	410.0	410.0						
1-1/4" DOWEL	STR	1	6	34	219.3	219.3						

SLAB TYPE 2, 15'x16' TRANSITION						(2) TYPE 2 SLABS						
MARK	TYPE	LENGTH (EACH)		NUMBER REQ'D	SLAB TOTAL WEIGHT (LBS) 602001-001	TOTAL WEIGHT (LBS) 602001-001	DIMENSIONS A		B		C	
		FT	IN				FT	IN	FT	IN	FT	IN
S2-601	1	16	6	21	520.4	1040.9	1	0	15	6		
S2-602	2	6	2	21	194.5	389.0	1	2	2	0	3	0
S2-603	3	4	0	22	132.2	264.4	1	9	1	1	1	2
S2-605	STR	14	6	26	566.3	1132.5						
1-1/4" DOWEL	STR	1	6	17	109.7	219.3						

SLAB TYPE 3, 15'x16'						(4) TYPE 3 SLABS						
MARK	TYPE	LENGTH (EACH)		NUMBER REQ'D	SLAB TOTAL WEIGHT (LBS) 602001-001	TOTAL WEIGHT (LBS) 602001-001	DIMENSIONS A		B		C	
		FT	IN				FT	IN	FT	IN	FT	IN
S3-601	1	16	6	21	520.4	2081.8	1	0	15	6		
S3-602	2	6	2	21	194.5	778.0	1	2	2	0	3	0
S3-605	STR	14	6	26	566.3	2265.0						
1-1/4" DOWEL	STR	1	6	17	109.7	438.6						

SLAB TYPE 4, 15'x16' END						(2) TYPE 4 SLABS						
MARK	TYPE	LENGTH (EACH)		NUMBER REQ'D	SLAB TOTAL WEIGHT (LBS) 602001-001	TOTAL WEIGHT (LBS) 602001-001	DIMENSIONS A		B		C	
		FT	IN				FT	IN	FT	IN	FT	IN
S4-601	1	16	6	21	520.4	1040.9	1	0	15	6		
S4-602	2	6	2	21	194.5	389.0	1	2	2	0	3	0
S4-605	STR	14	6	26	566.3	1132.5						
1-1/4" DOWEL	STR	1	6	17	109.7	219.3						



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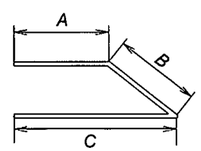

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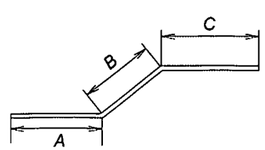

TYPE (3)

Stantec

111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0400

Professional Energy Consultants
A Division of SLS Land Services

Surveyors: SLS
Engineers
Environmental

PROJECT MGMT.
223 Third Ave. St.
P.O. Box 1139
Dunbar, WV 25321
(304) 768-8888

(800) Dillo Andrew Road
Bridgeport, WV 26330
(740) 471-2911

HONESTY, INTEGRITY, QUALITY

STEPHEN G. JOHNSON
REGISTERED
NO. 15628
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

QUANTITIES & REBAR SCHEDULE

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 10/13/2015
SCALE: AS SHOWN
DESIGNED BY: SGJ
FILE NO.: SLS-8051
SHEET 11 OF 11
REV:

EQT WEU 51 SITE PLAN
EQT PRODUCTION COMPANY

(PROPOSED WELL NO. H1-WV 514661, H2-WV 514662, H3-WV 514663, H4-WV 514664, H5-WV 514665)

PROJECT INFORMATION

PROJECT NAME: EQT WEU 51

TAX PARCEL:
WEST UNION DISTRICT, DODDRIDGE COUNTY, WV
TAX MAP 23-02

SURFACE OWNER:
JANE HARDIN (TRUSTEE) OF MARY HOLLAND TRUST
WEST UNION DISTRICT
DODDRIGE COUNTY, WV
TOTAL PROPERTY AREA: 1,557.637 +/- ACRES
TOTAL DISTURBANCE AREA: 51.8 +/- ACRES

OIL AND GAS ROYALTY OWNER:
LEEMAN MAXWELL HEIRS
WEST UNION DISTRICT
DODDRIGE COUNTY, WV
LEASE ACREAGE: 1,000 +/- ACRES

SITE LOCATION:
THE EQT WEU 51 SITE ENTRANCE IS LOCATED 1.6 MI+/- SOUTH OF THE JUNCTION OF WV 18 AND CR 13. THE WELL PAD IS LOCATED 1.4 MILES +/- SOUTHWEST OF THE JUNCTION OF WV 18 AND CR 13.

LOCATION COORDINATES

EQT WEU 51 WELL PAD CENTER
LATITUDE: 39.255748 LONGITUDE: 80.763153 (NAD 83)

EQT WEU 51 ASSOCIATED IMPOUNDMENT CENTER
LATITUDE: 39.254970 LONGITUDE: 80.761271 (NAD 83)

EQT WEU 51 ASSOCIATED PIT CENTER
LATITUDE: 39.254852 LONGITUDE: 80.763071 (NAD 83)

EQT WEU 51 ACCESS ROAD AT CR 13
LATITUDE: 39.252144 LONGITUDE: 80.745033 (NAD 83)

GENERAL DESCRIPTION

THE WELL PAD, ACCESS ROAD, ASSOCIATED IMPOUNDMENT, AND ASSOCIATED PIT ARE BEING CONSTRUCTED TO AID IN THE DEVELOPMENT OF INDIVIDUAL MARCELLUS SHALE GAS WELLS.

SITE DISTURBANCE COMPUTATIONS

WELL PAD/ASSOCIATED PIT/ASSOCIATED IMPOUNDMENT AREA = 11.5 +/- ACRES
ACCESS ROAD AREA = 40.3 +/- ACRES
TOTAL SITE DISTURBANCE AREA = 51.8 +/- ACRES

ENTRANCE PERMIT

EQT PRODUCTION COMPANY WILL OBTAIN AN ENCROACHMENT PERMIT (FORM MM-109) FROM THE WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS, PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITIES.

MISS UTILITY STATEMENT

MISS UTILITY OF WEST VIRGINIA WAS NOTED FOR THE LOCATING OF UTILITIES PRIOR TO THIS PROJECT DESIGN; TICKET #1324866542.
IN ADDITION, MISS UTILITY WILL BE CONTACTED PRIOR TO START OF THE PROJECT.

ENVIRONMENTAL NOTES

A WETLAND DELINEATION WAS PERFORMED BY POTESTA & ASSOCIATES TO REVIEW THE SITE FOR WATERS AND WETLANDS THAT ARE MOST LIKELY WITHIN THE REGULATORY PURVIEW OF THE U.S. ARMY CORPS OF ENGINEERS (USACE) AND/OR THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (WVDEP). THE SEPTEMBER 9, 2013 REPORT FOR EQT 51 PREPARED BY POTESTA & ASSOCIATES, INC., SUMMARIZES THE RESULTS OF THE FIELD DELINEATION. THE REPORT DOES NOT, IN ANY WAY, REPRESENT A JURISDICTIONAL DETERMINATION OF THE LANDWARD LIMITS OF WATERS AND WETLANDS WHICH MAY BE REGULATED BY THE USACE OR THE WVDEP. IT IS STRONGLY RECOMMENDED THAT THE AFORMENTIONED AGENCIES BE CONSULTED IN AN EFFORT TO GAIN WRITTEN CONFIRMATION OF THE DELINEATION DESCRIBED BY THIS REPORT PRIOR TO ENGAGING CONSTRUCTION ON THE PROPERTY DESCRIBED HEREIN. THE DEVELOPER SHALL OBTAIN THE APPROPRIATE PERMITS FROM THE FEDERAL AND/OR STATE REGULATORY AGENCIES PRIOR TO ANY PROPOSED IMPACTS TO WATERS OF THE U.S., INCLUDING WETLAND FILLS AND STREAM CROSSINGS.

GEOTECHNICAL NOTES

A SUBSURFACE GEOTECHNICAL INVESTIGATION HAS NOT BEEN PERFORMED AT THIS SITE.

RESTRICTIONS NOTES

1. THERE ARE PERENNIAL STREAMS, LAKES, PONDS, OR RESERVOIRS WITHIN 100 FEET OF THE PROJECT LOD. THERE ARE WETLANDS WITHIN 100 FEET OF THE PAD AND LOD, AND A WAIVER FROM THE WVDEP WILL BE APPLIED FOR THROUGH THE ARMY CORPS OF ENGINEERS.
2. THERE ARE NO NATURALLY PRODUCING TROUT STREAMS WITHIN 300 FEET OF THE PAD AND LOD.
3. THERE ARE NO GROUNDWATER INTAKE OR PUBLIC WATER SUPPLY FACILITIES WITHIN 1000 FEET OF THE PAD AND LOD.
4. THERE ARE NO KNOWN EXISTING WATER WELLS OR DEVELOPED SPRINGS WITHIN 250 FEET OF THE WELL(S) BEING DRILLED. STANTEC IS NOT RESPONSIBLE FOR ANY EXISTING WATER WELL OR DEVELOPED SPRING DISCOVERED DURING CONSTRUCTION.
5. THERE ARE NO OCCUPIED DWELLING STRUCTURES WITHIN 625 FEET OF THE CENTER OF THE PAD.
6. THERE ARE NO AGRICULTURAL BUILDINGS LARGER THAN 2,500 SQUARE FEET WITHIN 625 FEET OF THE CENTER OF THE PAD.

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

NEW MILTON, OXFORD, SMITHBURG AND WEST UNION QUADRANGLE
WEST VIRGINIA
7.5 MINUTE SERIES

2000' 0' 2000'

MISS Utility of West Virginia
1-800-245-4848
West Virginia State Law
(Section XIV, Chapter 24-C)
Requires that you call two business days before you dig in the state of West Virginia.
IT'S THE LAW!!

LIST OF DRAWINGS	
SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	GENERAL NOTES
3	OVERALL PLAN SHEET INDEX
4 - 10	ACCESS ROAD AND WELL SITE LAYOUT
11 - 14	ACCESS ROAD PROFILE
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EX. GAS WELL		PROP. TREELINE	
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EX. DELINEATED STREAM		X-SECTION GRID INTERMEDIATE	
EX. DELINEATED WETLAND		X-SECTION PROPOSED GRADE	
EX. BUILDING		X-SECTION EXISTING GRADE	

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9/16/13
DATE

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

TITLE SHEET
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013	
SCALE: AS SHOWN	
DESIGNED BY: RJN/JMR	
FILE NO. SLS-8051	
SHEET 1 OF 57	
REV:	

9/16/2013
WORKSPACE1.DOT.2006 SURVEY FEET)
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CONSTRUCTION NOTES

1. THE CONTRACTOR IS TO VERIFY FIELD CONDITIONS PRIOR TO AND DURING CONSTRUCTION AND WILL NOTIFY STANTEC AT (304) 367-9401 OR SMITH LAND SURVEYING AT (304) 462-5634 IMMEDIATELY OF ANY DISCREPANCIES BETWEEN ACTUAL FIELD CONDITIONS AND THE APPROVED PLAN. ANY WORK PERFORMED BY THE CONTRACTOR AFTER THE FINDING OF SUCH DISCREPANCIES, SHALL BE DONE AT THE CONTRACTOR'S RISK.

2. METHODS AND MATERIALS USED IN THE CONSTRUCTION OF THE IMPROVEMENTS HEREIN SHALL CONFORM TO THE CURRENT COUNTY CONSTRUCTION STANDARDS AND SPECIFICATIONS AND/OR CURRENT WVDEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL STANDARDS AND SPECIFICATIONS. SHOULD A CONFLICT BETWEEN THE DESIGN, SPECIFICATIONS, AND PLANS OCCUR, THE MOST STRINGENT REQUIREMENT WILL APPLY. THE APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE DEVELOPER OR HIS AGENT OF THE RESPONSIBILITIES CONTAINED IN THE WVDEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL.

3. AN APPROVED SET OF PLANS AND ALL APPLICABLE PERMITS MUST BE AVAILABLE AT THE CONSTRUCTION SITE. ALSO, A REPRESENTATIVE OF THE DEVELOPER MUST BE AVAILABLE AT ALL TIMES.

4. THE CONTRACTOR SHALL PROVIDE ADEQUATE MEANS OF CLEANING MUD FROM TRUCKS AND/OR OTHER EQUIPMENT PRIOR TO ENTERING PUBLIC STREETS, AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO CLEAN STREETS, ALLAY DUST, AND TO TAKE WHATEVER MEASURES ARE NECESSARY TO ENSURE THAT THE STREETS ARE MAINTAINED IN A CLEAN, MUD AND DUST FREE CONDITION AT ALL TIMES.

5. THE LOCATION OF EXISTING UTILITIES SHOWN IN THESE PLANS ARE FROM FIELD LOCATIONS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UTILITIES AS NEEDED PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL INFORM THE ENGINEER OF ANY CONFLICTS ARISING FROM HIS EXISTING UTILITY VERIFICATION AND THE PROPOSED CONSTRUCTION.

6. THE CONTRACTOR SHALL PROVIDE NOTIFICATION TO THE APPROPRIATE UTILITY COMPANY PRIOR TO CONSTRUCTION OF WATER AND/OR GAS PIPE LINES. INFORMATION SHOULD ALSO BE OBTAINED FROM THE APPROPRIATE AUTHORITY CONCERNING PERMITS, CUT SHEETS, AND CONNECTIONS TO EXISTING LINES.

7. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE REPAIR OF ANY DAMAGES TO THE EXISTING STREETS AND UTILITIES WHICH OCCURS AS A RESULT OF HIS CONSTRUCTION PROJECT WITHIN OR CONTIGUOUS TO THE EXISTING RIGHT-OF-WAY.

8. WHEN GRADING IS PROPOSED WITHIN EASEMENTS OF UTILITIES, LETTERS OF PERMISSION FROM ALL INVOLVED COMPANIES MUST BE OBTAINED PRIOR TO GRADING AND/OR SITE DEVELOPMENT.

9. THE DEVELOPER WILL BE RESPONSIBLE FOR THE RELOCATION OF ANY UTILITIES WHICH IS REQUIRED AS A RESULT OF HIS PROJECT. THE RELOCATION SHOULD BE DONE PRIOR TO CONSTRUCTION.

10. THESE PLANS IDENTIFY THE LOCATION OF ALL KNOWN GRAVESITES. GRAVESITES SHOWN ON THIS PLAN WILL BE PROTECTED IN ACCORDANCE WITH STATE LAW. IN THE EVENT GRAVESITES ARE DISCOVERED DURING CONSTRUCTION, THE OWNER AND ENGINEER MUST BE NOTIFIED IMMEDIATELY.

11. THE CONTRACTOR(S) SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATING OR BLASTING AT LEAST TWO (2) WORKING DAYS, BUT NOT MORE THAN TEN (10) WORKING DAYS, PRIOR TO COMMENCEMENT OF EXCAVATING OR DEMOLITION.

12. THE CONTRACTOR IS TO CONTACT THE OPERATOR AND ENGINEER IF GROUNDWATER IS ENCOUNTERED DURING CONSTRUCTION. THE ENGINEER OR SURVEYOR IS NOT RESPONSIBLE FOR ANY BURIED WATER WELLS, SPRINGS OR ANY OTHER FEATURES UNCOVERED DURING CONSTRUCTION.

13. THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING WITH THE EROSION AND SEDIMENT CONTROL INSPECTOR TWO DAYS PRIOR TO THE START OF CONSTRUCTION.

14. THE CONTRACTOR IS RESPONSIBLE FOR ALL FILL MATERIAL TESTING REQUIRED DURING THE CONSTRUCTION OF THIS PROJECT. ALL MATERIAL TESTS SHALL BE CONDUCTED BY A CERTIFIED MATERIALS TESTING LABORATORY AND A CERTIFICATION OF THE MATERIALS TESTED SHALL BE PROVIDED BY A LICENSED PROFESSIONAL ENGINEER REPRESENTING THE LABORATORY. ALL TEST RESULTS SHALL BE SUBMITTED TO THE ENGINEER CERTIFYING THE CONSTRUCTED FACILITY. FAILURE TO CONDUCT THE DENSITY TEST SHALL BE CAUSE FOR NON-ACCEPTANCE OF THE CONSTRUCTED FACILITY.

15. THE CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTING THE SITE IN ACCORDANCE WITH THE DESIGN PLANS AND CONSTRUCTION DOCUMENTS AND THE SCOPE OF WORK SHALL CONFORM WITH THE GRADES, BERMS, DEPTHS, DIMENSIONS, ETC. SHOWN HEREON.

MAINTENANCE PROGRAM

1. BMPS WILL BE INSPECTED ON A WEEKLY BASIS AND AFTER EACH MEASUREABLE RAINFALL EVENT DURING THE ACTIVE CONSTRUCTION PHASE OF THE PROJECT.

2. ALL REVEGETATED ACCESS ROADS AND FACILITIES ARE TO BE MAINTAINED THROUGHOUT THE LIFE OF THE PROJECT.

3. CULVERTS, ROAD DITCHES, BROAD-BASED DIPS, DIVERSION DITCHES, AND ROCK CHECK DAMS MUST BE MAINTAINED IN PROPER WORKING ORDER AND WILL BE CLEANED OUT, REPAIRED, OR REPLACED AS NECESSARY.

4. SEDIMENT SHOULD BE REMOVED FROM COMPOST FILTER SOCK WHERE ACCUMULATIONS REACH HALF THE ABOVE GROUND HEIGHT OF THE FILTER SOCK. REPLACE SECTIONS OF FAILED FILTER SOCK IMMEDIATELY. REMOVE ENTIRE FILTER SOCK UPON COMPLETION OF PROJECT AND ESTABLISHMENT OF VEGETATIVE GROWTH.

5. ALL AREAS OF EARTH DISTURBANCE WILL BE REPAIRED WHERE SIGNS OF ACCELERATED EROSION ARE DETECTED.

6. SEEDING AND MULCHING WILL BE REPEATED IN THOSE AREAS THAT APPEAR TO BE FAILING OR HAVE FAILED.

CONSTRUCTION SEQUENCE

THE DEVELOPMENT OF THE SITE SHALL BE CONSISTENT WITH THE FOLLOWING GENERAL SEQUENCE OF CONSTRUCTION. THE CONTRACTOR SHALL IMPLEMENT, MAINTAIN, AND OPERATE ALL PROPOSED EROSION AND SEDIMENT CONTROL MEASURES TO EFFECTIVELY MITIGATE THE HAZARD OF ACCELERATED EROSION AND SEDIMENTATION TO ACCEPTABLE LEVELS. MINOR DEVIATIONS FROM THIS SEQUENCE SHALL BE EXECUTED BY THE PROJECT'S SUPERINTENDENT AS NEEDED TO ELIMINATE ANY POTENTIAL EROSIVE CONDITION THAT MAY ARISE FOR THE DURATION OF THE PROJECT. THE WVDEP OFFICE OF OIL AND GAS SHALL BE NOTIFIED OF ANY AND ALL SUCH DEVIATIONS FROM THE APPROVED PLANS.

1. HOLD A PRE-CONSTRUCTION CONFERENCE WITH THE CONTRACTOR AND THE APPROPRIATE EROSION AND SEDIMENT CONTROL INSPECTOR 48 HOURS PRIOR TO BEGINNING WORK TO REVIEW THE CONSTRUCTION DRAWING AND PROVIDE ANY REQUESTED GUIDANCE.

2. STAKE THE LIMITS OF CONSTRUCTION.

3. INSTALL THE ROCK CONSTRUCTION ENTRANCE AS SHOWN ON THE PLANS.

4. INSTALL ALL BMPS NECESSARY TO BEGIN CLEARING AND GRUBBING OF THE SITE AS SHOWN ON THE PLANS AND DETAILS.

5. CLEAR AND GRUB THE ACCESS ROAD AND PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT AREAS. ALL WOODY MATERIAL, BRUSH, TREES, STUMPS, LARGE ROOTS, BOULDERS, AND DEBRIS SHALL BE CLEARED FROM THE SITE AREA AND KEPT TO THE MINIMUM NECESSARY FOR PROPER CONSTRUCTION, INCLUDING THE INSTALLATION OF ANY NECESSARY SEDIMENT CONTROLS. TREES SIX INCHES IN DIAMETER AND LARGER SHALL BE CUT AND LOGS STACKED. SMALLER TREES, BRUSH, AND STUMPS SHALL BE CUT AND/OR GRUBBED AND WINDROWED IN APPROPRIATE AREAS FOR USE AS SEDIMENT BARRIERS AT WATER DRAINAGE OUTLETS, WINDROWED BELOW THE WELL SITE, USED FOR WILDLIFE HABITAT, BURNED (AS PER WV FOREST FIRE LAWS), REMOVED FROM THE SITE, OR DISPOSED OF BY OTHER METHODS APPROVED BY DEP.

6. STRIP THE TOPSOIL FROM THE ACCESS ROAD AREAS, WELL PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT AREAS. ALL STRIPPED TOPSOIL SHALL BE STOCKPILED ON AREAS SHOWN ON THE PLANS AND IMMEDIATELY STABILIZED. ADDITIONAL BMP MEASURES SHALL BE CONSTRUCTED AROUND TOPSOIL STOCKPILES, IF NECESSARY.

7. CONSTRUCT THE ACCESS ROAD, PROPOSED CROSS CULVERTS AND ROAD SIDE DITCHES. AS ACCESS ROAD CONSTRUCTION PROGRESSES, BEGIN WELL PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT CONSTRUCTION TO GENERATE EXCESS MATERIAL REQUIRED FOR ACCESS ROAD CONSTRUCTION. AS FILL SLOPES ARE CONSTRUCTED, INSTALL SLOPE INTERRUPTION COMPOST FILTER SOCK AS LABELED ON THE PLANS AND SHOWN ON THE DETAILS.

8. INSTALL DITCH RELIEF CULVERTS AT A MINIMUM SLOPE OF 1% AND APPROXIMATELY 30 DEGREES DOWNGRADE TO THE CENTERLINE OF THE DITCH. INSTALL OUTLET PROTECTION AS SHOWN ON PLANS AND DETAILS AS CROSS CULVERTS ARE INSTALLED AND IMMEDIATELY STABILIZE ROAD SIDE DITCHES WITH ROCK. STABILIZE THE ROAD WITH GEOTEXTILE FABRIC AND STONE AND SIDE SLOPES AS SPECIFIED WITH PERMANENT SEEDING. STOCKPILE AND STABILIZE EXCESS MATERIAL ALONG THE ACCESS ROAD, AS NEEDED.

9. ALL DITCH LINES SHALL BE CLEANED PRIOR TO INSTALLATION OF LINED PROTECTION. ALL DITCHES SHALL BE ROCK LINED WITH D50 = 6" MIN. SIZED RIPRAP UNLESS SPECIFIED OTHERWISE.

10. FINALIZE GRADING OF THE WELL PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT. IMMEDIATELY STABILIZE THE OUTER AREAS OF THE WELL PAD, PIT, AND IMPOUNDMENT. THE WELL PAD AND MANIFOLD PAD AND TURNAROUND AREA(S) SHALL BE STABILIZED WITH GEOTEXTILE FABRIC AND STONE. STABILIZE ALL SIDE SLOPES WITH COCONUT EROSION CONTROL BLANKETS. APPLY SEED AND MULCH TO ALL DISTURBED AREAS. THIS SHALL BE INCLUDED IN ALL AREAS THAT WILL NOT BE SUBJECT TO REGULAR TRAFFIC ACTIVITY (TO BE STABILIZED WITH STONE), OR ANY DISTURBED AREA THAT WILL NOT BE RE-DISTURBED BEFORE SITE RECLAMATION BEGINS.

11. PRIOR TO THE INSTALLATION OF THE ASSOCIATED PIT AND ASSOCIATED IMPOUNDMENT LINER SYSTEM, THE CONTRACTOR SHALL CONTACT THE ENGINEER/SURVEYOR TO COMPLETE AN AS-BUILT SURVEY OF THE CONSTRUCTED PIT/IMPOUNDMENT/BERM TO ENSURE CONFORMANCE WITH THE DESIGN DRAWINGS. THE AS-BUILT WILL BE REVIEWED BY THE ENGINEER AND THE CONTRACTOR IS RESPONSIBLE FOR ANY CORRECTIVE ACTION DEEMED NECESSARY BY THE ENGINEER FOR ANY DEVIATION(S) FROM THE DESIGN DRAWINGS.

12. INSTALL THE LINER SYSTEM AND PERIMETER SAFETY FENCE WITH GATE AND EMERGENCY LIFE LINE AS SHOWN ON THE PLANS.

13. PREVIOUSLY DISTURBED AREAS AND IMMEDIATE DOWN SLOPE AREAS SHALL BE INSPECTED AFTER EACH RAINFALL STORM EVENT AND MONITORED WEEKLY FOR SIGNS OF ACCELERATED EROSION. IMPLEMENT ADDITIONAL BMPS AS DEEMED NECESSARY. THESE INSPECTIONS SHALL CONTINUE DURING THE DURATION OF THE PROJECT AND SUBSEQUENT SITE RECLAMATION.

14. ONCE THE ASSOCIATED PIT AND ASSOCIATED IMPOUNDMENT HAS BEEN CONSTRUCTED AND LINER SYSTEMS COMPLETED, SUBMIT THE AS-BUILT CERTIFICATION FOR THE FACILITIES TO THE WVDEP OFFICE OF OIL AND GAS PRIOR TO PLACING FLUIDS IN EITHER STRUCTURE.

15. COMMENCE THE DRILLING ACTIVITY.

16. ONCE DISTURBED AREAS HAVE BEEN RE-VEGETATED AND STABILIZED FOLLOWING RECLAMATION, THE TEMPORARY BMPS IN THOSE AREAS MAY BE REMOVED. CONTINUE TO MONITOR THESE AREAS TO ENSURE A UNIFORM RATE OF 70% VEGETATIVE COVERAGE IS MAINTAINED. ANY AREAS FOUND TO BE DEFFICIENT SHALL BE RE-SEEDED AND MULCHED.

ASSOCIATED PIT/IMPOUNDMENT CONSTRUCTION STANDARDS

THE DESIGN, CONSTRUCTION, AND REMOVAL OF EMBANKMENTS ASSOCIATED WITH ASSOCIATED PITS/IMPOUNDMENTS FOR OIL AND GAS WELLS MUST BE ACCOMPLISHED IN SUCH A MANNER AS TO PROTECT THE HEALTH AND SAFETY OF THE PEOPLE, THE NATURAL RESOURCES, AND ENVIRONMENT OF THE STATE. THE PIT/IMPOUNDMENT EMBANKMENTS SHALL BE DESIGNED, CONSTRUCTED, AND MAINTAINED TO BE STRUCTURALLY SOUND AND REASONABLY PROTECTED FROM UNAUTHORIZED ACTS OF THIRD PARTIES.

1. THE FOUNDATION FOR AN ASSOCIATED PIT/IMPOUNDMENT EMBANKMENT MUST BE STRIPPED AND GRUBBED TO A MINIMUM DEPTH OF 2 FEET PRIOR TO PLACEMENT AND COMPACTION OF EARTHEN FILL MATERIAL. NO EMBANKMENT FILL SHALL BE PLACED ON FROZEN MATERIAL.

2. ANY SPRINGS ENCOUNTERED WITHIN THE FOUNDATION AREA SHALL BE DRAINED TO OUTSIDE/DOWNSTREAM TOE OF EMBANKMENT. CONSTRUCTED DRAIN SECTION SHALL BE AN EXCAVATED 2' X 2' TRENCH AND BACK FILLED WITH TYPE A SAND, COMPACTED BY HAND TAMPER. NO GEOTEXTILES SHALL BE USED TO LINE TRENCH. THE LAST 3 FEET OF DRAIN AT THE DOWNSTREAM END SHALL BE CONSTRUCTED WITH AASHTO #8 MATERIAL.

3. SOILS FOR EARTHEN EMBANKMENT CONSTRUCTION SHALL BE LIMITED TO TYPES GC, GM, SC, SM, CL, OR ML (ASTMD-2487 - UNIFIED SOILS CLASSIFICATION). SOILS MUST CONTAIN A MINIMUM OF 20% PF PLUS NO. 200 SIEVE AND BE "WELL GRADED" MATERIAL WITH NO COBBLES OR BOULDER SIZE MATERIAL MIXED WITH CLAY. A MINIMUM OF THREE SAMPLES SHALL BE CLASSIFIED.

4. THE EARTHEN EMBANKMENT SHALL BE COMPACTED BY A VIBRATING SHEEPSFOOT ROLLER. THE LIFTS MUST BE IN HORIZONTAL LAYERS WITH A MAXIMUM LOOSE LIFT THICKNESS OF 12" AND MAXIMUM PARTICLE SIZE LESS THAN 6". ALL FILL SHALL BE COMPACTED TO 95% PER THE STANDARD PROCTOR TEST (ASTMD-698).

5. THE PLACEMENT OF ALL FILL MATERIAL SHALL BE FREE OF WOOD, STUMPS AND ROOTS, LARGE ROCKS AND BOULDERS, AND ANY OTHER NONCOMPACTABLE SOIL MATERIAL. THE EMBANKMENT SHALL BE COMPACTED TO A MINIMUM OF VISIBLE NON-MOVEMENT, HOWEVER, THE COMPACTION EFFORT SHALL NOT EXCEED THE OPTIMUM MOISTURE LIMITS.

6. THE EMBANKMENT TOP SHALL BE A MINIMUM OF 15 FEET IN WIDTH.

7. THE MINIMUM INSIDE SIDESLOPES SHALL BE 3H:1V AND OUTSIDE SIDESLOPES SHALL BE 2H:1V, UNLESS OTHERWISE SPECIFIED.

8. ALL EXPOSED EMBANKMENT SLOPES NOT COVERED BY COMPACTED ROCKFILL OR RIPRAP SHALL BE LIMED, FERTILIZED, SEEDED AND MULCHED. PERMANENT VEGETATIVE GROUND COVER IN COMPLIANCE WITH THE WVDEP EROSION AND SEDIMENT CONTROL FIELD MANUAL MUST BE ESTABLISHED UPON THE COMPLETION OF THE PIT CONSTRUCTION. EMBANKMENTS SHALL BE MAINTAINED WITH A GRASSY VEGETATIVE COVER AND FREE OF BRUSH AND/OR TREES.

9. A MINIMUM OF 2 FEET OF FREEBOARD SHALL BE MAINTAINED AT ALL TIMES DURING THE OPERATION OF THE PIT/IMPOUNDMENT.

10. ALL EMBANKMENT CONSTRUCTION AND COMPACTION TESTING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

ASSOCIATED PIT/IMPOUNDMENT LINER SYSTEM NOTES

THE DESIGNED PIT/IMPOUNDMENT FACILITY SHALL BE FULLY LINED WITH A GEOSYNTHETIC LINER SYSTEM. LINERS SHALL BE INSTALLED IN ACCORDANCE TO MANUFACTURER'S SPECIFICATIONS.

1. THE SUB-BASE SHALL BEAR THE WEIGHT OF THE LINER SYSTEM, WATER, AND EQUIPMENT OPERATING ON THE PIT OR IMPOUNDMENT WITHOUT CAUSING OR ALLOWING A FAILURE OF THE LINER SYSTEM.

2. THE SUB-BASE SHALL BE COMPACTED TO ACCOMODATE POTENTIAL SETTLEMENT WITHOUT DAMAGE TO THE LINER SYSTEM.

3. THE UPPER 6" OF THE SUB-BASE SHALL BE COMPACTED TO A STANDARD PROCTOR DENSITY OF AT LEAST 95%.

4. THE SUB-BASE SHALL BE HARD, UNIFORM, SMOOTH AND FREE OF DEBRIS, ROCK FRAGMENTS, PLANT MATERIAL AND OTHER FOREIGN MATERIAL.

5. THE SUB-BASE SHALL BE COVERED WITH NON-WOVEN GEOTEXTILE FABRIC TO CUSHION THE PRIMARY LINER AND ALLOW FOR ADEQUATE VENTING BETWEEN THE PRIMARY LINER AND THE SUB-BASE TO PREVENT THE ENTRAPMENT OF GASES BENEATH THE LINER SYSTEM.

6. THE PIT/IMPOUNDMENT AREA SHALL BE DRAINED AND COMPLETELY DRY PRIOR TO THE PLACEMENT OF THE PRIMARY LINER. THE PRIMARY LINER SHALL MEET ALL WVDEP GUIDELINES FOR MINIMUM THICKNESS AND SHALL PREVENT THE MIGRATION OF WATER THROUGH THE LINER TO THE GREATEST DEGREE THAT IS TECHNOLOGICALLY POSSIBLE.

7. THE PRIMARY LINER SHALL FULLY COVER THE BOTTOM AND SIDEWALLS OF THE PIT/IMPOUNDMENT.

8. AN ANCHOR TRENCH SHALL BE EXCAVATED COMPLETELY AROUND THE PERIMETER OF THE PIT/IMPOUNDMENT AREA AT THE PLANNED ELEVATION OF THE TOP OF THE LINING. THE TRENCH SHALL BE A MINIMUM 36 INCHES DEEP AND 24 INCHES WIDE.

9. ALL ELEMENTS OF THE LINER SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS. ALL SEAMS AND SEALS AROUND ANY PROJECTIONS SHALL BE SEALED AND TESTED IN A METHOD APPROVED BY THE MANUFACTURER.

10. GAS RELIEF VENTS SHALL BE PROVIDED ALONG THE TOP OF THE LINER AND WITHIN ONE FOOT OF THE PERIMETER OF THE PIT TO ALLOW GASES TO ESCAPE FROM UNDER THE GEOMEMBRANE. MAXIMUM SPACING FOR VENTS SHALL BE 30 FEET.

11. WATER LEVEL MARKINGS SHALL BE CLEARLY PAINTED (1' INCREMENTS) ON THE LINER SYSTEM TO IDENTIFY THE WATER SURFACE ELEVATION.

SITE CLEANUP & RECYCLE PROGRAM

1. GARBAGE, FUELS OR ANY SUBSTANCE HARMFUL TO HUMAN, AQUATIC OR FISH LIFE, WILL BE PREVENTED FROM ENTERING SPRINGS, STREAMS, PONDS, LAKES, WETLANDS OR ANY WATER COURSE OR WATER BODY.

2. OILS, FUELS, LUBRICANTS AND COOLANTS WILL BE PLACED IN SUITABLE CONTAINERS AND DISPOSED PROPERLY.

3. ALL TRASH AND GARBAGE WILL BE COLLECTED AND DISPOSED PROPERLY.

4. ALL SEDIMENT REMOVED FROM SEDIMENT CAPTURING DEVICES SHALL BE PLACED ON THE TOPSOIL STOCKPILE, THEN SEEDED AND MULCHED, AS NECESSARY. ALTERNATIVELY, THE REMOVED SEDIMENT CAN BE TRANSPORTED TO A SITE WITH AN APPROVED PERMIT.

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THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

GENERAL NOTES

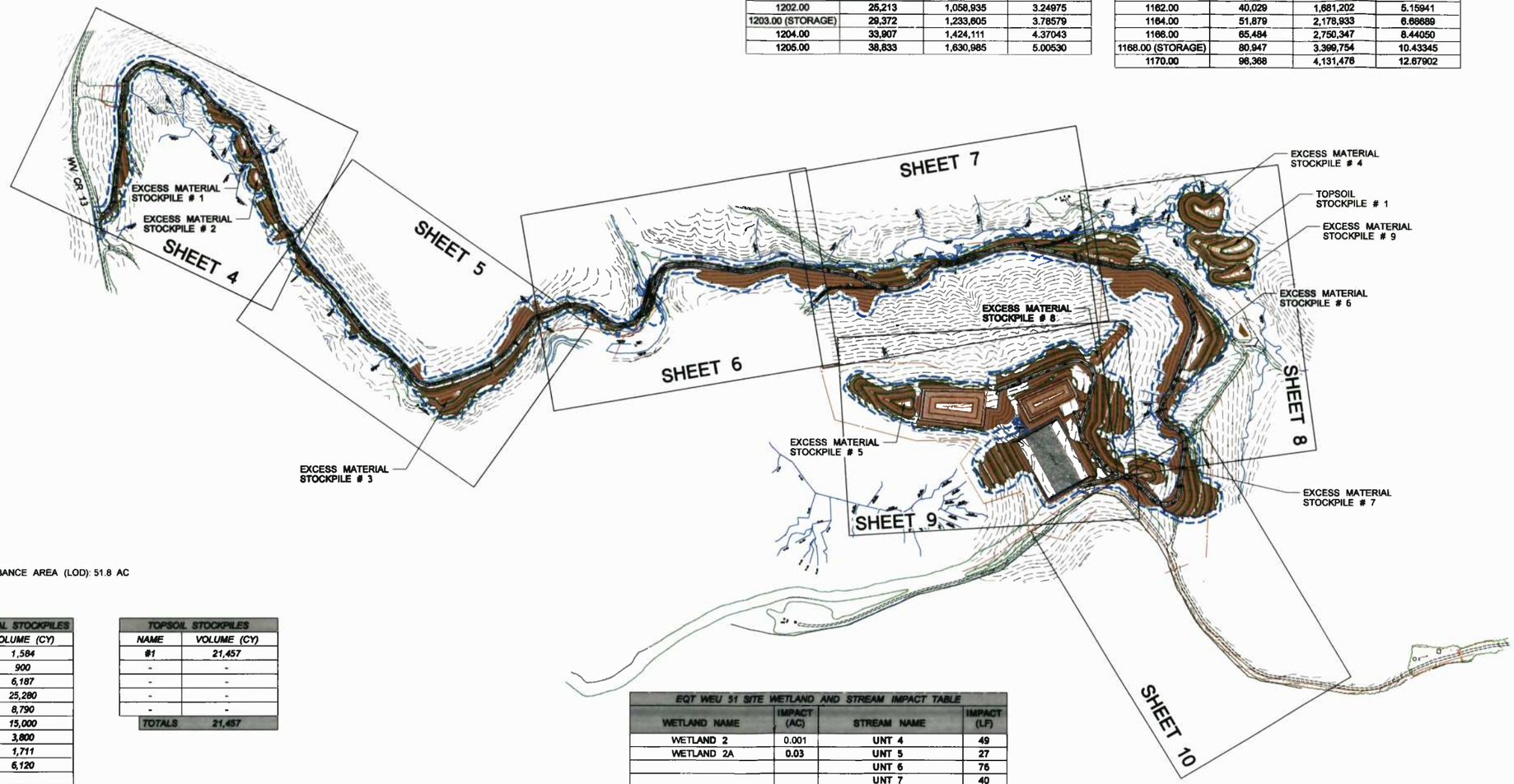
EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 2 OF 57
REV:

ASSOCIATED PIT CUMULATIVE STORAGE VOLUME SUMMARY			
ELEVATION	BARRELS	GALLONS	ACRE-FT
1190.00	0.0	0	0.0
1192.00	1,502	63,091	0.19362
1194.00	3,947	165,791	0.50879
1196.00	7,438	312,409	0.95875
1198.00	12,078	507,261	1.55673
1200.00	17,966	754,865	2.31596
1202.00	25,213	1,058,935	3.24975
1203.00 (STORAGE)	29,372	1,233,805	3.78579
1204.00	33,907	1,424,111	4.37043
1205.00	38,833	1,630,985	5.00530

ASSOCIATED IMPOUNDMENT CUMULATIVE STORAGE VOLUME SUMMARY			
ELEVATION	BARRELS	GALLONS	ACRE-FT
1150.00	0.0	0.0	0.0
1152.00	3,486	146,431	0.44938
1154.00	8,110	340,610	1.04529
1156.00	13,973	586,854	1.80099
1158.00	21,178	889,486	2.72973
1160.00	29,829	1,252,630	3.84479
1162.00	40,029	1,681,202	5.15941
1164.00	51,879	2,178,933	6.68689
1166.00	65,484	2,750,347	8.44050
1168.00 (STORAGE)	80,947	3,399,754	10.43345
1170.00	98,368	4,131,476	12.67902



LIMIT OF DISTURBANCE AREA (LOD): 51.8 AC

EXCESS MATERIAL STOCKPILES	
NAME	VOLUME (CY)
#1	1,584
#2	900
#3	6,187
#4	25,280
#5	8,790
#6	15,000
#7	3,800
#8	1,711
#9	6,120
TOTALS	69,372

TOPSOIL STOCKPILES	
NAME	VOLUME (CY)
#1	21,457
-	-
-	-
-	-
-	-
TOTALS	21,457

EQT WEU 51 SITE EARTHWORK SUMMARY						
DESCRIPTION	CUT (CY)	FILL (CY)	SPOIL (CY)	BORROW (CY)	MAX SLOPE (%)	LENGTH OF SLOPE (FT)
ACCESS ROADS	47,206	117,271	0	70,065	20.0	241
WELL PAD	49,320	15,664	33,656	0	N/A	N/A
ASSOCIATED PIT	28,483	2,181	26,302	0	N/A	N/A
ASSOCIATED IMPOUNDMENT	80,982	1,503	79,479	0	N/A	N/A
STRIPPED TOPSOIL (6")	21,457	0	21,457	0	N/A	N/A
MATERIAL STOCKPILES *	0	90,829	0	90,829	N/A	N/A
TOTALS	227,448	227,448	160,894	160,894		
EXCESS MATERIAL			0 CY			

* INCLUDES TOPSOIL STOCKPILE AREAS

EQT WEU 51 SITE WETLAND AND STREAM IMPACT TABLE			
WETLAND NAME	IMPACT (AC)	STREAM NAME	IMPACT (LF)
WETLAND 2	0.001	UNT 4	49
WETLAND 2A	0.03	UNT 5	27
		UNT 6	76
		UNT 7	40
		UNT 9	63
		UNT 10	10
		UNT 11	5
		UNT 12	101
		UNT 13	60
		UNT 14	36
		UNT 15	40
		UNT 16	47
		UNT 17	60
		UNT 18	81
		UNT 19	67
		UNT 24	35
		UNT 25	70
		UNT 26	55
		UNT 26A	149
		UNT 27A	36
		UNT 28A	158
		UNT 30	146
		UNT 33	67
TOTAL	0.031	TOTAL	1,476

THE EARTHWORK QUANTITIES PROVIDED ARE AN ESTIMATE FOR CONSIDERATION. THE QUANTITIES SHOWN ARE CALCULATED USING A 1:1 CUT/SWELL AND FILL/SHRINK FACTOR. THE QUANTITIES SHOWN MAY BE GREATER OR LESSER THAN ACTUALLY EXCAVATED. THE ENGINEER IS NOT RESPONSIBLE FOR VARIANCES FROM THE ESTIMATED QUANTITIES AND DOES NOT CERTIFY TO THEIR ACCURACY.

0' 300' 600' 900'
HORIZONTAL SCALE

NORTH

Stantec
111 ELKINS STREET
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RICHARD L. GAINES
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THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

OVERALL PLAN SHEET INDEX

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 3 OF 57
REV:

PROPOSED V-DITCH WITH CHECK DAMS
UNT #5 IMPACT - 27 LF
PROPOSED 15" CMP
EX. 15" METAL CULVERT
UNT #4 IMPACT - 49 LF
UNT #6 IMPACT - 76 LF
UNT #7 IMPACT - 40 LF
UNT #11 IMPACT - 5 LF
UNT #10 IMPACT - 10 LF
UNT #9 IMPACT - 63 LF
UNT #12 IMPACT - 101 LF
PROPOSED 18" CMP
EXCESS MATERIAL STOCKPILE #1 (APPROX. 1,584 CY)
EXCESS MATERIAL STOCKPILE #2 (APPROX. 900 CY)
LIMIT OF DISTURBANCE
NORTH
POTENTIAL SLIP AREA
DO NOT EXCAVATE WITHIN THIS AREA
CONSTRUCT PILE WALL TO RETAIN EARTH
CFS-10 (12")
CFS-09 (24")
CFS-08 (24")
CFS-06 (12")
CFS-05 (12")
CFS-04 (12")
CFS-03 (12")
CFS-02 (12")
CFS-01 (12")
CFS-11 (12")
CFS-12 (12")
CFS-13 (12")
CFS-14 (12")
CFS-15 (12")
CFS-16 (12")
CFS-17 (12")
CFS-18 (12")
CFS-19 (12")
CFS-20 (12")
CFS-21 (12")
CFS-22 (12")
CFS-23 (18")
CFS-24 (24")
CFS-25 (24")
CFS-26 (24")
CFS-27 (24")
CFS-28 (24")
CFS-29 (12")
CFS-30 (12")
CFS-31 (24")
CFS-33 (18")
CFS-34 (18")
CFS-35 (24")
CFS-36 (24")
CFS-37 (24")
CFS-38 (12")
CFS-38A (24")
CFS-39 (24")
CFS-40 (24")
CFS-41 (24")
CFS-42 (24")
CFS-43 (24")
PROPOSED 20' ACCESS ROAD WITH NORMAL CROWN
PROPOSED V-DITCH WITH CHECK DAMS
EX GATE
STONE CONSTRUCTION ENTRANCE
LIMIT OF DISTURBANCE
EPHEMERAL UNIT 1
EPHEMERAL UNIT 2
INTERMITTENT UNIT 3
EPHEMERAL UNIT 4
EPHEMERAL UNIT 5
EPHEMERAL UNIT 6
EPHEMERAL UNIT 7
EPHEMERAL UNIT 8
EPHEMERAL UNIT 9
EPHEMERAL UNIT 10
EPHEMERAL UNIT 11
UNIT 12
SWALE
2:1 FILL
WV CR 13
SEE SHEET 5
0' 50' 100' 150'
HORIZONTAL SCALE

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THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

ACCESS ROAD LAYOUT
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 4 OF 57
REV:

9/16/2013
WORKSPACE: DIT_2006 | SURVEY FEET
W:\2006\75372\EQT WEU 51\3.0 ADDV\3.1 Highway prFES\372esP504.dgn
DIT_2006
DGN_Db_Lists_TB
DILES_Full_ISO_Zm_PDF_plt

SEE SHEET 4

LIMIT OF DISTURBANCE
PROPOSED V-DITCH WITH CHECK DAMS
PROPOSED 20' ACCESS ROAD WITH NORMAL CROWN
UNT #13 IMPACT - 60 LF
PROPOSED 15" CMP
EX. 15" METAL CULVERT
CFS 42 (12")
CFS 43 (24")
CFS 44 (24")
CFS 45 (24")
CFS 46 (24")
CFS 47 (12")
CFS 48 (12")
CFS 49 (24")
CFS 50 (24")
CFS 51 (12")
CFS 52 (12")
CFS 53 (12")
CFS 54 (12")
CFS 55 (12")
CFS 56 (12")
CFS 56A (12")
CFS 57 (24")
CFS 57A (24")
CFS 58 (24")
CFS 59 (24")
CFS 60 (24")
CFS 61 (24")
CFS 59A (24")
CFS 62 (24")
CFS 63 (24")
CFS 64 (24")
CFS 64A (24")
CFS 65 (24")
CFS 66 (24")
CFS 67 (24")
CFS 68 (24")
CFS 69 (12")
CFS 70 (12")
CFS 71 (12")
EPHEMERAL UNT 13
EPHEMERAL UNT 14
EPHEMERAL UNT 15
EPHEMERAL UNT 16
EPHEMERAL UNT 18
UNT #14 IMPACT - 36 LF
UNT #15 IMPACT - 40 LF
UNT #16 IMPACT - 47 LF
UNT #17 IMPACT - 60 LF
UNT #18 IMPACT - 81 LF
BEGIN PROPOSED 16' ACCESS ROAD WITH NORMAL CROWN (STA 30+75)
END PROPOSED 16' ACCESS ROAD WITH NORMAL CROWN (STA 32+25)
PROPOSED 18" CMP
PROPOSED 20' ACCESS ROAD WITH NORMAL CROWN
PROPOSED V-DITCH WITH CHECK DAMS
PROPOSED 15" CMP
EX. 15" METAL CULVERT
EX. WELL API# 47-017-4446
EX. RISER
EXISTING 2" GASLINE
TOP OF HIGHWALL
LIMIT OF DISTURBANCE
ADDITIONAL 10-FT WIDTH TO PROVIDE PULL-OFF AREA AND STOCKPILE EXCESS MATERIAL
EXCESS MATERIAL STOCKPILE #3 (APPROX. 6,187 CY)
2:1 CUT
2:1 FILL
1.0%
2.5%
4.5%
8.3%
8.0%

SEE SHEET 6

NORTH

0' 50' 100' 150'
HORIZONTAL SCALE

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THIS DOCUMENT WAS PREPARED BY: STANTEC
FOR: EQT PRODUCTION COMPANY

ACCESS ROAD LAYOUT
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013	
SCALE: AS SHOWN	
DESIGNED BY:RJH/JMR	
FILE NO.:SLS-8051	
SHEET	5 OF 57
REV:	

9/16/2013
WORKSPACE1 DOT_2016 (SURVEY FEET)
U:\2012\05\3724\01 RES\ S\13.0 CADD\13.1 Highways\prES\3724esP05.dgn

SEE SHEET 5

LIMIT OF DISTURBANCE
PROPOSED 20' ACCESS ROAD WITH NORMAL CROWN
PROPOSED 15" CMP
EX. 15" METAL CULVERT
2:1 CUT
TOP OF HIGHWALL
EPHEMERAL UNT 18
CFS 70 (12")
CFS 71 (12")
CFS 73 (12")
CFS 74 (12")
CFS 75 (12")
CFS 76 (24")
CFS 77 (24")
CFS 78 (12")
CFS 79 (24")
CFS 80 (12")
CFS 81 (12")
CFS 82 (12")
CFS 83 (12")
CFS 84 (12")
CFS 85 (12")
EX. ROCK OUTCROP
EX. 15" METAL CULVERT
PROPOSED V-DITCH WITH CHECK DAMS
EXISTING ROCK (DO NOT DISTURB) EX. ROCK OUTCROP
EXISTING ROCK OUTCROP
EXISTING 6" GAS LINE
EXISTING 2" GAS LINE
EXISTING RISERS AND EXISTING GAS LINE MARKER WITH VALVE
STA 49+96.30 MAIN ACCESS ROAD CL = STA 704+08.41 TEMPORARY ROAD CL
EXISTING METAL POST
PERENNIAL UNT 19
UNT #19 IMPACT - 67 LF
PERMANENT CULVERT CROSSING OUTLET PROTECTION (SEE DETAILS)
TEMPORARY 40' PORTABLE BRIDGE (SEE NOTE BELOW)
WL 1
PERENNIAL UNT 20
VERNAL POOL 1
EXISTING SEPARATOR
OLD OVERGROWN LOG ROAD
EXISTING ROCK (DO NOT DISTURB)
PERENNIAL UNT 19
PERMANENT CULVERT CROSSING 15" ALUMINUM PIPES (4 BARRELS) (SEE DETAILS)
TEMPORARY LAY-DOWN AREA
STA 46+54.60 MAIN ACCESS ROAD CL = STA 700+78.57 TEMPORARY ROAD CL
EXISTING RISERS AND EXISTING METER CHART
EXISTING WELL HEAD API #47-017-02397
EXISTING POND/ SEDIMENT TRAP
PERENNIAL UNT 21
PROPOSED V-DITCH WITH CHECK DAMS
PROPOSED 20' ACCESS ROAD WITH NORMAL CROWN
PROPOSED 15" CMP
BEGIN PROPOSED 18' ACCESS ROAD WITH NORMAL CROWN (STA 57+25)
EPHEMERAL UNT 22
EXISTING LOG ROAD
PROPOSED V-DITCH WITH CHECK DAMS
LIMIT OF DISTURBANCE
PROPOSED 21" CMP
PERENNIAL UNT 21
LIMIT OF DISTURBANCE
PROPOSED 10' ACCESS ROAD TO EXISTING WELL WITH NO CROWN

SEE SHEET 7

NOTE:
REMOVE THE TEMPORARY PORTABLE BRIDGE PRIOR TO CONSTRUCTION OF THE LOW WATER CROSSING

0' 50' 100' 150'
HORIZONTAL SCALE

NORTH

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ACCESS ROAD LAYOUT
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 6 OF 57
REV:

NORTH

SEE SHEET 6

LIMIT OF DISTURBANCE
END PROPOSED 18' ACCESS ROAD WITH NORMAL CROWN (STA 59+50)
PROPOSED 20' ACCESS ROAD WITH NORMAL CROWN
PROPOSED V-DITCH WITH CHECK DAMS
EPHEMERAL UNT 23
EPHEMERAL UNT 27
EPHEMERAL UNT 28
CFS 88 (12")
CFS 89 (12")
CFS 90 (24")
CFS 91 (24")
CFS 92 (24")
CFS 95 (24")
CFS 96 (12")
CFS 96A (24")
CFS 97 (18")
CFS 98 (18")
CFS 99 (12")
CFS 100 (12")
CFS 101 (12")
CFS 102 (12")
CFS 103 (12")
CFS 104 (18")
CFS 105 (18")
CFS 106 (24")
CFS 109 (12")
CFS 135 (24")
CFS 136 (24")
CFS 137 (24")
CFS 138 (24")
PROPOSED 15" CMP
PROPOSED 27" CMP
PROPOSED 21" CMP
PROPOSED 18" CMP
WETLAND #2 IMPACT - 27 SF
PERENNIAL UNT 21
EPHEMERAL UNT 25
EPHEMERAL UNT 24
EPHEMERAL UNT 1A
UNT 21
UNT 26
UNT 25
UNT 24 IMPACT - 35 LF
UNT #26 IMPACT - 55 LF
UNT #25 IMPACT - 70 LF
UNT #30 IMPACT - 146 LF
EXPOSED 3" GAS LINE
WL 1
WL 2
WL 3
WL 4
WL 5
WL 6
WL 7
WELL
EX. 15" METAL CULVERT
2:1 CUT
2:1 FILL
PROPOSED 10' ACCESS ROAD TO EXISTING WELL WITH NO CROWN
PROPOSED 10' ACCESS ROAD TO EXISTING WELL WITH 2% INSLOPE
PROPOSED 10' ACCESS ROAD TO STOCKPILES NO CROWN
PROPOSED 20' ACCESS ROAD WITH 4.0% INSLOPE
PROPOSED V-DITCH
PROPOSED V-DITCH WITH CHECK DAMS
LIMIT OF DISTURBANCE
6.5%
14.0%
19.0%
20.0%
15.0%
9.0%
4.0%
2.0%

0' 50' 100' 150'
HORIZONTAL SCALE

SEE SHEET 8

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ACCESS ROAD LAYOUT
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE:	9/16/2013
SCALE:	AS SHOWN
DESIGNED BY:	RJH/JMR
FILE NO.:	SLS-8051
SHEET	7 OF 57
REV:	

NOTE:
UTILIZE TOPSOIL STOCKPILE #1 AND EXCESS MATERIAL STOCKPILES #4 AND #9 FOR SITE RECLAMATION. COMPLETELY REMOVE THESE STOCKPILES BEFORE USING OTHER STOCKPILE LOCATIONS FOR SITE RECLAMATION.

NORTH

TEMPORARY EXCESS MATERIAL STOCKPILE #4 (APPROX. 25,280 CY) (SEE NOTE ABOVE)

TEMPORARY TOPSOIL STOCKPILE #1 (APPROX. 21,457) (SEE NOTE ABOVE)

TEMPORARY EXCESS MATERIAL STOCKPILE #9 (APPROX. 6,120 CY) (SEE NOTE ABOVE)

LIMIT OF DISTURBANCE

DO NOT DISTURB EXISTING WELL

EX. WELL HEAD API# 47-017-1687

CFS-110 (12")
CFS-111 (24")
CFS-112 (24")
CFS-113 (24")
CFS-115 (24")
CFS-116 (24")
CFS-117 (24")
CFS-118 (24")
CFS-118A (24")
CFS-118B (24")
CFS-118C (12")
CFS-119 (24")
CFS-120 (24")
CFS-121 (24")
CFS-122 (24")
CFS-123 (24")
CFS-124 (12")
CFS-125 (12")
CFS-126 (24")
CFS-127 (24")
CFS-135 (24")
CFS-136 (24")
CFS-137 (24")
CFS-138 (24")
CFS-142 (12")
CFS-143 (24")
CFS-144 (12")
CFS-145 (12")
CFS-146 (24")
CFS-147 (24")
CFS-148 (24")
CFS-149 (24")
CFS-150 (24")
CFS-151 (24")
CFS-152 (24")
CFS-153 (24")
CFS-154 (24")
CFS-155 (24")
CFS-156 (24")
CFS-157 (24")
CFS-158 (24")
CFS-159 (24")
CFS-160 (12")
CFS-161 (12")
CFS-162 (12")
CFS-163 (12")
CFS-164 (12")
CFS-165 (24")
CFS-166 (24")
CFS-175 (24")
CFS-176 (24")
CFS-177 (24")
CFS-178 (24")
CFS-178A (24")
CFS-178B (24")
CFS-182 (24")
CFS-182A (18")
CFS-183 (24")
CFS-184 (24")
CFS-185 (24")
CFS-186 (24")
CFS-187 (24")
CFS-188 (24")
CFS-191 (18")
CFS-192 (18")
CFS-193 (18")
CFS-194 (18")
CFS-195 (18")
CFS-196 (18")
CFS-197 (18")
CFS-198 (18")
CFS-199 (18")

PERENNIAL UNT 21

EXISTING LOG PILE

EX. 10" METAL CULVERT

EX. 18" METAL CULVERT

EX. 12" METAL CULVERT

EXCESS MATERIAL STOCKPILE #6 (APPROX. 15,000 CY)

EXCESS MATERIAL STOCKPILE #8 (APPROX. 1,711 CY)

EXISTING 2" GAS LINE

EXISTING 15" METAL CULVERT

EX. WEL API# 47-017

PROPOSED 15" CMP

PROPOSED 18" CMP

PROPOSED 24" CMP

PROPOSED DUAL 24" CMP

PROPOSED V-DITCH WITH CHECK DAMS

PROPOSED 20' ACCESS ROAD WITH 4.0% INSLOPE

UNT #33 IMPACT - 67 LF

UNT #28A IMPACT - 158 LF

UNT #27A IMPACT - 36 LF

UNT #26A IMPACT - 149 LF

INTERMITTENT UNT 32

INTERMITTENT UNT 34

EPHEMERAL UNT 30A

EPHEMERAL UNT 32

EPHEMERAL UNT 25A

EPHEMERAL UNT 31

EPHEMERAL UNT 27A

EPHEMERAL UNT 26A

VERNAL POOL 2

POND 1

81+00
80+00
11.3%
92+00
79+00
16.5%
83+00
1.0%
84+00
65+00
16.0%
69+00
78+00
5.0%
14.0%

2:1 FILL
2:1 CUT

SEE SHEET 7

SEE SHEET 9

SEE SHEET 10

0' 50' 100' 150'
HORIZONTAL SCALE

9/16/2013
WORK PLAN - DOT 2006
H:\GIS\PROJECTS\372 EQT WEU 51\MXD\3.1 Highway prFS\372eaPF08.dgn
DOT_2006
Config: tbl
Level: 2e_PDF_plt
ALL DISTANCES ARE IN SURVEY FEET.

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FOR:
EQT PRODUCTION COMPANY

ACCESS ROAD LAYOUT
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE:	9/16/2013
SCALE:	AS SHOWN
DESIGNED BY:	RJH/JMR
FILE NO.:	SLS-8051
SHEET	8 OF 57
REV:	

SEE SHEET 10

SEE SHEET 8

EXISTING GAS LINE

PROPOSED V-DITCH WITH CHECK DAMS

PROPOSED 20' ACCESS ROAD WITH 4% INSLOPE

MEET AND MATCH ACCESS ROAD TO WELL PAD (TYP)

PROPOSED 15" CMP

CONTAINMENT BERM (TYP)

MOUNTABLE BERM (TYP)

SUMP DRAIN ELEV - 1207.0

WELL PAD CENTER
39.255748 N
-80.763153 W

H5-WV 514665
H4-WV 514664
H3-WV 514663
H2-WV 514662
H1-WV 514661

ELEV - 1208.0

SUMP DRAIN ELEV - 1207.0

1:1 CUT SLOPE

WETLAND #2A
IMPACT - 0.03 AC

WL 2A

EX WELL
API# 47-017-4136

EXISTING GAS WELL
DO NOT DISTURB

EXISTING TANK

WL 1A

MANIFOLD PAD AND TRUCK TURNAROUND

ASSOC. PIT CENTER
39.254852 N
-80.763071 W

ACCESS GATE WITH EMERGENCY LIFELINE

ASSOC. IMPOUNDMENT CENTER
39.254970 N
-80.761271 W

ACCESS GATE WITH EMERGENCY LIFELINE

MANIFOLD PAD AND TRUCK TURNAROUND

PROPOSED 15" CMP

PERIMETER SAFETY FENCE

PERIMETER SAFETY FENCE

LIMIT OF DISTURBANCE

LIMIT OF DISTURBANCE

UNT #26A
IMPACT - 149 LF
(SEE SHEET 8 FOR ADDITIONAL IMPACTS)

PROPOSED 20' ACCESS ROAD WITH 4% INSLOPE

CFS-178 (24")
CFS-179 (24")
CFS-180 (24")
CFS-181 (24")
CFS-181A (24")
CFS-182 (24")
CFS-182A (24")
CFS-182B (24")
CFS-182C (24")
CFS-182D (24")
CFS-183 (24")
CFS-184 (24")
CFS-185 (24")
CFS-186 (24")
CFS-187 (24")
CFS-188 (24")
CFS-190 (12")
CFS-191 (18")
CFS-192 (18")
CFS-193 (18")
CFS-194 (18")
CFS-195 (18")
CFS-196 (18")
CFS-197 (18")
CFS-198 (18")
CFS-199 (18")
CFS-200 (18")
CFS-201 (18")
CFS-202 (12")
CFS-203 (24")
CFS-205 (24")
CFS-206 (24")
CFS-207 (24")
CFS-208 (24")
CFS-209 (12")
CFS-210 (12")
CFS-211 (12")
CFS-212 (12")
CFS-213 (12")
CFS-214 (24")
CFS-215 (24")
CFS-217 (24")
CFS-219 (24")
CFS-220 (12")
CFS-221 (12")
CFS-222 (12")
CFS-223 (12")
CFS-225 (12")
CFS-226 (12")
CFS-227 (12")
CFS-228 (24")
CFS-229 (24")
CFS-230 (12")
CFS-231 (12")
CFS-232 (12")
CFS-233 (12")
CFS-234 (12")
CFS-235 (24")
CFS-236 (12")
CFS-237 (18")
CFS-238 (24")
CFS-239 (24")
CFS-240 (24")
CFS-241 (24")
CFS-242 (24")
CFS-243 (24")
CFS-244 (24")
CFS-245 (24")
CFS-246 (24")
CFS-247 (24")
CFS-248 (24")
CFS-249 (24")

EPHEMERAL UNT 25A
EPHEMERAL UNT 22A
EPHEMERAL UNT 23A
EPHEMERAL UNT 24A
EPHEMERAL UNT 15A
EPHEMERAL UNT 14A
EPHEMERAL UNT 13A
EPHEMERAL UNT 11A
EPHEMERAL UNT 21A
EPHEMERAL UNT 20A
EPHEMERAL UNT 19A
EPHEMERAL UNT 18A
EPHEMERAL UNT 17A
EPHEMERAL UNT 12A
INTERMITTENT UNT 2A
INTERMITTENT UNT 16A
INTERMITTENT UNT 2A
NORTH

ASSOCIATED IMPOUNDMENT

PIT TO BE FULLY LINED TO ELEV 1170.0 WITH:
-16 OZ NON-WOVEN GEOTEXTILE FABRIC
-60 MIL TEXTURED PRIMARY LINER

TOTAL VOLUME = 12.67 AC.-FT (4.13 MIL. GAL)
STORAGE VOLUME = 10.43 AC.-FT (3.40 MIL. GAL)

WATER SURFACE ELEVATION = 1168.00 (DEPTH = 18.0 FT)
TOP OF BERM ELEVATION = 1170.00 (DEPTH = 20.0 FT)

ASSOCIATED PIT

PIT TO BE FULLY LINED TO ELEV 1205.0 WITH:
-16 OZ NON-WOVEN GEOTEXTILE FABRIC
-60 MIL TEXTURED PRIMARY LINER

TOTAL VOLUME = 5.00 AC.-FT (1.63 MIL. GAL)
STORAGE VOLUME = 3.79 AC.-FT (1.23 MIL. GAL)

WATER SURFACE ELEVATION = 1203.00 (DEPTH = 13.0 FT)
TOP OF BERM ELEVATION = 1205.00 (DEPTH = 15.0 FT)

EXCESS MATERIAL STOCKPILE #5 (APPROX 8,790 CY)

EXCESS MATERIAL STOCKPILE #6 (APPROX. 1,711 CY)

0' 50' 100' 150'
HORIZONTAL SCALE

SEE SHEET 7

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

Professional Energy Consultants
A DIVISION OF SMITH, LAND SURVEYING
SURVEYORS / ENGINEERS / ENVIRONMENTAL
PROJECT MGMT.
SLS
230 West Main St.
Suite 104
Ghent, WV 25351
(304) 462-5634
HONESTY, INTEGRITY, QUALITY
3648 Dillon Bottom Road
Hurricane, WV 25526
(740) 516-2341

RICHARD L. CAINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

ACCESS ROAD AND WELL SITE LAYOUT
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE:	9/16/2013
SCALE:	AS SHOWN
DESIGNED BY:	RJH/JMR
FILE NO.:	SLS-8051
SHEET	9 OF 57
REV:	

9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)
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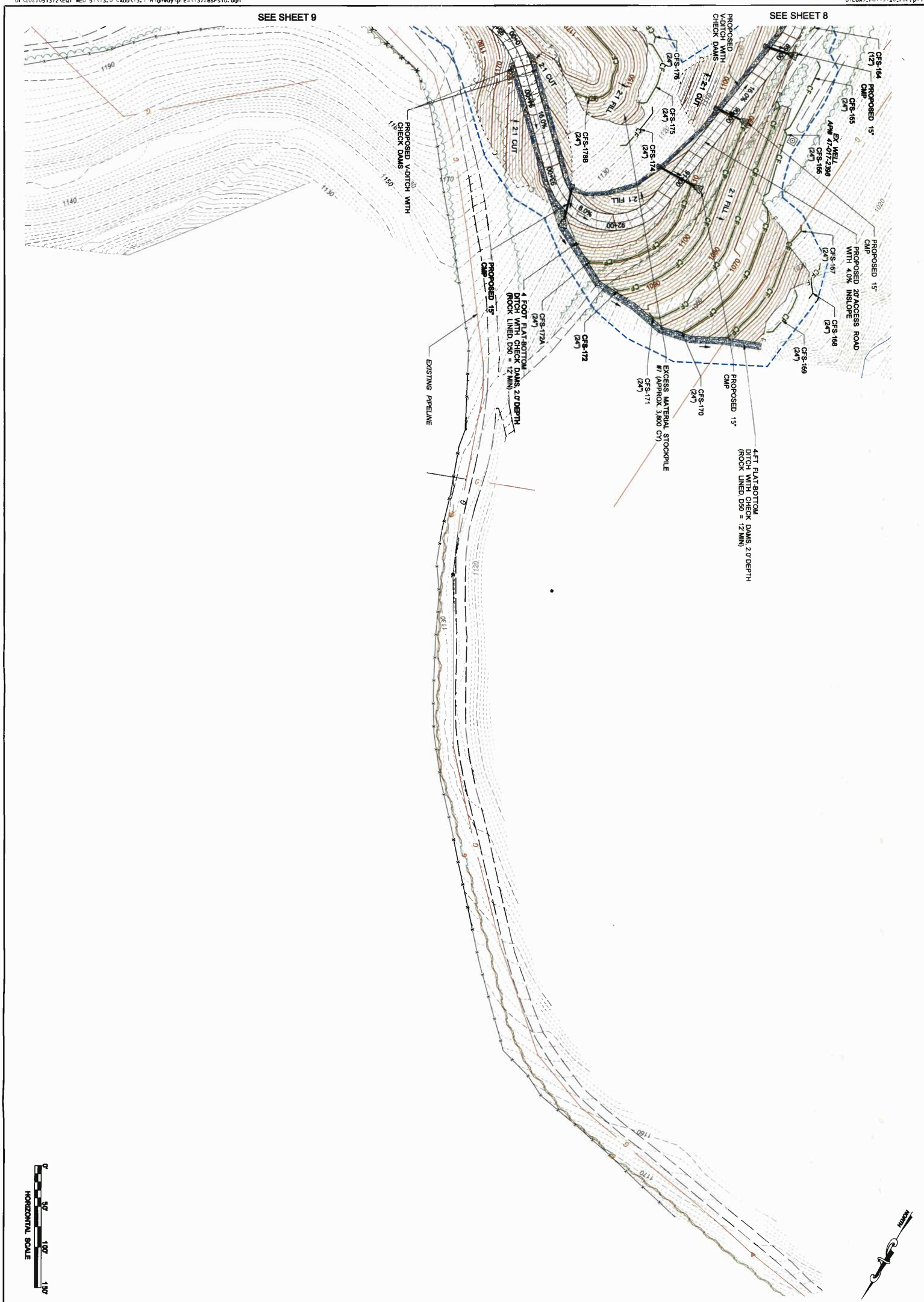


ACCESS ROAD AND WELL SITE LAYOUT

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

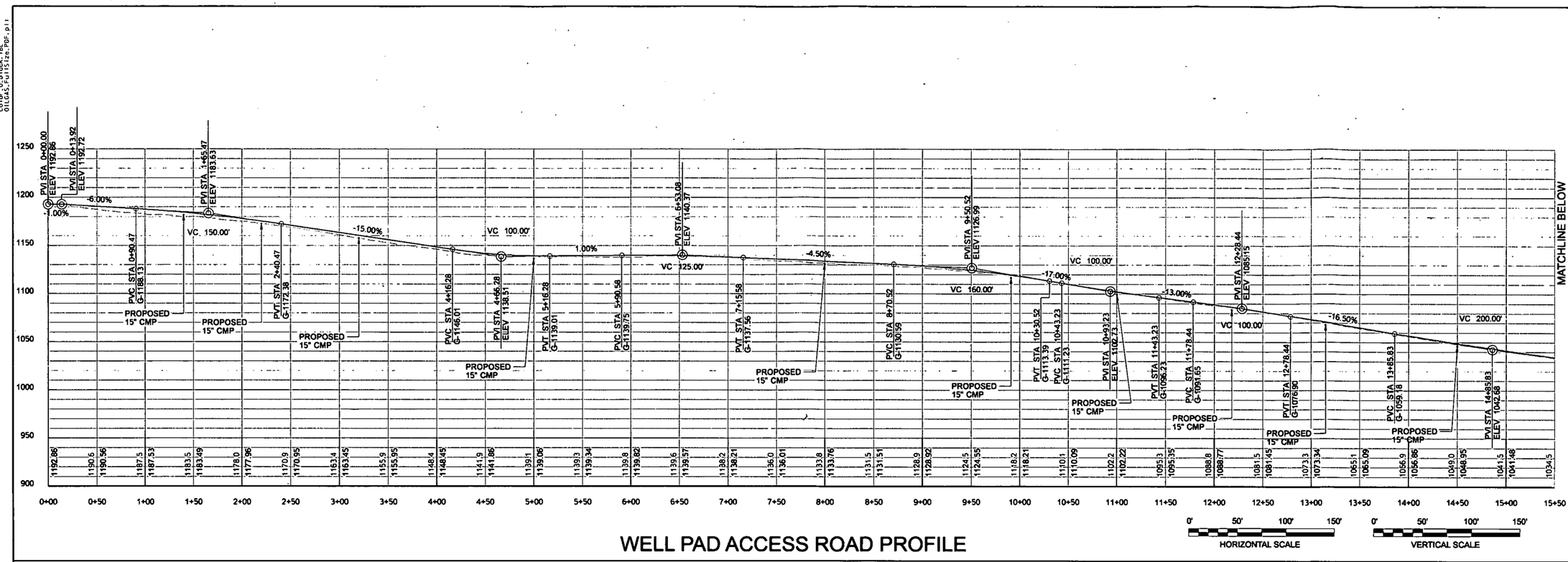
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO: SLS-8051
SHEET: 10 OF 57
REV:

THIS DOCUMENT WAS PREPARED BY STANTEC FOR EQT PRODUCTION COMPANY

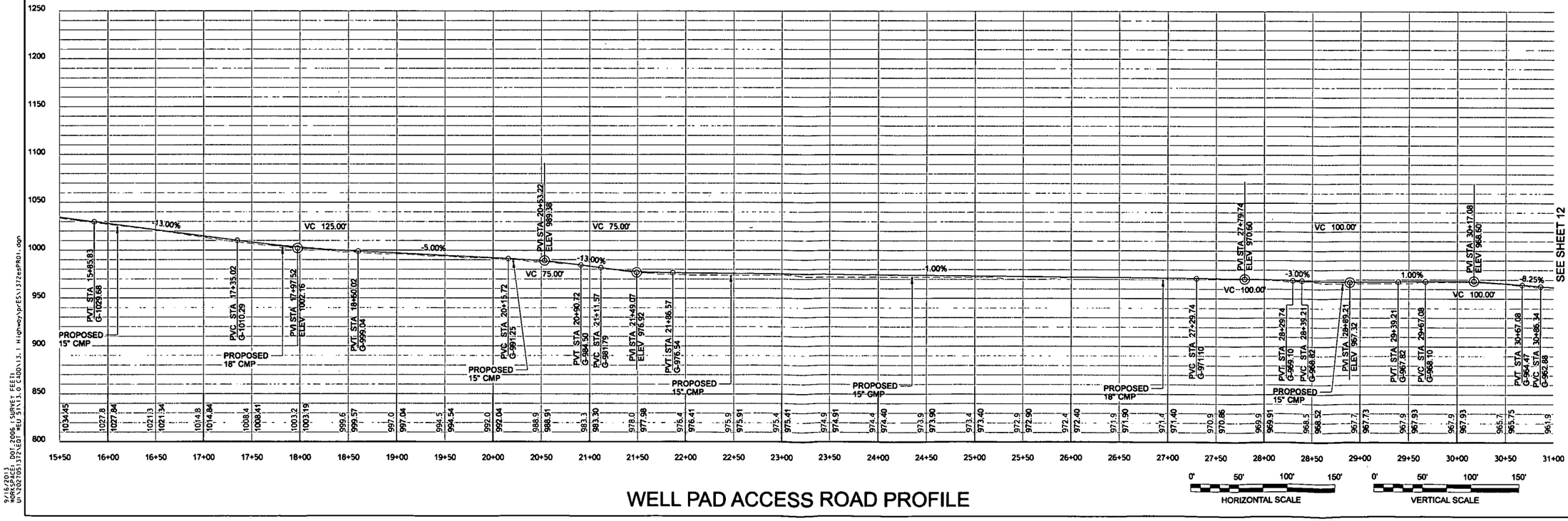
RICHARD J. HUNTER, JR. — STATE OF WEST VIRGINIA — 17220 — PROFESSIONAL ENGINEER

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS — PROJECT MGMT. — ENGINEERS — ENVIRONMENTAL
SLS
229 West Main St.
P.O. Box 190
Glenville, WV 26351
(304) 462-5634
35065 Dillon Bottom Road
Shadyside, OH 43947
(740) 671-0911
HONESTY, INTEGRITY, QUALITY

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401



WELL PAD ACCESS ROAD PROFILE



WELL PAD ACCESS ROAD PROFILE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
Surveying
Project Design
Environmental
Services
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Fairmont, WV 26554
(304) 816-4105 Phone
(304) 816-4106 Fax
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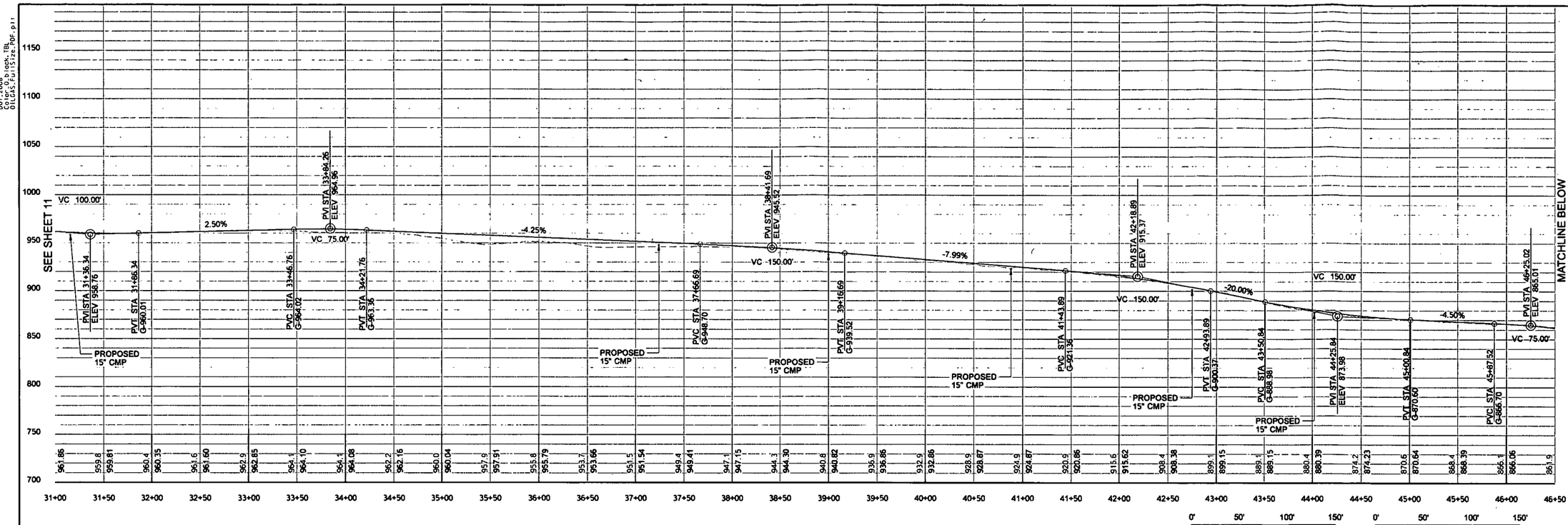
RICHARD L. CLINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

ACCESS ROAD PROFILE
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 11 OF 57
REV:



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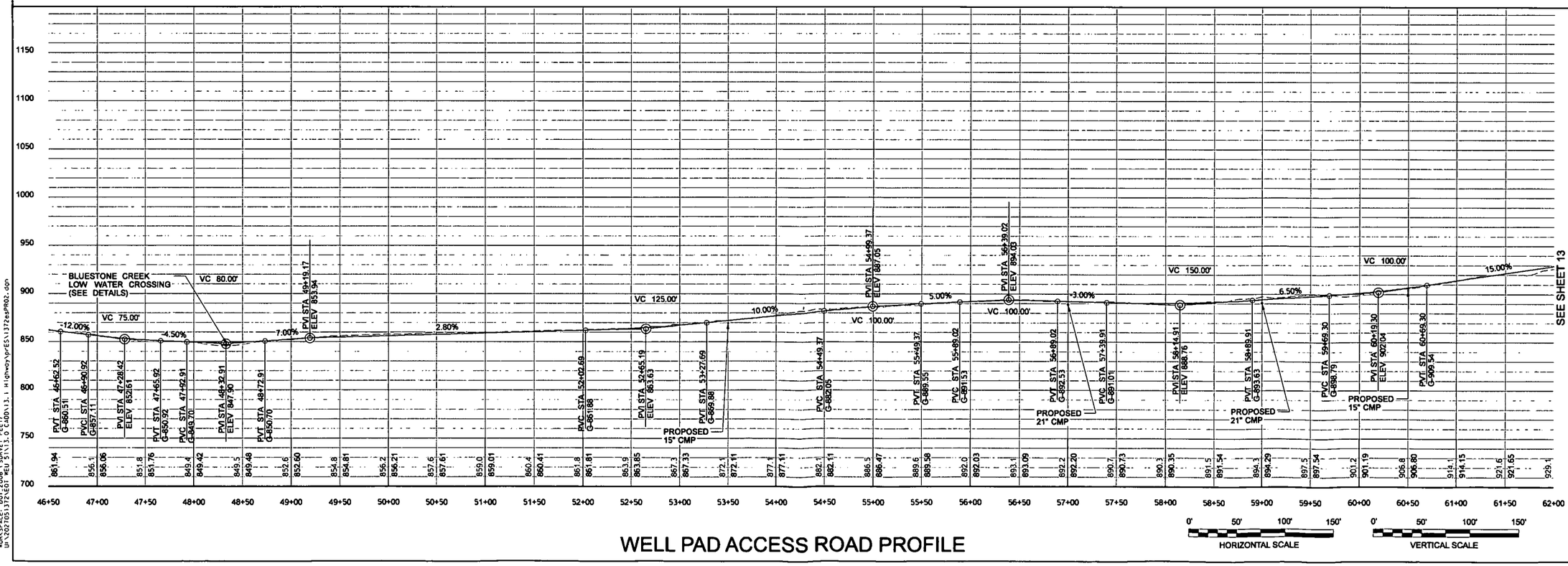

WELL PAD ACCESS ROAD PROFILE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

Professional Energy Consultants
A DIVISION OF SMITH, LAGO & ROBERTS, INC.
SURVEYORS / PROJECT MGMT.
SLS Engineering / Environmental
2003 Otho Dorton Road
Kenova, WV 25530
(304) 453-1771
(800) 624-6157
HONESTY / INTEGRITY / QUALITY
225 West Main St.
Clarksburg, WV 26301
(304) 462-5634

RICHARD L. GAINES
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17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

ACCESS ROAD PROFILE
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 12 OF 57
REV:

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9/16/2013
WORKSPACE1
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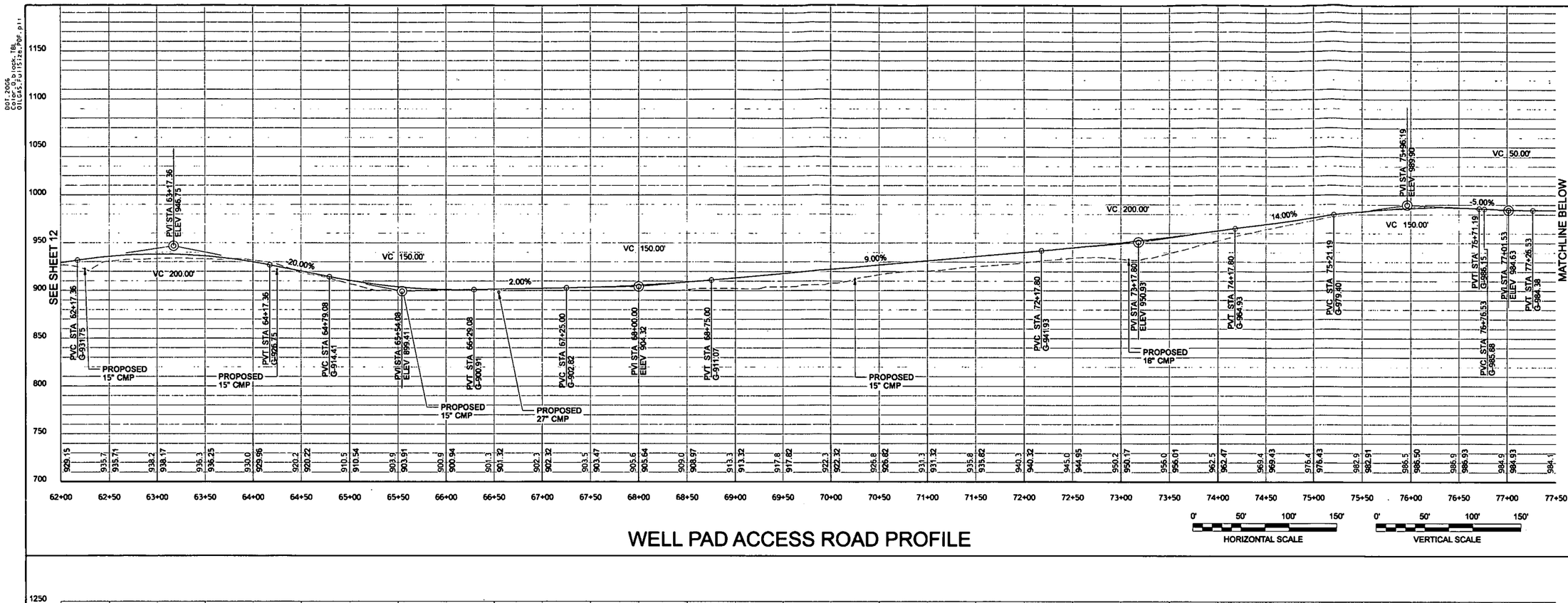

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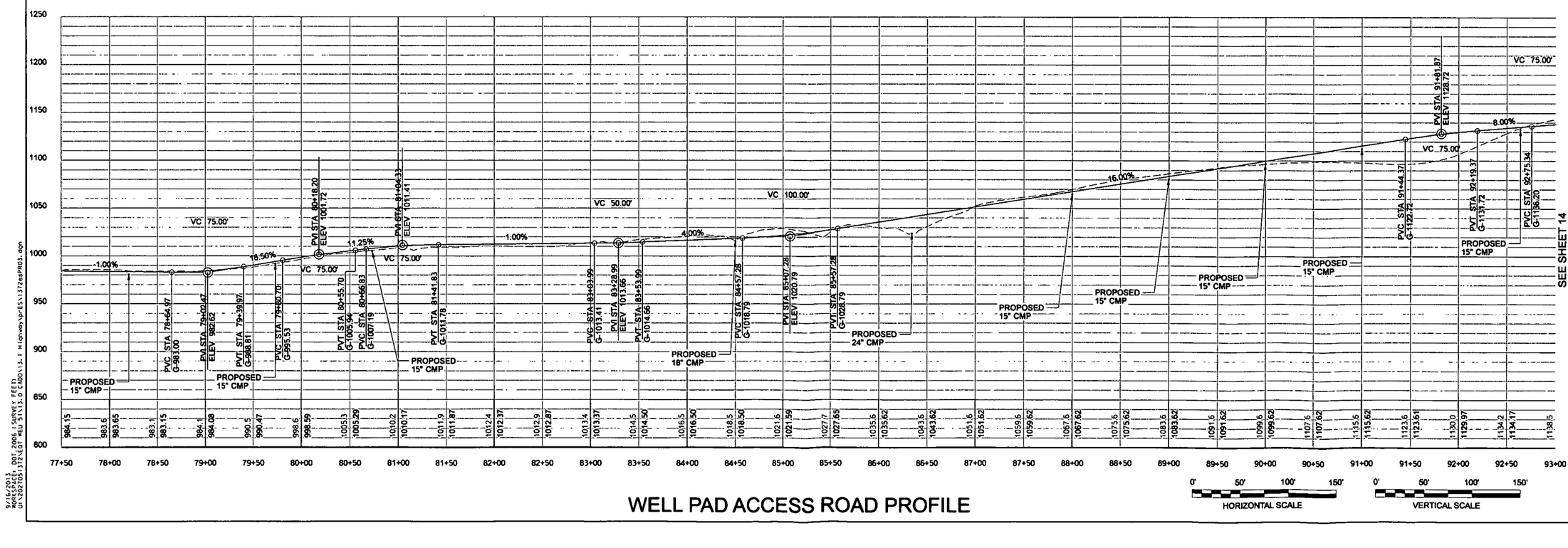

WELL PAD ACCESS ROAD PROFILE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304.367.0401

Professional Energy Consultants
(A DIVISION OF SEITH LAND SURVEYING)
Surveyors
Project Road
Geospatial
Environmental
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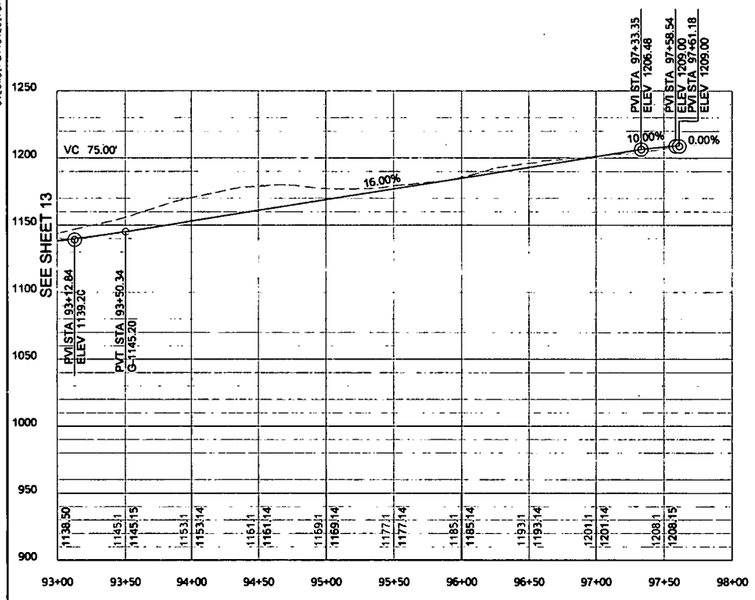
2525 Ellis Station Road
Steubenville, OH 43952
(740) 264-6611
(800) 624-8334
Honesty, Integrity, Quality

RICHARD L. CALVELLS
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

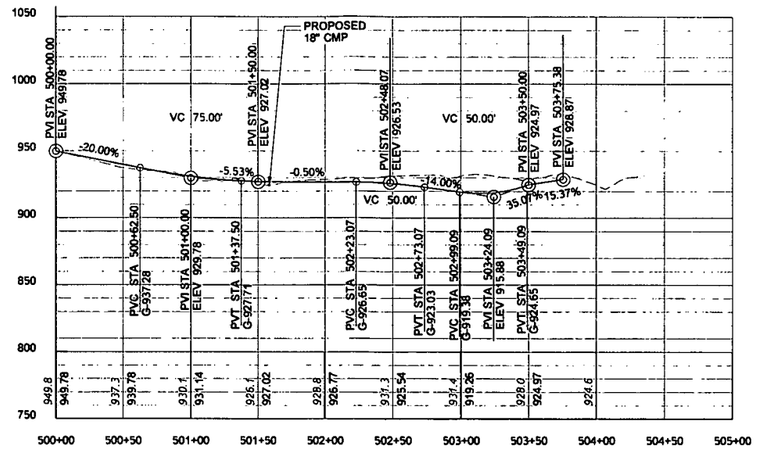
THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

ACCESS ROAD PROFILE
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

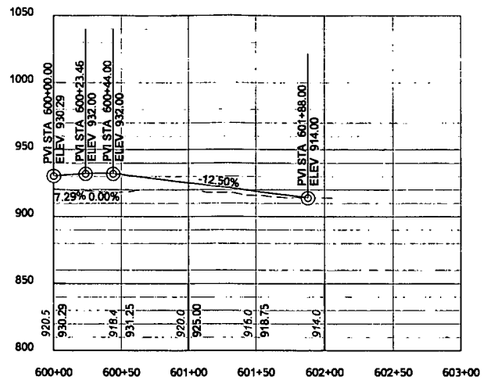
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 13 OF 57
REV:



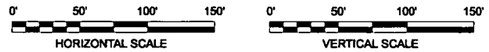
WELL PAD ACCESS ROAD PROFILE

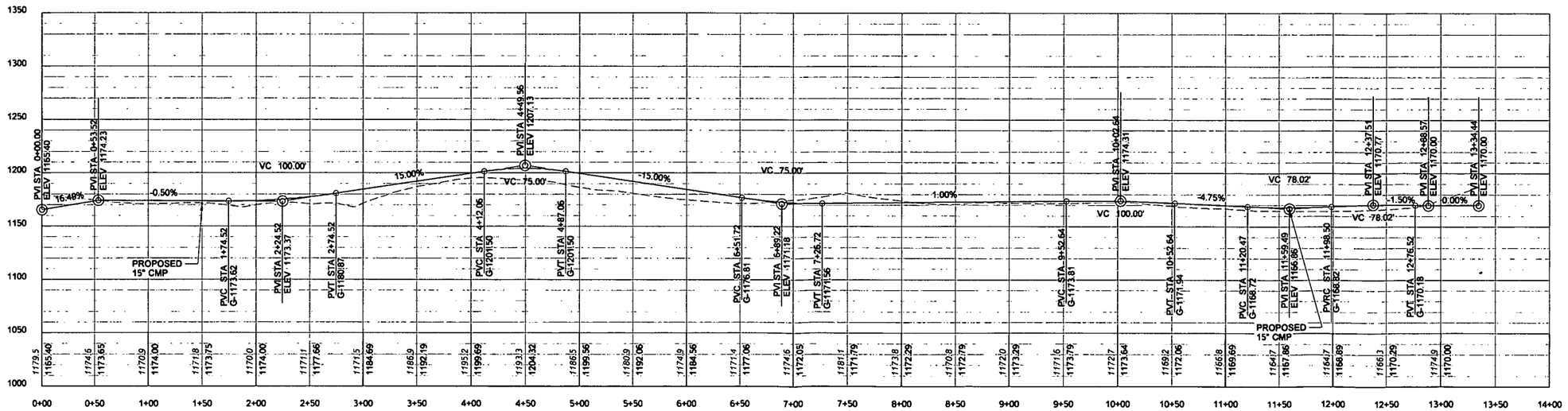


EXISTING WELL ROAD PROFILE



STOCKPILE ACCESS ROAD PROFILE





PIT / IMPOUNDMENT ACCESS ROAD PROFILE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-4601

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS ENGINEERS ENVIRONMENTAL
PROJECT RIGHT.
225 West Main St.
Suite 201
Clarksburg, WV 26301
(304) 622-3434
8503 Dille Bottom Road
Glenville, WV 26351
(304) 462-8768
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

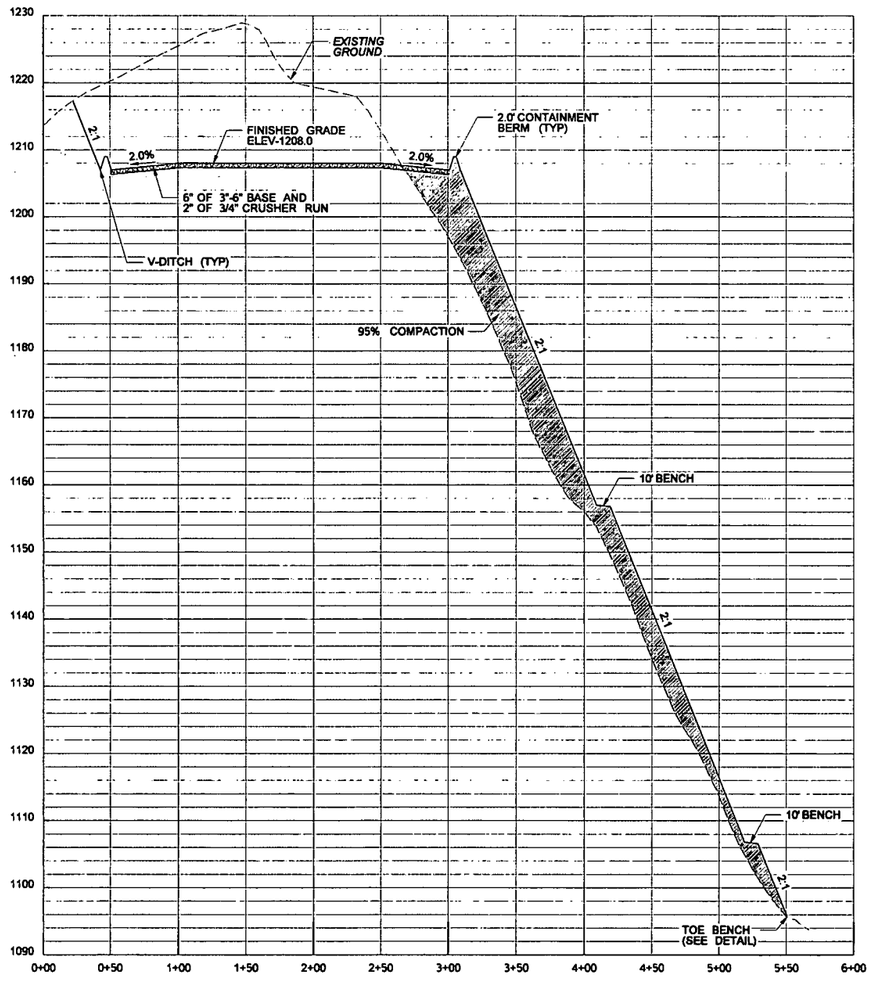
THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

ACCESS ROAD PROFILE

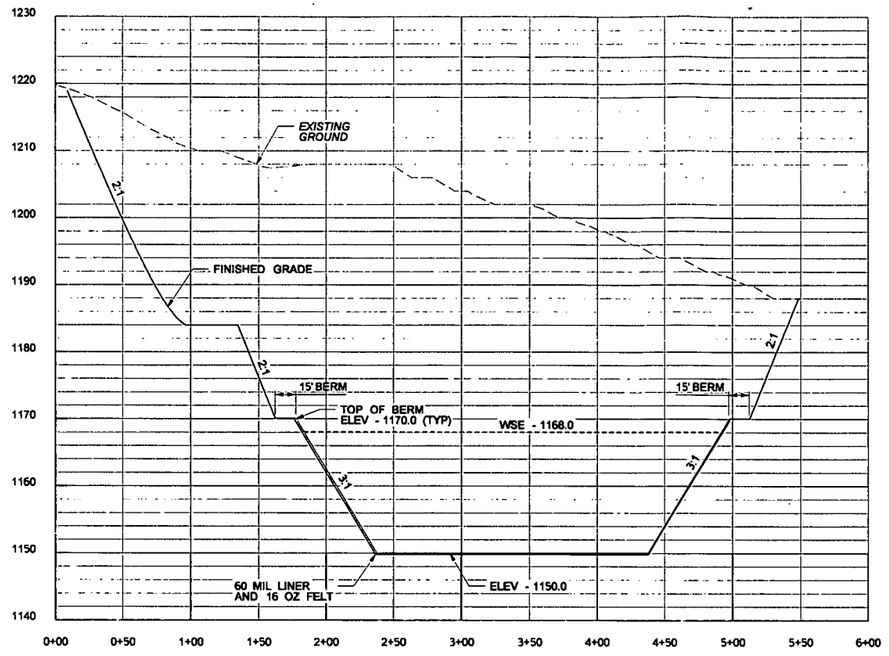
EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

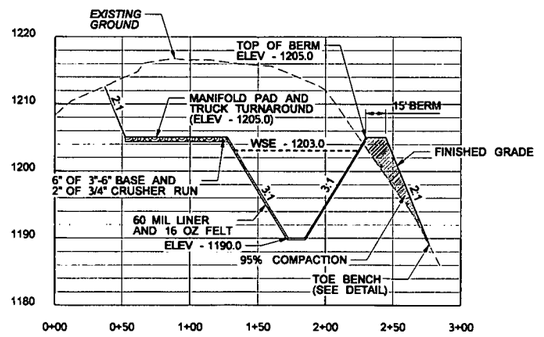
DATE:	9/16/2013
SCALE:	AS SHOWN
DESIGNED BY:	RJH/JMR
FILE NO.:	SLS-8051
SHEET	14 OF 57
REV:	



WELL PAD CROSS SECTION A-A



ASSOCIATED IMPOUNDMENT SECTION C-C



ASSOCIATED PIT SECTION B-B

NOTE:

1. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.

HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING, INC.
SURVEYORS / ENGINEERS / ENVIRONMENTAL
PROJECT READY
SLS
225 West 10th St.
Clarksburg, WV 26301
(304) 624-5834
2033 Elkins Garrison Road
Elkins, WV 26241
(740) 971-4911
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
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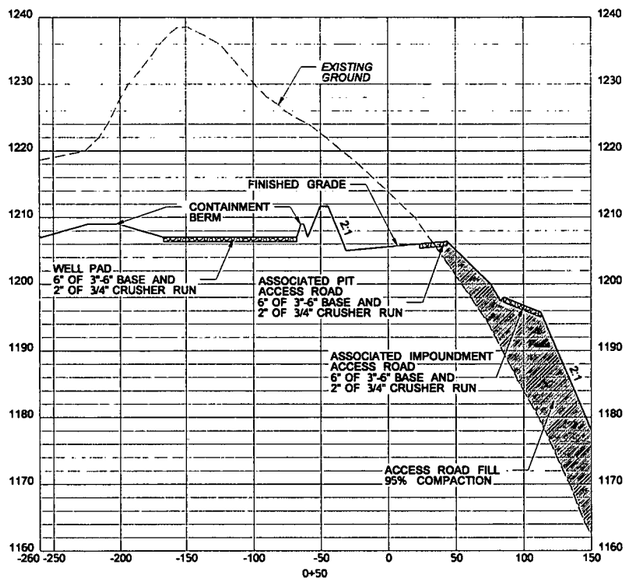
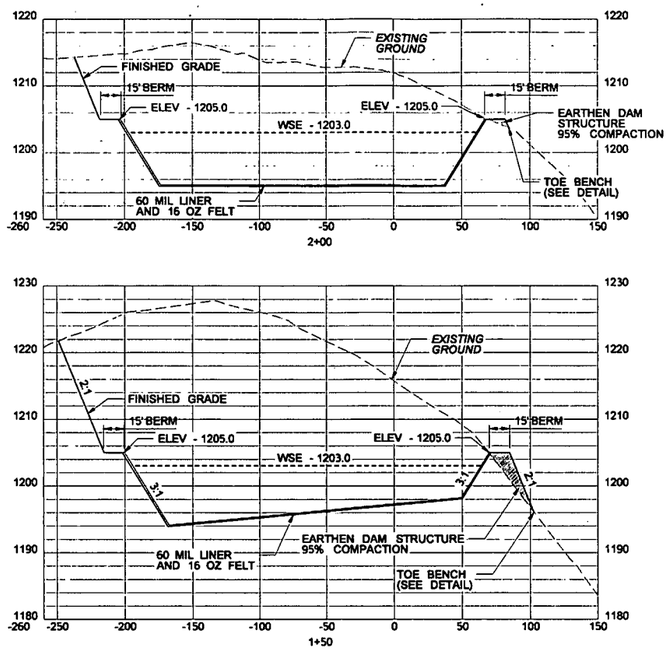
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

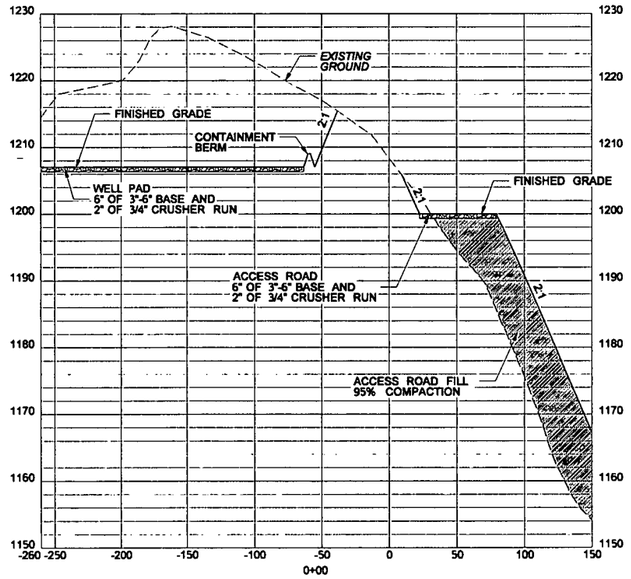
THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

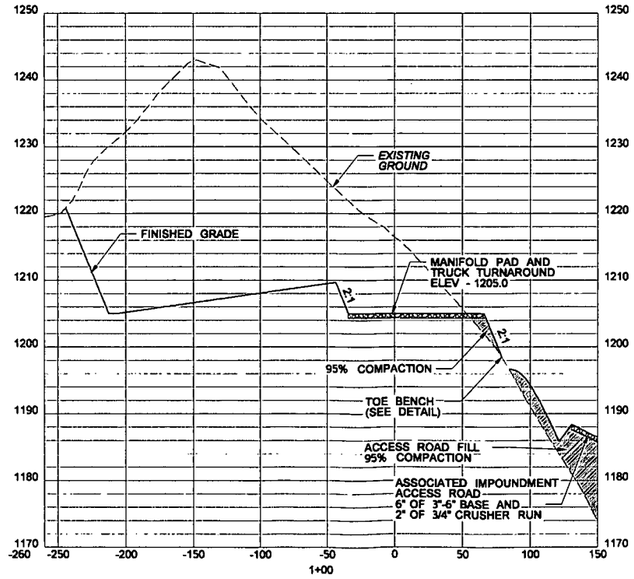
WELL PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

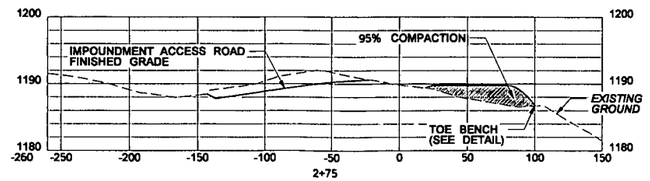
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 15 OF 57
REV:

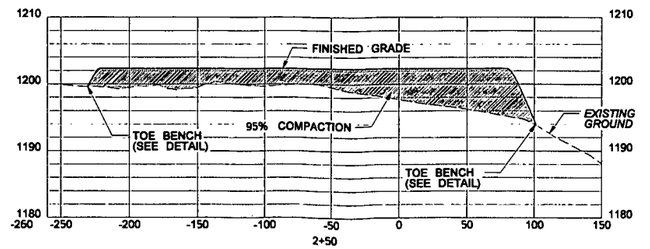












NOTE:

1. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.

ASSOCIATED PIT CROSS SECTIONS ALONG SECTION LINE B-B

HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

Stantec

111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-4601

Professional Energy Consultants
A DIVISION OF SOUTHLAND SYSTEMS

SLS
(SURVEYORS & ENGINEERS)
PROJECT NO.(#): 8051

2633 Dirtec Bottom Road
Hurricane, WV 25526
(304) 562-3741
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
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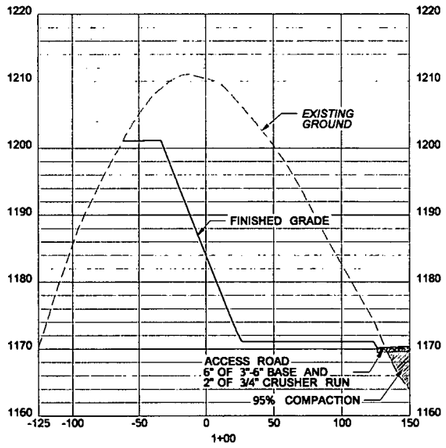
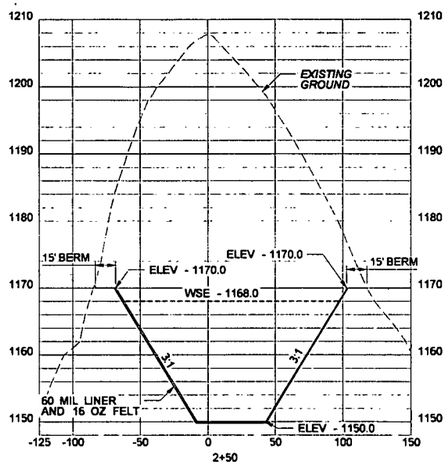
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

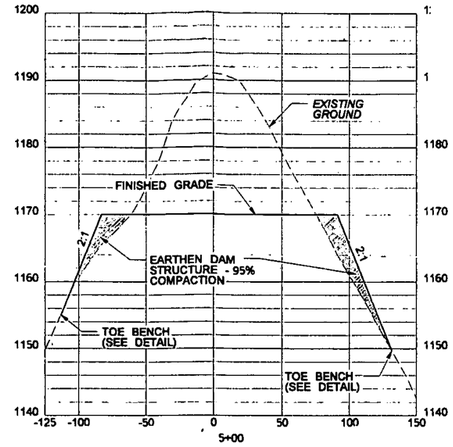
THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

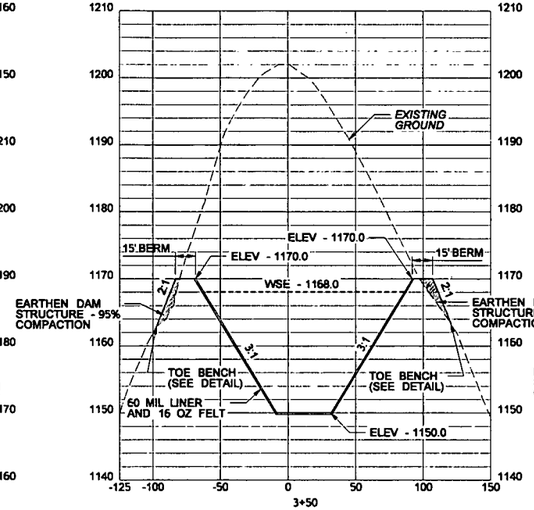
WELL PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

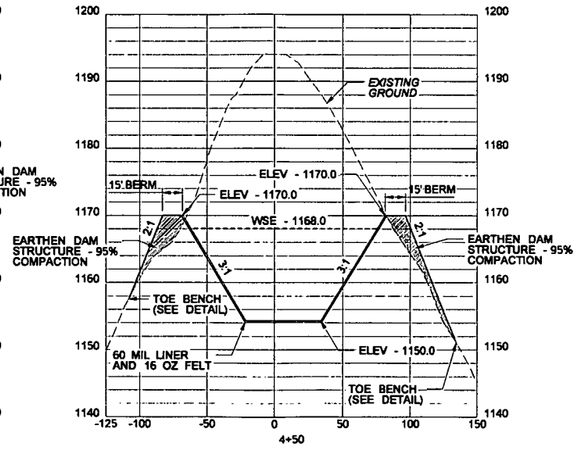
DATE:	9/16/2013
SCALE:	AS SHOWN
DESIGNED BY:	RJH/JMR
FILE NO.:	SLS-8051
SHEET	16 OF 57
REV:	

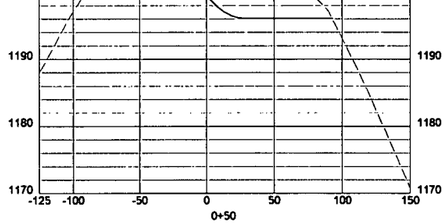


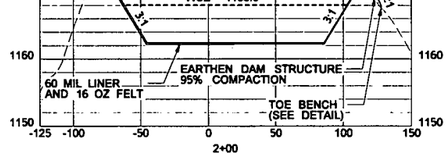


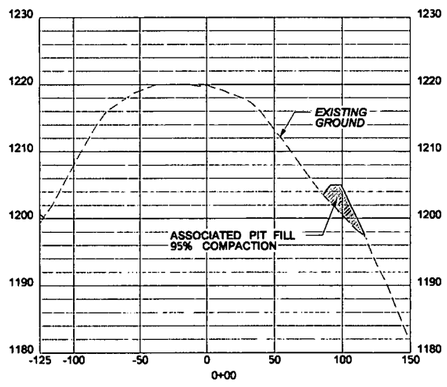


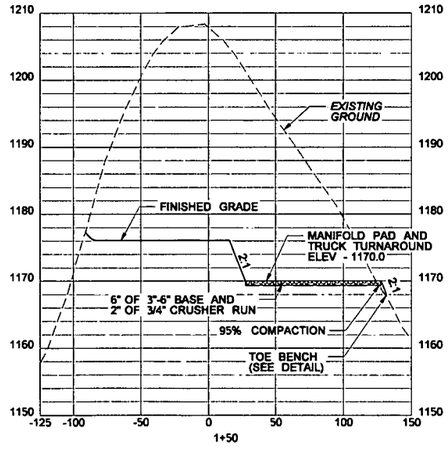


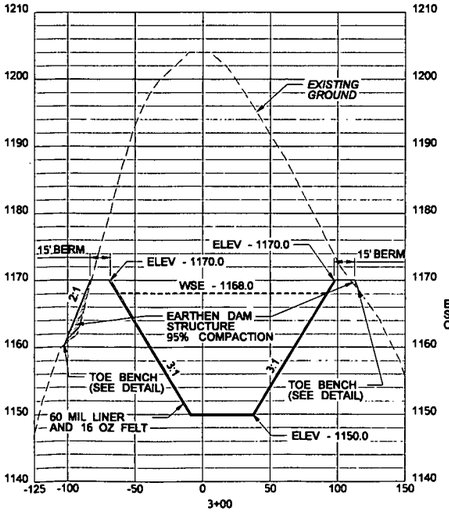


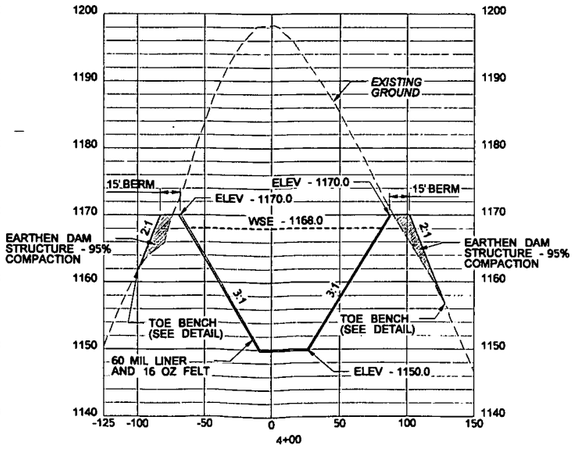












NOTE:

1. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.

ASSOCIATED IMPOUNDMENT CROSS SECTIONS ALONG SECTION LINE C-C

HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-4401

Professional Energy Consultants
A division of SEVEN LAKES SURVEYING

Surveyors
Project Plans
Engineers
Environmental
SLS
2003-E Elkins Station Road
Elkins, WV 26241
(304) 636-2549
Fax (304) 636-2550
HONESTY, INTEGRITY, QUALITY

RICHARD L. CAMPBELL
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

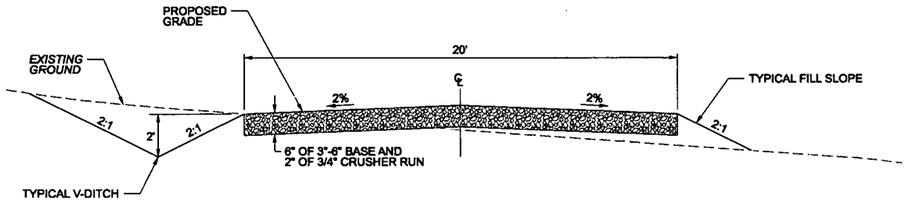
THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

WELL PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT SECTIONS

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

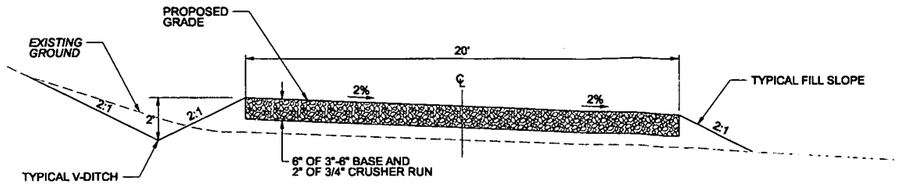
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 17 OF 57
REV:



MAIN ACCESS ROAD TYPICAL SECTION - CROWNED

NOT TO SCALE

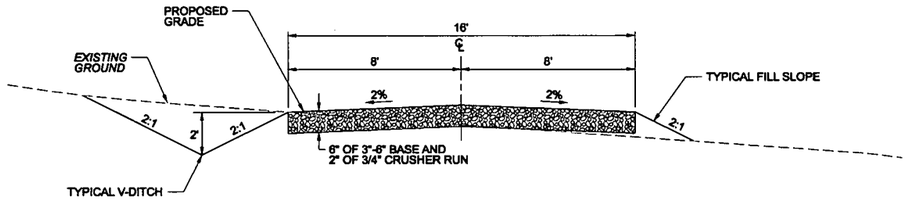
STA 0+00 TO STA 8+00
STA 12+50 TO STA 30+75
STA 32+25 TO STA 41+15
STA 46+75 TO STA 57+25
STA 59+50 TO STA 73+25
STA 82+50 TO STA 94+50
STA 96+00 TO STA 97+64



MAIN ACCESS ROAD TYPICAL SECTION - INSLOPED RIGHT

NOT TO SCALE

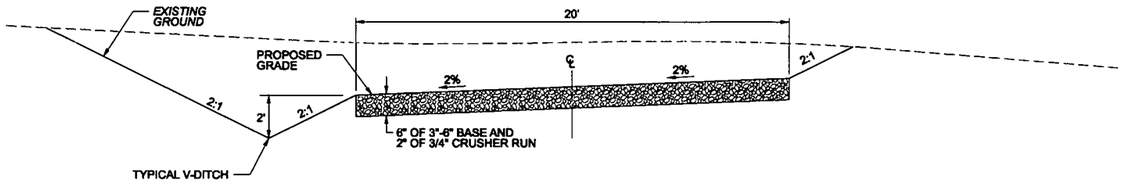
STA 8+00 TO STA 12+50
STA 41+15 TO STA 46+75
STA 73+25 TO STA 82+50



MAIN ACCESS ROAD TYPICAL SECTION - CROWNED

NOT TO SCALE

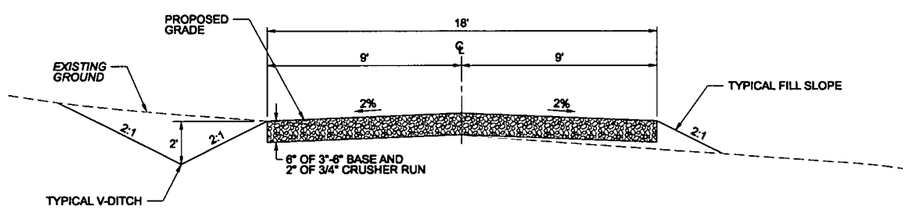
STA 30+75 TO STA 32+25



MAIN ACCESS ROAD TYPICAL SECTION - INSLOPED LEFT

NOT TO SCALE

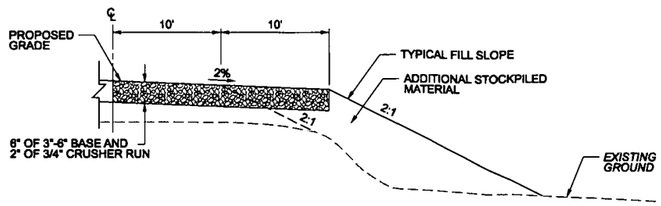
STA 94+50 TO STA 98+00



MAIN ACCESS ROAD TYPICAL SECTION - CROWNED

NOT TO SCALE

STA 57+25 TO STA 59+50



ALTERNATE FILL SECTION

NOT TO SCALE

STA 34+00 TO STA 40+50 RT

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS ENGINEERS ENVIRONMENTAL
PROJECT MGMT.
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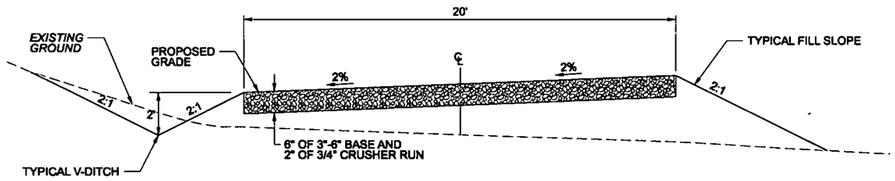
215 West Main St.
Bridgeport, WV 26330
(304) 842-3804
2005 Ohio Bottom Road
Ravenswood, OH 45381
(740) 377-4011
HONESTY, INTEGRITY, QUALITY

RICHARD L. CAINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

ACCESS ROAD TYPICAL SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

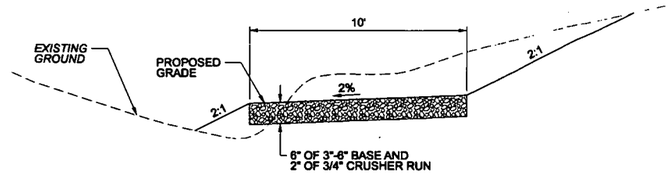
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 18 OF 57
REV:



PIT/IMPOUNDMENT ACCESS ROAD - INSLOPED LEFT

NOT TO SCALE

STA 1+50 TO STA 5+00
STA 6+50 TO STA 13+00

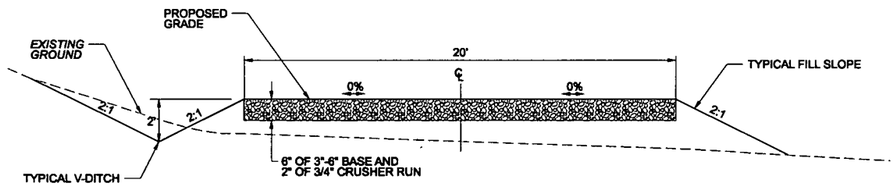


EXISTING WELL ACCESS ROAD

NOT TO SCALE

STA 500+00 TO STA 504+38

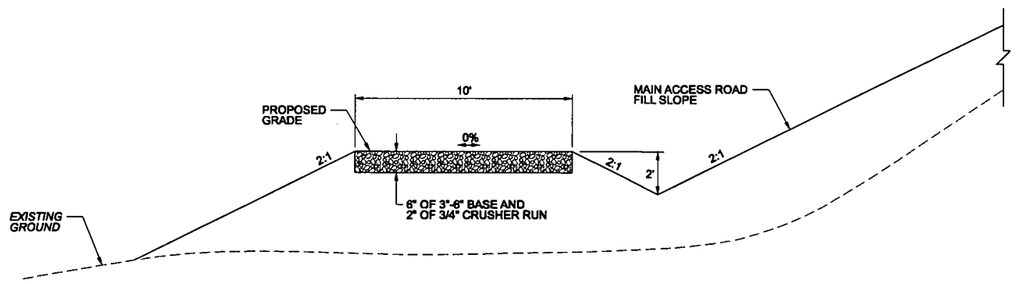
NOTE:
STATION LIMITS PROVIDED ABOVE ARE APPROXIMATE AND CAN BE FIELD ADJUSTED AS DIRECTED BY THE CONSTRUCTION INSPECTOR.



PIT/IMPOUNDMENT ACCESS ROAD

NOT TO SCALE

STA 0+00 TO STA 1+50 (TRANSITION FROM MAIN ACCESS ROAD)
STA 5+00 TO STA 6+50



ACCESS ROAD TO STOCKPILES

NOT TO SCALE

STA 600+00 TO STA 602+08

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111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

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RICHARD L. GAINER
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STATE OF
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PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

ACCESS ROAD TYPICAL SECTIONS

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 19 OF 57
REV:

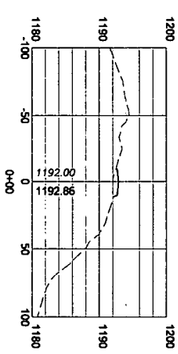
9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)
U:\2027051372\EQT WEU 51\13.0 CADD\13.1 Highway\prES\1372esX501.dgn

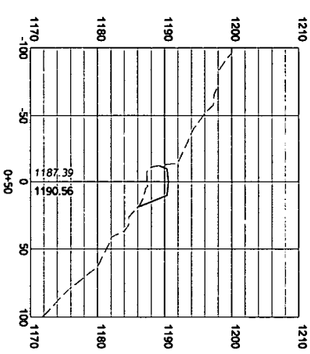
DOT_2006
Color_0_black.TBL
OILGAS_Full1Size.PDF.plt

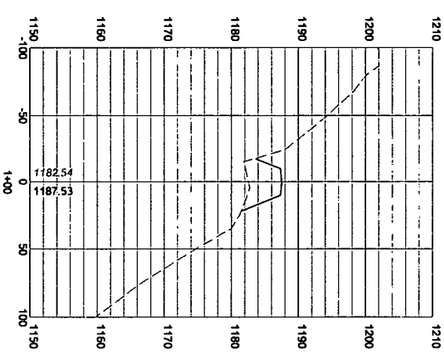
LEGEND

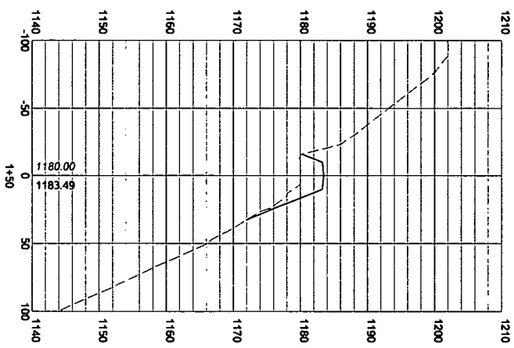
PROPOSED GRADE

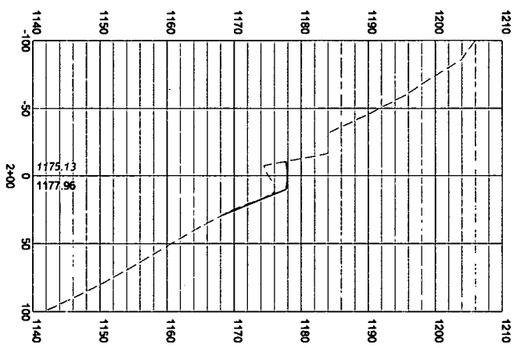
EXISTING GRADE

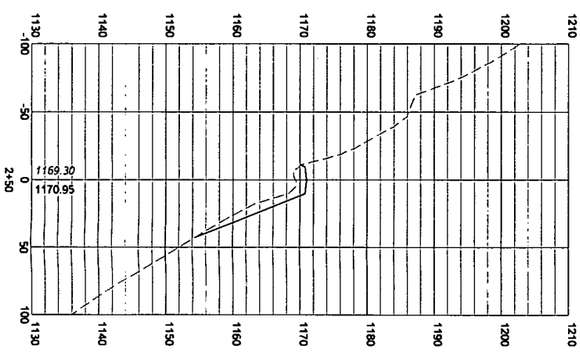


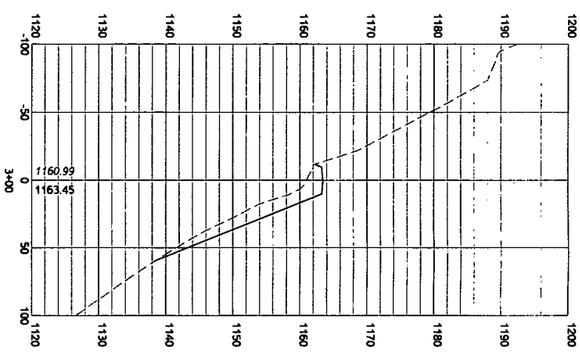


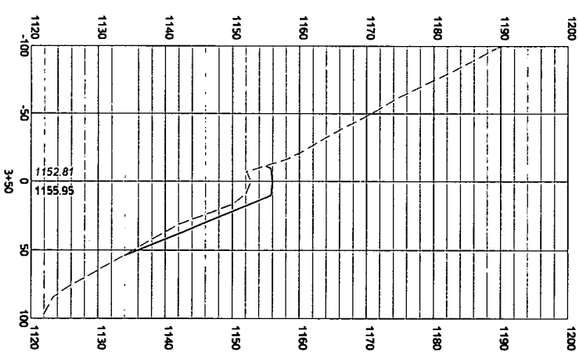


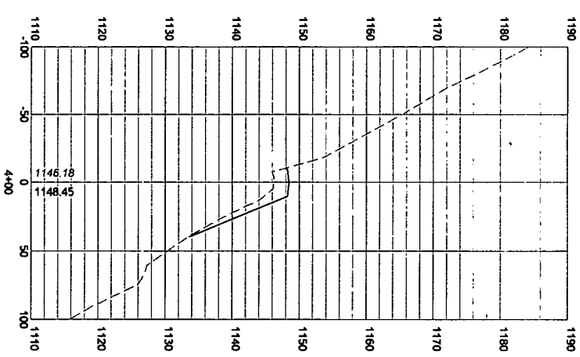


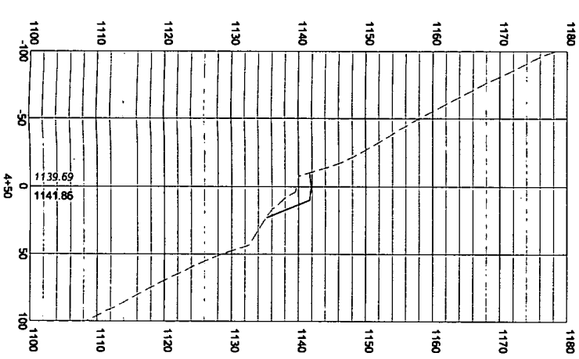


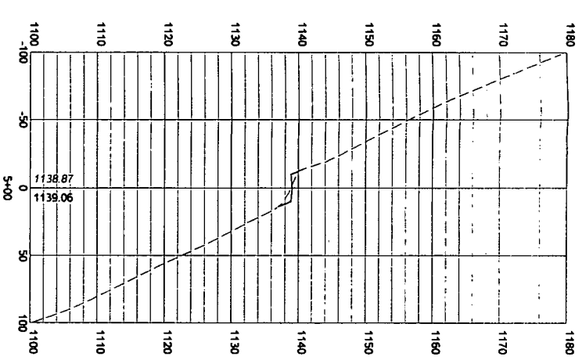












MAIN ACCESS ROAD CROSS SECTIONS
EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

THIS DOCUMENT WAS PREPARED BY STANTEC FOR EQT PRODUCTION COMPANY

RICHARD L. SCHMITT 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
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PROJECT MGMT: SLS
229 West Main St. P.O. Box 150 Glenville, WV 26351 (304) 462-5634
39083 Otten Station Road Shadyville, OH 43947 (740) 971-9911
HONESTY, INTEGRITY, QUALITY

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO: SLS-8051
SHEET 20 OF 57
REV:

LEGEND

——— PROPOSED GRADE

– – – *EXISTING GRADE*

HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

Stantec

111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

Professional Energy Consultants
A Division of Skelly and Loy, Inc.

Engineers
Environmental
Surveyors
Project Right

SLS

2916 West Main St.
Kanawha Plaza
Glenville, WV 26351
(304) 462-5634

2916 West Main Street
Kanawha Plaza
Glenville, WV 26351
(304) 462-5634

Honesty, Integrity, Quality

RICHARD L. GAINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

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STANTEC
FOR:
EQT PRODUCTION COMPANY

MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE:	9/16/2013
SCALE:	AS SHOWN
DESIGNED BY:	RJH/JMR
FILE NO.:	SLS-8051
SHEET	21 OF 57
REV:	

LEGEND

——— PROPOSED GRADE

– – – – *EXISTING GRADE*

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS & ENGINEERS
PROJECT MGMT. ENVIRONMENTAL
SLS
2606 Elkins Bottom Road
Bridgeport, WV 26330
(304) 842-3597
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RICHARD L. GAINES
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17220
STATE OF
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FOR:
EQT PRODUCTION COMPANY

MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 22 OF 57
REV:

LEGEND

PROPOSED GRADE

EXISTING GRADE

HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

Stantec

111 ELMS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

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A DIVISION OF SMITH LAND SURVEYING!

SURVEYORS
PROJECT MGMT.
ENGINEERS
ENVIRONMENTAL

SLS
2934 Fifth Avenue Road
Huntington, WV 25747
(304) 429-3000

INTEGRITY, QUALITY...

RICHARD L. GAINES
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17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

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FOR:
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MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013	
SCALE: AS SHOWN	
DESIGNED BY: RJH/JMR	
FILE NO.: SLS-8051	
SHEET 23 OF 57	
REV:	

9/16/2013
WORKSPACE: DOT 2006 (SURVEY FEET)
U:\2012\05\3725\CAD\WEU 51\LD\CADD\13.1 Highways\xpFES\3725es1501.dgn

DOT 2006
County Boundaries
Cities_Subdivisions.PDF.plt

LEGEND

PROPOSED GRADE

EXISTING GRADE

HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

Stantec

111 ELDER STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

Professional Energy Consultants
A division of Stantec Land Surveying

Surveyors
Project Right

STS

Engineers
Environmentalists

2605 Elder Bottom Road
Huntington, WV 25701
(304) 453-3334

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MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-6051
SHEET 24 OF 57
REV:

LEGEND

PROPOSED GRADE

EXISTING GRADE

HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

Stantec

111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

Professional Energy Consultants
A Division of Sierra Land Surveying

Surveyors
Project Mgmt.

Engineers
Environmental

SLS

2002 Ohio Avenue Road
Parkersburg, WV 26101
(304) 428-3000

Honesty, Integrity, Quality

RICHARD L. CAMPBELL
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17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

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MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 25 OF 57
REV:

LEGEND

PROPOSED GRADE

EXISTING GRADE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)
U:\2021051.372\EQT WEU SLS\13.0 CADD\13.1 Highway\PES\1372essS01.dgn

007.2006
Color Display: FALSE
Date/Time: 9/16/2013 12:25:20 PM

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE 304-367-0401

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225 West Main St.
Clarksburg, WV 26301
(304) 624-5834
3600 Dimmi Harrison Road
Lexington, KY 40517
(859) 971-4911
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

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MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 26 OF 57
REV:

LEGEND

——— PROPOSED GRADE

– – – – *EXISTING GRADE*

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

Professional Energy Consultants
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ENGINEERS
ENVIRONMENTAL
STS
255 West Main St.
Kingwood, WV 26537
(304) 329-1234
HONESTY/INTEGRITY/QUALITY
26053 Elmo Graham Road
Millsboro, DE 19966
(302) 934-9788

RICHARD L. CAINES
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STATE OF
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FOR:
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MAIN ACCESS ROAD CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 27 OF 57
REV:

LEGEND

PROPOSED GRADE

EXISTING GRADE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec

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FAIRMONT, WV 26554
PHONE: 304-367-9401

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Project Right

Engineers
Environmental

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2633 Elks Garden Road
Bluefield, WV 24701
(304) 327-4805

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MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 28 OF 57
REV:

LEGEND

PROPOSED GRADE

EXISTING GRADE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-4601

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Engineers
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320 West Main St.
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(304) 624-5830
8024 Kilby Shiloh Road
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Plain City, OH 43064
(614) 873-5221
Honesty, Integrity, Quality

RICHARD L. GINES
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PROFESSIONAL ENGINEER

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FOR:
EQT PRODUCTION COMPANY

MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 29 OF 57
REV:

LEGEND

PROPOSED GRADE

EXISTING GRADE

0' 50' 100' 150'

HORIZONTAL SCALE

0' 10' 20' 30'

VERTICAL SCALE

Stantec

111 ELDER STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING

SURVEYORS ENGINEERS ENVIRONMENTAL

PROJECT READY

2525 West Main St.
Kalispell, MT 59901
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3000 Ellis Station Road
Steubenville, OH 43947
(740) 264-6611

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RICHARD L. CAVENDISH
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

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MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013	
SCALE: AS SHOWN	
DESIGNED BY:RJH/JMR	
FILE NO.:SLS-8051	
SHEET 30 OF 57	
REV:	

LEGEND

PROPOSED GRADE

EXISTING GRADE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec
111 ELDERS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

Professional Energy Consultants
A DIVISION OF SMITH, LAND SURVEYING
Surveyors
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Engineers
Environmentalists
228 West Main St.
P.O. Box 190
Clarksburg, WV 26301
(304) 462-5634
8040 Elms Station Road
Sharpsville, OH 43457
(740) 317-4951
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RICHARD L. GAINES
REGISTERED
17220
STATE OF
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PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

MAIN ACCESS ROAD CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-6051
SHEET 31 OF 57
REV:

LEGEND

PROPOSED GRADE

EXISTING GRADE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0491

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
Surveyors
Project Mgmt.
Engineering
Environmental
SLS
2605 Cranberry Square Road
Morgantown, WV 26508
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235 West Main St.
Clarksburg, WV 26301
(304) 622-3024
HONESTY/INTEGRITY, QUALITY

RICHARD L. CALNICK
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 32 OF 57
REV:

LEGEND

PROPOSED GRADE

EXISTING GRADE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec
111 CLEVELAND STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
Surveyors
Project Team
Engineers
Environmental
SLS
255 West Main St.
P.O. Box 189
Waynesburg, PA 15370
(724) 852-2031
(304) 455-3004
8051 Ellis Bridge Road
Shepherdstown, WV 25443
(304) 876-2121
HONESTY | INTEGRITY | QUALITY

RICHARD L. CAINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

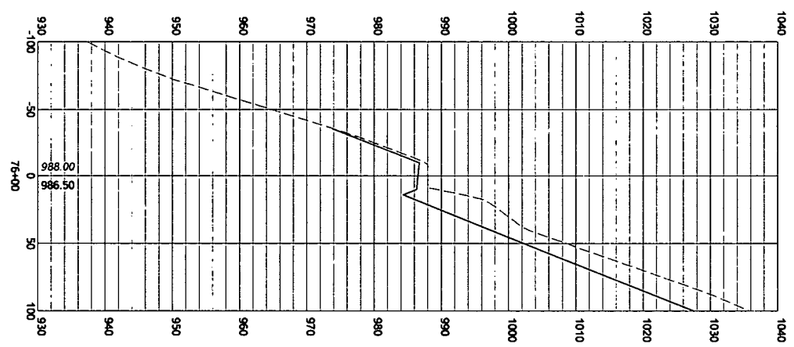
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 33 OF 57
REV:

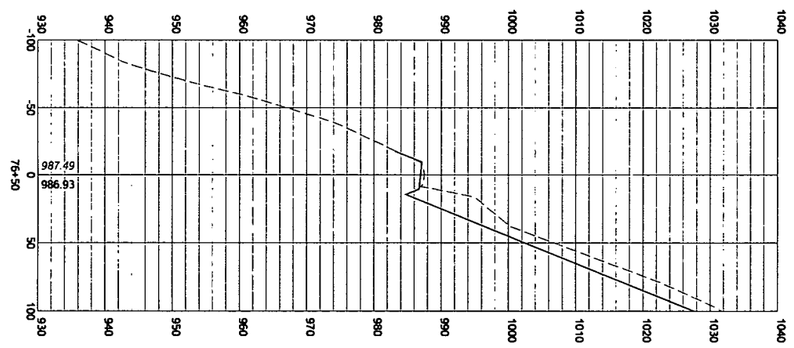
9/16/2013
WORKSPACE: DOT 2006 (SURVEY FEET)
U:\NORTH\SLS\2160-WELLS\LOCDOC\13.1 HIGHWAYS\PLANS\13726aXS01.dgn

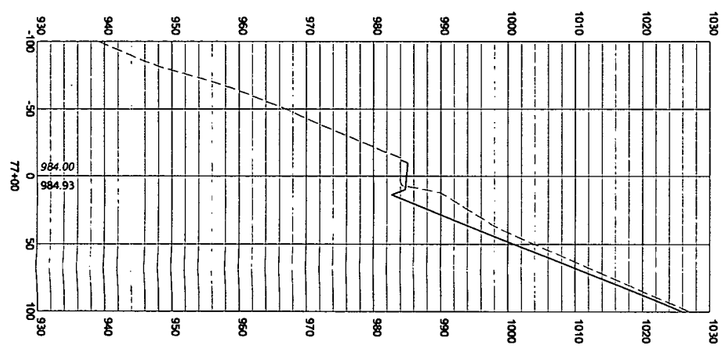
LEGEND

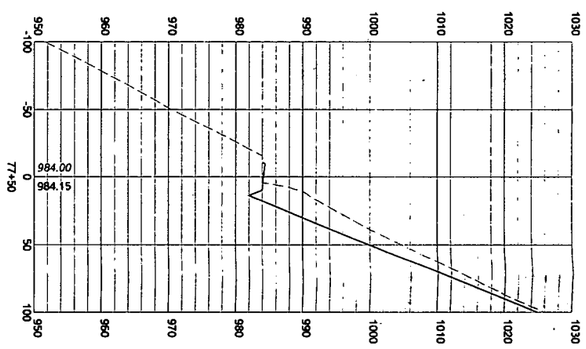
PROPOSED GRADE

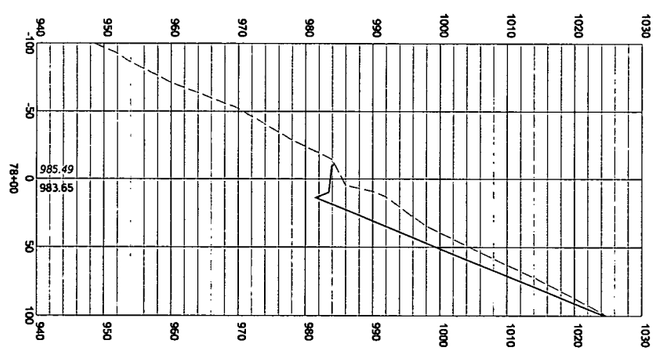
EXISTING GRADE

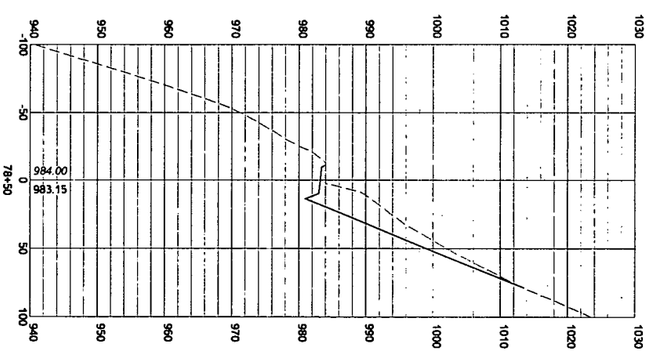


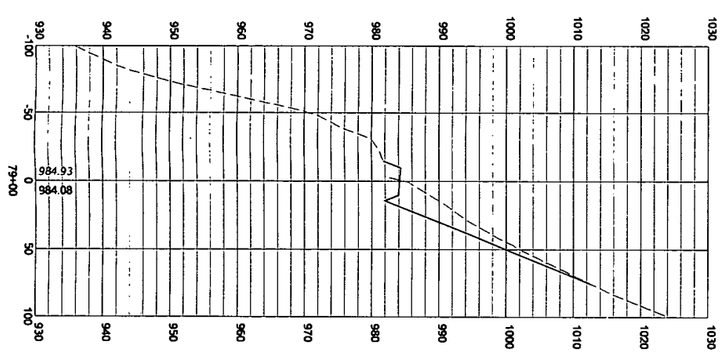


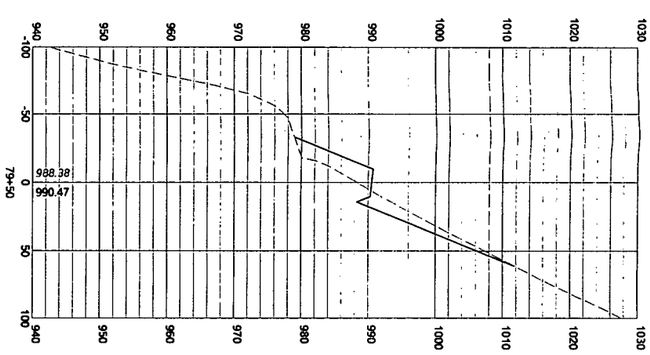






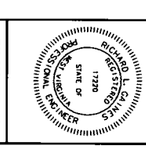






MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

THIS DOCUMENT WAS PRODUCED BY: STANTEC FOR: EQT PRODUCTION COMPANY



Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS
PROJECT MGMT.
ENGINEERS
ENVIRONMENTAL
SLS
226 West Main St.
P.O. Box 150
Glenville, WV 26351
(304) 462-5634
35053 Otto Dutton Road
Shadyville, OH 43947
(740) 671-0911
HONESTY, INTEGRITY, QUALITY

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/MR
FILE NO.: SLS-8051
SHEET: 34 OF 57
REV:

LEGEND

——— PROPOSED GRADE

– – – *EXISTING GRADE*

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec

111 ELDER STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
Surveyors Engineers
Project Mgmt. Environmental

SLS
228 West Main St.
P.O. Box 129 25311
Ripley, WV 25271
(304) 372-4012

8642 Lee's Summit Road
Batchtown, WV 25813
(740) 971-1911

HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 35 OF 57
REV:

LEGEND

PROPOSED GRADE

EXISTING GRADE

HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

Stantec

111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING

Surveyors
Project Mgmt.

Engineers
Environmental

SLS

238 West Main St.
P.O. Box 189 25231
Ripley, WV
(304) 462-8054

5644 Elbin Ashton Road
Sharpsville, PA 16347
(724) 813-3911

HONESTY · INTEGRITY · QUALITY

RICHARD L. CAINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 36 OF 57
REV:

LEGEND

PROPOSED GRADE

EXISTING GRADE

HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

Stantec

111 ELKINS STREET
FAIRMONT, WV 26554
PHONE 304-367-4601

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING

SURVEYORS
PROJECT RIGHT.

SLS

ENGINEERS
ENVIRONMENTAL

2693 Ohio Pennington Road
Reno, Ohio 45773
(740) 374-2331

HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 37 OF 57
REV:

DOT_2006
C:\pr_0_b\ltcks_TB\
01\ltcs_5\u15\2ss_PDF.plt

9/16/2013
WORKSPACE1, DOT_2006(SURVEY FEED)
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LEGEND

PROPOSED GRADE

EXISTING GRADE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE 304-367-4451

Professional Energy Consultants
Surveyors. Engineers. Environmental
Project Mgmt.
SLS
3054 Cities Service Road
Suite 1
Petroleum, WV 26161
(740) 374-4811
HONESTY, INTEGRITY, QUALITY

RICHARD L. CAINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

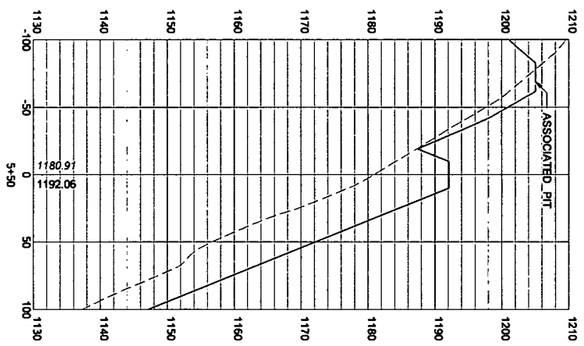
PIT / IMPOUND ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

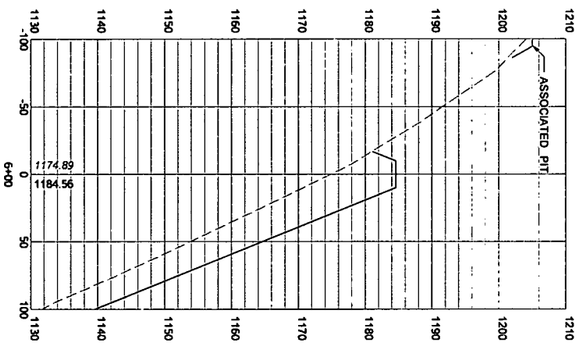
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 38 OF 57
REV:

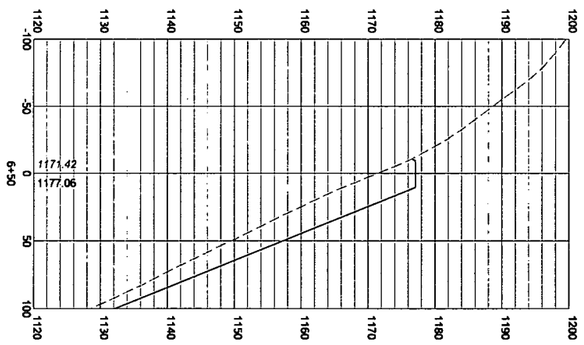
LEGEND

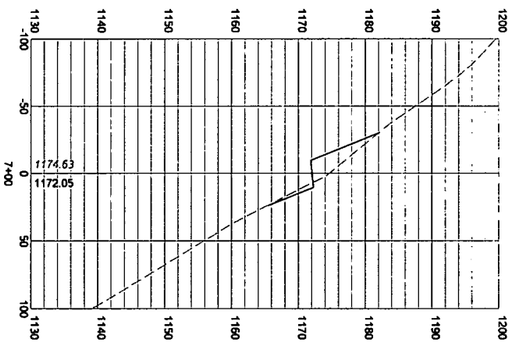
PROPOSED GRADE

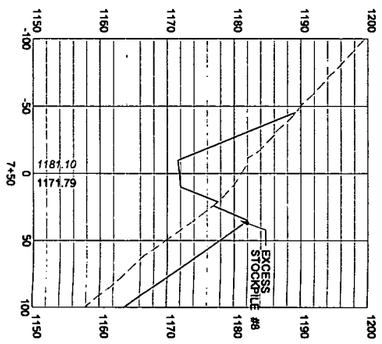
EXISTING GRADE

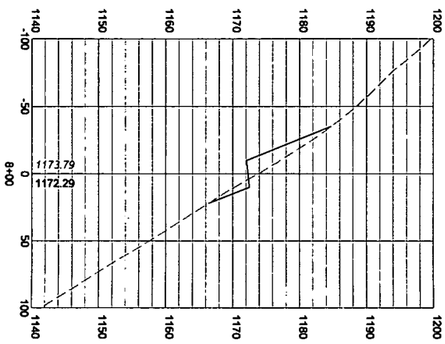


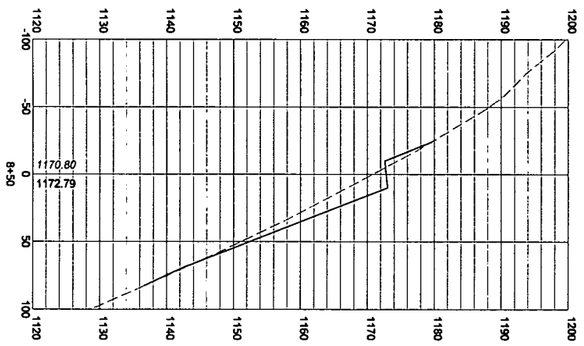


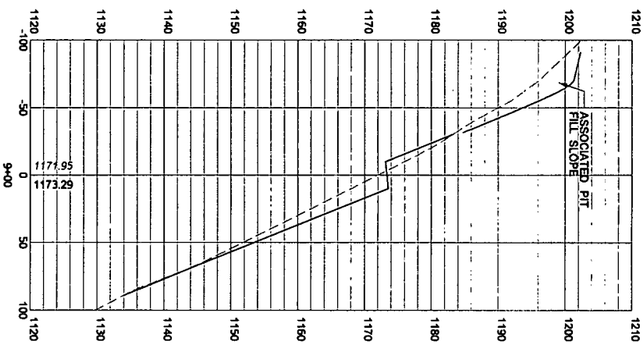


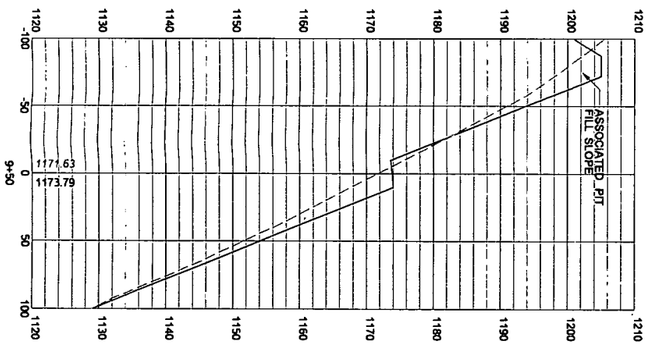


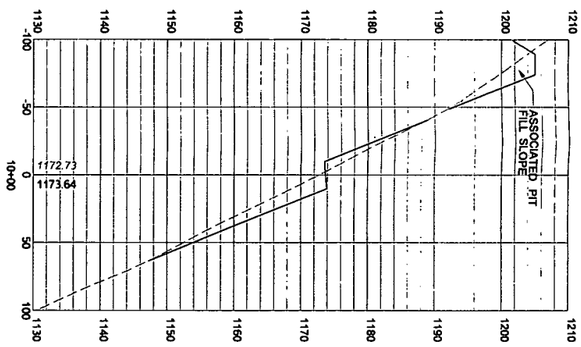












HORIZONTAL SCALE 0' 5' 10' 15'

VERTICAL SCALE 0' 10' 20' 30'

PIT / IMPOUND ACCESS ROAD CROSS SECTIONS
EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

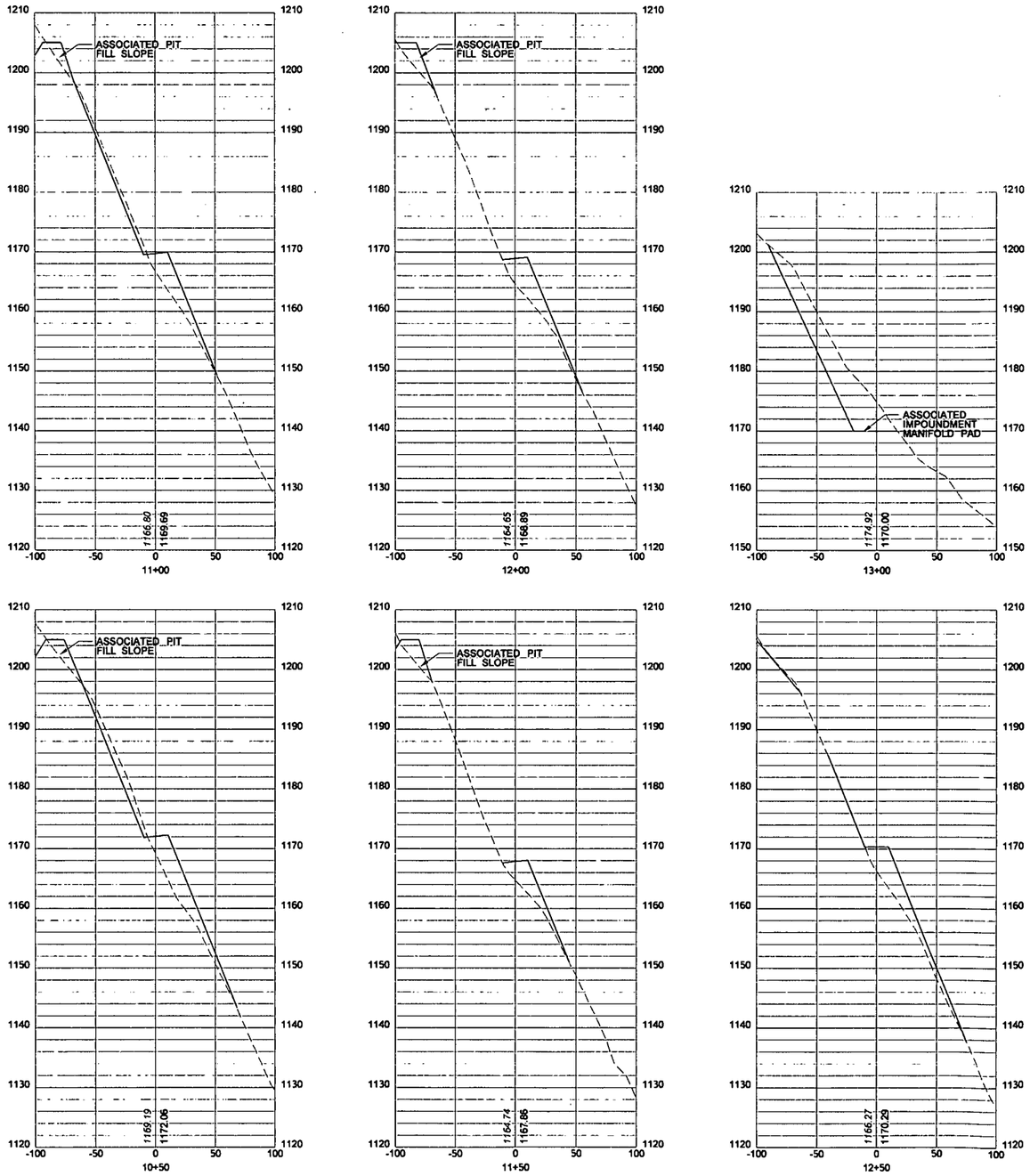
THIS DOCUMENT WAS PREPARED BY STANTEC FOR EQT PRODUCTION COMPANY

RICHARD L. CRAWFORD 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS PROJECT MGMT. SLS ENGINEERS ENVIRONMENTAL
228 West Main St. P.O. Box 150 Glenville, WV 26351 (304) 462-5634
5063 Otter Dorian Road Shadyside, OH 43947 (740) 671-8011
HONESTY, INTEGRITY, QUALITY

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

DATE: 9/16/2013	
SCALE: AS SHOWN	
DESIGNED BY: RJH/MJR	
FILE NO: SLS-4051	
SHEET	39 OF 57
REV:	



LEGEND

——— PROPOSED GRADE

– – – – *EXISTING GRADE*

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec

111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

Professional Energy Consultants
A DIVISION OF SMITH LAND SERVICES

SURVEYORS
PROJECT MGMT.
ENGINEERS
ENVIRONMENTAL

225 West Main St.
P.O. Box 1000
Glenville, WV 26351
(304) 462-5634

3024 Dirty Dehart Road
Bridgeport, WV 26330
(740) 971-0911

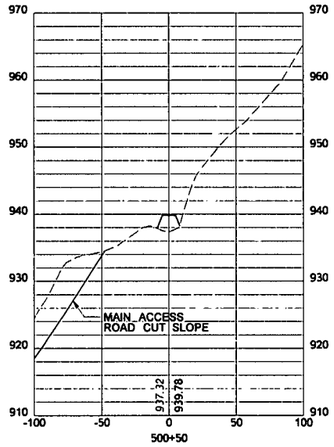
HONESTY, INTEGRITY, QUALITY

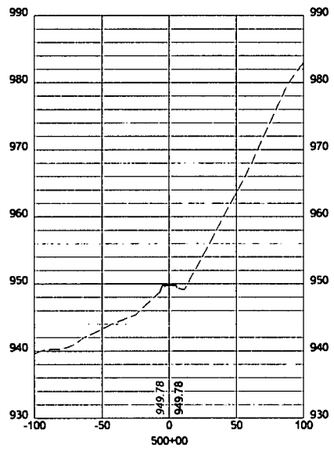
RICHARD L. GAINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

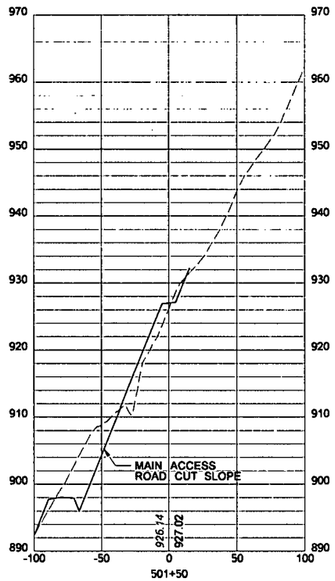
THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

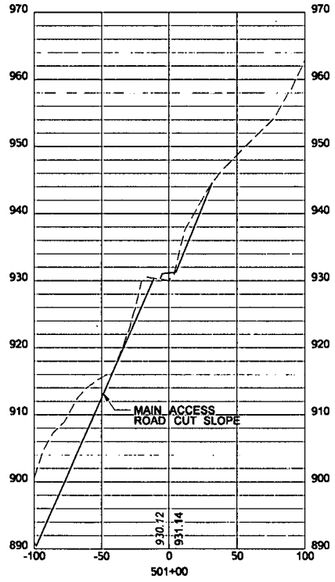
PIT / IMPOUND ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

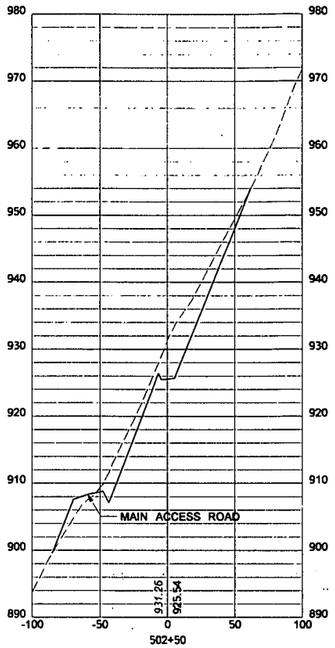
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 40 OF 57
REV:

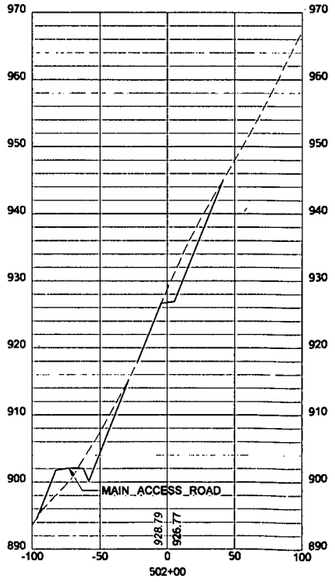


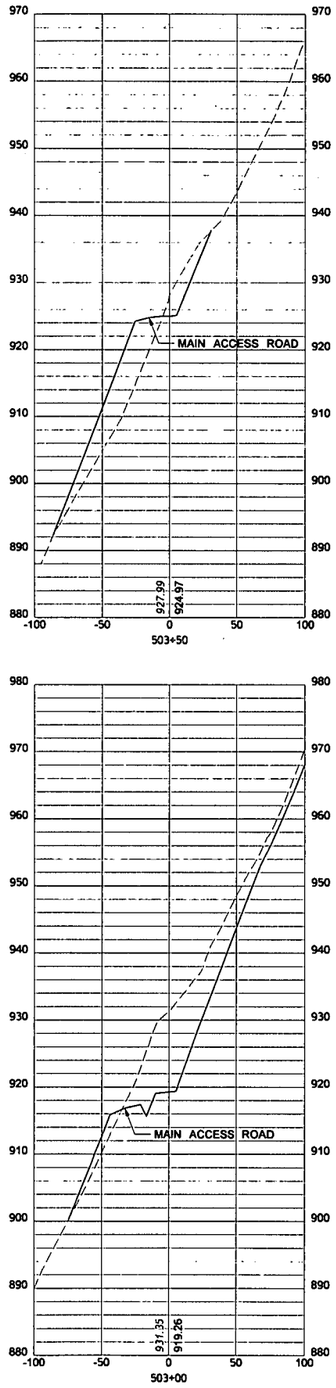


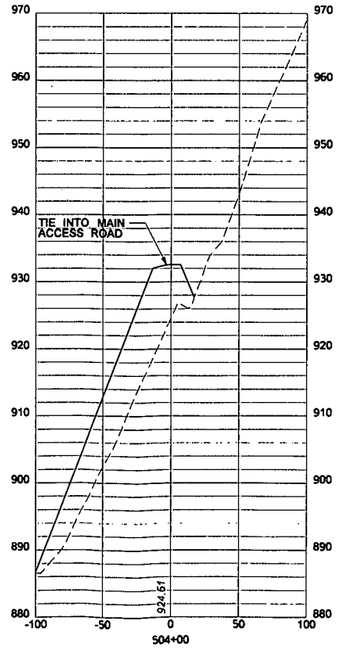












LEGEND

——— PROPOSED GRADE

– – – *EXISTING GRADE*

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE 304-367-9401

Professional Energy Consultants
A DIVISION OF SOUTHWESTERN LAND SURVEYORS, INC.
SURVEYORS
PROJECT RIGHT
ENGINEERS / ENVIRONMENTAL
SLS
2624 Ohio Avenue Road
St. Albans, WV 25177
(740) 971-9511
225 West Main St.
P.O. Box 1000
Glenville, WV 26351
(304) 462-5634
HONESTY / INTEGRITY / QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

EXISTING WELL ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 41 OF 57
REV:

LEGEND

PROPOSED GRADE

EXISTING GRADE

HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

Stantec

111 ELKINS STREET
FAIRMONT, WV 26554
PHONE 304-367-0401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING

SURVEYORS — ENGINEERS
PROJECT MGMT. — ENVIRONMENTAL

225 West 16th St.
Ronceverte, WV 24970
(304) 647-4539

3908 Ohio Avenue Road
Nitro, WV 25143
(740) 516-9911

HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

STOCKPILE ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE:	9/16/2013
SCALE:	AS SHOWN
DESIGNED BY:	RJH/JMR
FILE NO.:	SLS-8051
SHEET	42 OF 57
REV:	

9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)
u:\2027051372\eqt weu 51\13.0 roddi\13.1 highway\pres\RECLAIMED_1372eaP504.dgn

DOT_2006
Color_0.blackTB
OILGAS_Full51ze.PDF.plt

SITE RECLAMATION NARRATIVE

WITHIN SIX MONTHS OF THE EXPIRATION OF APPROVAL OF THE WELL PAD, ASSOCIATED IMPOUNDMENT, AND ASSOCIATED PIT, THIS SITE SHALL BE CLOSED AND RESTORED TO A PRE-CONSTRUCTION CONDITION. ALL PIPING FOR THE GROUNDWATER DEWATERING SYSTEM, WATER LINES, AND ASSOCIATED STRUCTURES SHALL BE REMOVED. ALL EXISTING BMPS SHOWN SHALL BE INSPECTED FOR DAMAGE AND REPLACED AS NECESSARY BEFORE RECLAMATION CAN BEGIN. THE SITE SHALL BE REGRADED AS INDICATED ON THE PLAN TO PRE-CONSTRUCTION GRADES. UPON COMPLETION OF GRADING, THE SITE SHALL BE SEEDED AND MULCHED PER THE REVEGETATION DETAILS ON SHEET 56.

DO NOT EXCAVATE WITHIN THIS AREA
POTENTIAL SLIP AREA
LIMIT OF DISTURBANCE
WV CR 13
EPHEMERAL UNIT 1
INTERMITTENT UNIT 3
EPHEMERAL UNIT 2
EPHEMERAL UNIT 3
EPHEMERAL UNIT 4
EPHEMERAL UNIT 6
EPHEMERAL UNIT 7
EPHEMERAL UNIT 8
EPHEMERAL UNIT 9
EPHEMERAL UNIT 10
EPHEMERAL UNIT 11
UNT 12
CFS-30 (24")
CFS-31 (24")
CFS-33 (18")
CFS-34 (18")
CFS-35 (24")
CFS-36 (24")
CFS-37 (24")
EXCESS MATERIAL STOCKPILE TO BE REMOVED
EXCESS MATERIAL STOCKPILE TO BE REMOVED
LIMIT OF DISTURBANCE
LIMIT OF DISTURBANCE
NORTH
HORIZONTAL SCALE
0' 50' 100' 150'

SEE SHEET 44

ACCESS ROAD RECLAMATION PLAN
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO: SLS-8051
SHEET 43 OF 57
REV:

THIS DOCUMENT WAS PREPARED BY STANTEC FOR EQT PRODUCTION COMPANY

RICHARD J. HOLSTEIN, JR. 17220 STATE OF WEST VIRGINIA REGISTERED PROFESSIONAL ENGINEER

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS PROJECT MGMT. SLS ENGINEERS ENVIRONMENTAL
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99063 Dries Bottom Road Shadyside, OH 43947 (740) 671-0611
HONESTY, INTEGRITY, QUALITY

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

SEE SHEET 43

SITE RECLAMATION NARRATIVE

WITHIN SIX MONTHS OF THE EXPIRATION OF APPROVAL OF THE WELL PAD, ASSOCIATED IMPOUNDMENT, AND ASSOCIATED PIT, THIS SITE SHALL BE CLOSED AND RESTORED TO A PRE-CONSTRUCTION CONDITION. ALL PIPING FOR THE GROUNDWATER DEWATERING SYSTEM, WATER LINES, AND ASSOCIATED STRUCTURES SHALL BE REMOVED. ALL EXISTING BMPS SHOWN SHALL BE INSPECTED FOR DAMAGE AND REPLACED AS NECESSARY BEFORE RECLAMATION CAN BEGIN. THE SITE SHALL BE REGRADED AS INDICATED ON THE PLAN TO PRE-CONSTRUCTION GRADES. UPON COMPLETION OF GRADING, THE SITE SHALL BE SEEDED AND MULCHED PER THE REVEGETATION DETAILS ON SHEET 56.

LIMIT OF DISTURBANCE

EPHEMERAL UNT 12

EPHEMERAL UNT 14

EPHEMERAL UNT 15

EPHEMERAL UNT 16

EPHEMERAL UNT 17

EPHEMERAL UNT 18

EPHEMERAL UNT 19

CFS (24") 58

CFS (24") 59

CFS (24") 60

CFS (24") 61

CFS (24") 62

EX WELL API# 47-017-4446

EXCESS MATERIAL STOCKPILE TO BE REMOVED

EXISTING 2" GASLINE

EX. RISER

TOP OF HIGHWALL

HORIZONTAL SCALE 0' 50' 100' 150'

SEE SHEET 45

ACCESS ROAD RECLAMATION PLAN

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO: BLS-8051
SHEET 44 OF 57
REV:

THIS DOCUMENT WAS PREPARED BY STANTEC FOR EQT PRODUCTION COMPANY

RICHARD J. HUNSINGER 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

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SITE RECLAMATION NARRATIVE

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RICHARD L. GAINES REGISTERED 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

ACCESS ROAD RECLAMATION PLAN

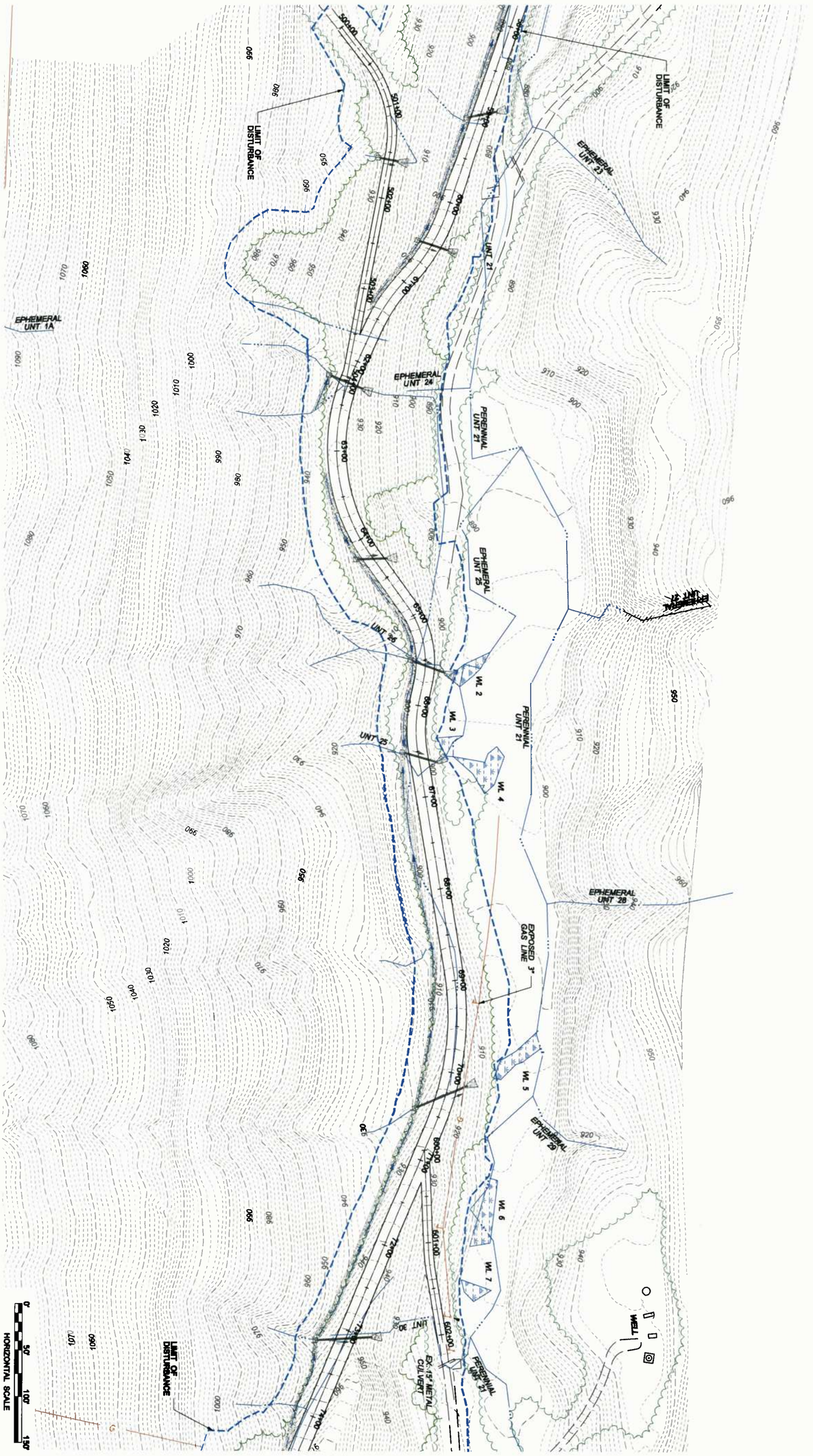
EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE:	9/16/2013
SCALE:	AS SHOWN
DESIGNED BY:	RJH/JMR
FILE NO.:	SLS-8051
SHEET	45 OF 57
REV:	

9/16/2013
WORKPACES 9/17/2006 (SURVEY FEED)
H:\2012\8051\372dwg\wells\8051GDOV13.1 highwaysplansREVISED.1372exPS06.dgn
DOT 2006
8051GDOV13.1 highways.TBL
8051GDOV13.1 highways.PDF.plt

SEE SHEET 45



SEE SHEET 47

SITE RECLAMATION NARRATIVE

WITHIN SIX MONTHS OF THE EXPIRATION OF APPROVAL OF THE WELL PAD, ASSOCIATED IMPOUNDMENT, AND ASSOCIATED PIT, THIS SITE SHALL BE CLOSED AND RESTORED TO A PRE-CONSTRUCTION CONDITION. ALL PIPING FOR THE GROUNDWATER DEWATERING SYSTEM, WATER LINES, AND ASSOCIATED STRUCTURES SHALL BE REMOVED. ALL EXISTING BMPS SHALL REMAIN INSTALLED AND MAINTAINED AS NECESSARY BEFORE RECLAMATION CAN BEGIN. THE SITE SHALL BE REGRADED AS INDICATED ON THE PLAN TO PRE-CONSTRUCTION GRADES. UPON COMPLETION OF GRADING, THE SITE SHALL BE SEEDED AND MULCHED PER THE REVEGETATION DETAILS ON SHEET 55.

ACCESS ROAD RECLAMATION PLAN

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

THE PROJECT WAS PREPARED BY STANTEC FOR EQT PRODUCTION COMPANY

RICHARD L. GUMP — 17220 — STATE OF WEST VIRGINIA — REGISTERED PROFESSIONAL ENGINEER

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FAIRMONT, WV 26554
PHONE: 304-367-9401

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO: SLS-8051
SHEET: 46 OF 57
REV:

SITE RECLAMATION NARRATIVE

WITHIN SIX MONTHS OF THE EXPIRATION OF APPROVAL OF THE WELL PAD, ASSOCIATED IMPOUNDMENT, AND ASSOCIATED PIT, THIS SITE SHALL BE CLOSED AND RESTORED TO A PRE-CONSTRUCTION CONDITION. ALL PIPING FOR THE GROUNDWATER DEWATERING SYSTEM, WATER LINES, AND ASSOCIATED STRUCTURES SHALL BE REMOVED. ALL EXISTING BMPS SHOWN SHALL BE INSPECTED FOR DAMAGE AND REPLACED AS NECESSARY BEFORE RECLAMATION CAN BEGIN. THE SITE SHALL BE REGRADED AS INDICATED ON THE PLAN TO PRE-CONSTRUCTION GRADES. UPON COMPLETION OF GRADING, THE SITE SHALL BE SEEDED AND MULCHED PER THE REVEGETATION DETAILS ON SHEET 55.

NOTE:

UTILIZE TOPSOIL STOCKPILE #1 AND EXCESS MATERIAL STOCKPILES #4 AND #9 FOR SITE RECLAMATION. COMPLETELY REMOVE THESE STOCKPILES BEFORE USING OTHER STOCKPILE LOCATIONS FOR SITE RECLAMATION.

NORTH

CFS-127 (24")
CFS-126 (24")
EXCESS MATERIAL STOCKPILE #9 TO BE REMOVED (SEE NOTE ABOVE)
TOPSOIL MATERIAL STOCKPILE #1 TO BE REMOVED (SEE NOTE ABOVE)
EXCESS MATERIAL STOCKPILE #4 TO BE REMOVED (SEE NOTE ABOVE)
LIMIT OF DISTURBANCE
CFS-124 (12")
CFS-125 (12")
PERENNIAL UNT 21
EX. 10" METAL CULVERT
LOG PILE
EX. 18" METAL CULVERT
EX. 12" METAL CULVERT
CFS-112 (24")
CFS-113 (24")
DO NOT DISTURB EXISTING WELL
EX. WELL HEAD API# 47-017-1687
CFS-150 (24")
CFS-149 (24")
CFS-148 (24")
CFS-151 (24")
EPHEMERAL UNT 30A
EXCESS MATERIAL STOCKPILE TO BE REMOVED
CFS-147 (24")
CFS-122 (24")
CFS-121 (24")
CFS-120 (24")
CFS-119 (24")
CFS-152 (24")
CFS-153 (24")
CFS-154 (24")
LIMIT OF DISTURBANCE
EXISTING 2" GAS LINE
EXISTING 15" METAL CULVERT
CFS-155 (24")
CFS-156 (24")
CFS-115 (24")
CFS-116 (24")
CFS-117 (24")
CFS-118 (24")
INTERMITTENT UNT 34
EPHEMERAL UNT 30A
INTERMITTENT UNT 33
VERNAL POOL 2
EPHEMERAL UNT 32
EPHEMERAL UNT 29A
EPHEMERAL UNT 31
POND 1
LIMIT OF DISTURBANCE
CFS-195 (18")
CFS-194 (18")
CFS-193 (18")
CFS-192 (18")
CFS-191 (18")
EXCESS MATERIAL STOCKPILE TO BE REMOVED
CFS-196 (18")
CFS-197 (18")
CFS-198 (18")
CFS-199 (18")
EPHEMERAL UNT 27A
EPHEMERAL UNT 26A
EXCESS MATERIAL STOCKPILE TO BE REMOVED
CFS-175 (24")
CFS-176 (24")
CFS-177 (24")
CFS-178 (24")
EX. WELL API# 47-017
81+00
80+00
82+00
79+00
83+00
84+00
85+00
86+00
87+00
78+00
77+00
76+00
75+00
74+00

0' 50' 100' 150'
HORIZONTAL SCALE

SEE SHEET 46
SEE SHEET 48
SEE SHEET 49

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

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HONESTY, INTEGRITY, QUALITY

RICHARD L. CAINES REGISTERED 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

ACCESS ROAD RECLAMATION PLAN

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO. SLS-8051
SHEET 47 OF 57
REV:

9/16/2013
WORK PATH: DOT-2006 (SURVEY FEET)
LAYOUT: 1372-eap-wes_51\13.0 Cad\13.1 hi\Pheasy\pres\RECLAIMED 1372eaP508.dgn

SEE SHEET 49

SEE SHEET 47

EXISTING GAS LINE

CFS-246C (18")

CFS-246D (18")

CFS-246B (12")

CONTAINMENT BERM TO BE REMOVED (TYP)

CFS-246A (18")

CFS-245 (24")

CFS-244 (24")

CFS-243 (24")

CFS-241 (24")

LIMIT OF DISTURBANCE

CFS-242 (24")

CFS-240 (24")

CFS-246 (24")

CFS-248 (24")

CFS-248A (18")

CFS-247 (24")

CFS-178 (24")

CFS-247A (18")

CFS-247B (18")

CFS-247C (12")

CFS-247D (18")

CFS-247E (12")

CFS-247F (24")

H5-WV 514665
H4-WV 514664
H3-WV 514663
H2-WV 514662
H1-WV 514661

ELEV - 1208.0

CFS-238 (24")

EXISTING GAS WELL DO NOT DISTURB

WL 2A

EX WELL API# 47-017-4136

EXISTING TANK

WL 1A

ASSOCIATED PIT, SAFETY FENCE, AND MANIFOLD PAD AND TRUCK TURNAROUND TO BE REMOVED

CFS-235A (24")

CFS-232 (12")

CFS-233 (12")

CFS-234 (12")

CFS-235 (24")

CFS-232A (24")

CFS-232B (18")

CFS-209 (12")

CFS-211 (12")

CFS-210 (12")

CFS-212 (12")

CFS-213 (12")

EXCESS MATERIAL STOCKPILE TO BE REMOVED

CFS-191 (18")

CFS-192 (18")

CFS-193 (18")

CFS-194 (18")

CFS-195 (18")

CFS-196 (18")

CFS-197 (18")

CFS-198 (18")

CFS-199 (18")

CFS-200 (18")

CFS-201 (18")

CFS-202 (12")

EXCESS MATERIAL STOCKPILE TO BE REMOVED

ASSOCIATED IMPOUNDMENT, SAFETY FENCE, AND MANIFOLD PAD AND TRUCK TURNAROUND TO BE REMOVED

CFS-231 (12")

CFS-230 (12")

CFS-229 (24")

CFS-228 (24")

CFS-227 (12")

CFS-226 (12")

CFS-223 (12")

CFS-222 (12")

CFS-221 (12")

CFS-220 (12")

CFS-219 (24")

CFS-214 (24")

CFS-215 (24")

CFS-216 (24")

CFS-217 (24")

CFS-218 (24")

LIMIT OF DISTURBANCE

EPHEMERAL UNT 22A
EPHEMERAL UNT 22A
EPHEMERAL UNT 23A
EPHEMERAL UNT 24A
EPHEMERAL UNT 15A
EPHEMERAL UNT 14A
EPHEMERAL UNT 13A
EPHEMERAL UNT 11A
INTERMITTENT UNT 2A
EPHEMERAL UNT 21A
INTERMITTENT UNT 2A
EPHEMERAL UNT 20A
EPHEMERAL UNT 19A
EPHEMERAL UNT 18A
INTERMITTENT UNT 16A
EPHEMERAL UNT 17A
EPHEMERAL UNT 12A

NORTH

SITE RECLAMATION NARRATIVE

WITHIN SIX MONTHS OF THE EXPIRATION OF APPROVAL OF THE WELL PAD, ASSOCIATED IMPOUNDMENT, AND ASSOCIATED PIT, THIS SITE SHALL BE CLOSED AND RESTORED TO A PRE-CONSTRUCTION CONDITION. ALL PIPING FOR THE GROUNDWATER DEWATERING SYSTEM, WATER LINES, AND ASSOCIATED STRUCTURES SHALL BE REMOVED. ALL EXISTING BMPS SHOWN SHALL BE INSPECTED FOR DAMAGE AND REPLACED AS NECESSARY BEFORE RECLAMATION CAN BEGIN. THE SITE SHALL BE REGRADED AS INDICATED ON THE PLAN TO PRE-CONSTRUCTION GRADES. UPON COMPLETION OF GRADING, THE SITE SHALL BE SEEDED AND MULCHED PER THE REVEGETATION DETAILS ON SHEET 55.

0' 50' 100' 150'

HORIZONTAL SCALE

SEE SHEET 47

Stantec

111 ELDER STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

Professional Energy Consultants
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HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

ACCESS ROAD AND WELL SITE RECLAMATION PLAN

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 48 OF 57
REV:

9/16/2013
WORKSPACE1 (DOT_2006 (SURVEY FEET)
u:\2802\05_372-0401_wvu-3_3.0_6001.3.1_highway_pas\RECLAMATION\137-asP-09.dgn

SEE SHEET 47

SITE RECLAMATION NARRATIVE

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0' 50' 100' 150'
HORIZONTAL SCALE

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PHONE: 304-367-9401

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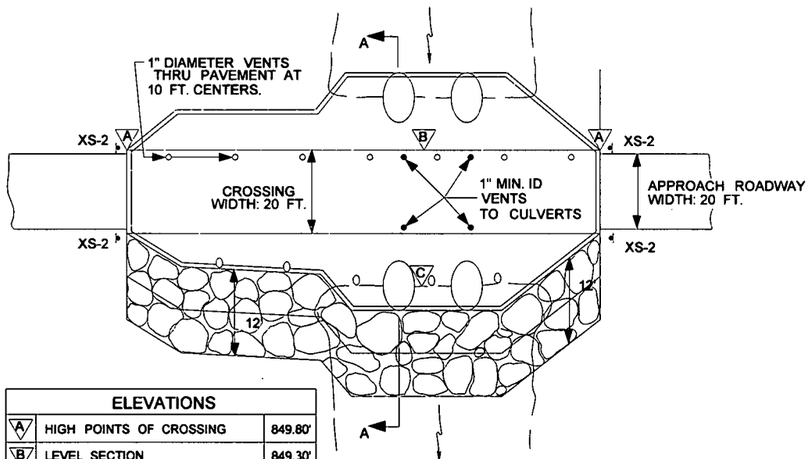
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

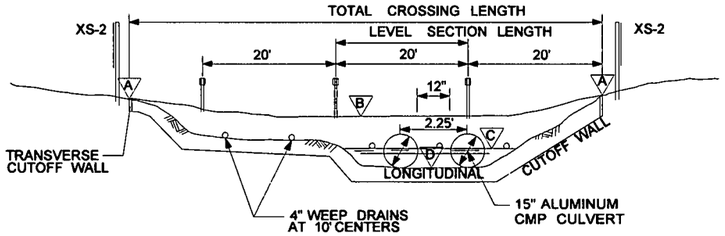
ACCESS ROAD AND WELL SITE
RECLAMATION PLAN
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 49 OF 57
REV:

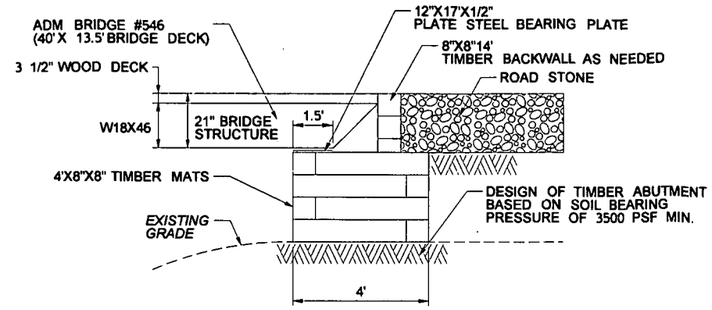


ELEVATIONS		
A	HIGH POINTS OF CROSSING	849.80'
B	LEVEL SECTION	849.30'
C	NORMAL DAILY STREAM FLOW	846.50'
D	STREAMBED (DOWNSTREAM)	846.00'

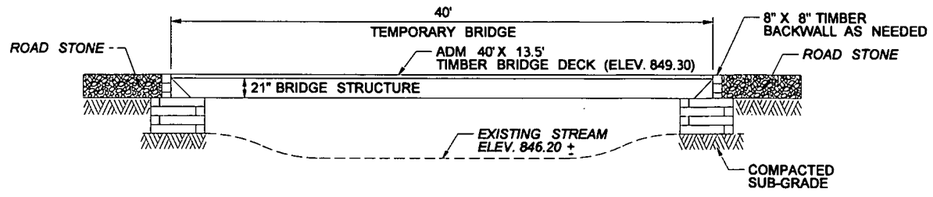
PLAN VIEW



ELEVATION VIEW

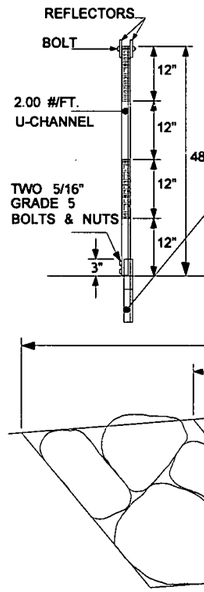


ABUTMENT DETAILS

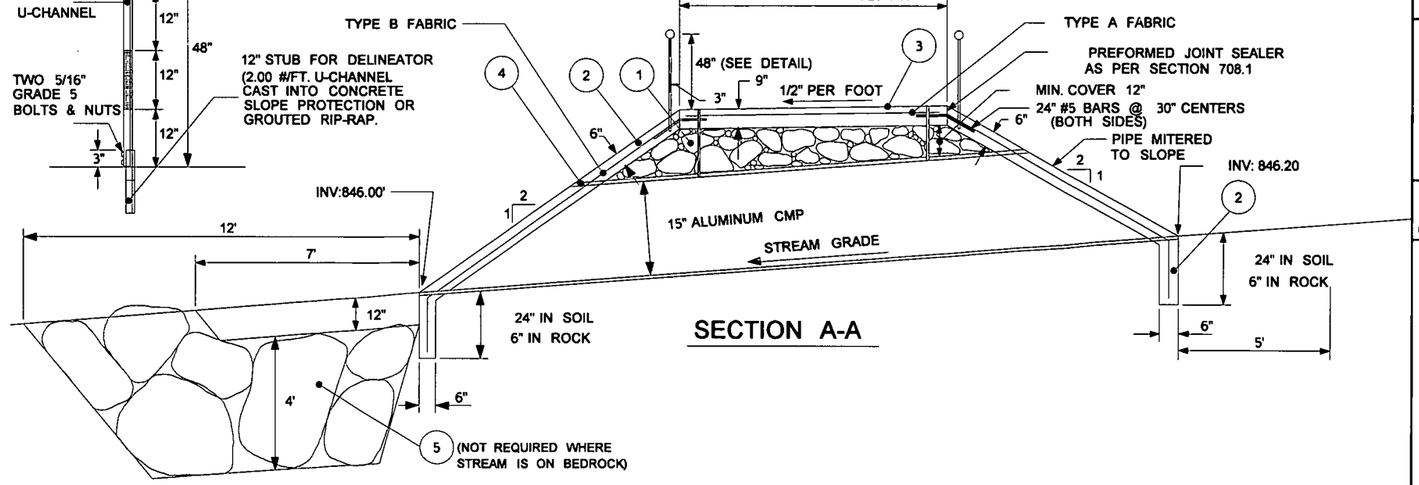


TEMPORARY BRIDGE DETAIL

NTS



DELINEATOR DETAIL
(PROFILE VIEW)



(1) ROCK BORROW EXCAVATION (ROCK SIZE MAXIMUM: 6" WITHIN 12" OF PIPE)

(2) CONCRETE SLOPE PROTECTION (ITEM 218002-000,GROUTED RIP RAP MAY BE SUBSTITUTED AS PER ALTERNATE SLOPE DETAIL)

(3) 9 INCH REINFORCED PORTLAND CEMENT CONCRETE PAVEMENT

(4) FOUR 15" ALUMINUM CULVERTS

(5) ROCK BORROW EXCAVATION (ROCK SIZE MINIMUM 18", MAXIMUM 48")

WEEP DRAINS

WEEP DRAINS ARE TO BE PLACED ON DOWNSTREAM SIDE ONLY. ANY TYPE OF PIPE WHICH WILL PROVIDE ADEQUATE FORMING OF WEEP HOLES THRU THE WALL MAY BE USED. COST OF PIPE IS TO BE INCLUDED IN VARIOUS BID ITEMS.

CULVERT PIPES

ALTHOUGH THESE DETAILS INDICATE USE OF 2 CULVERTS AS TYPICAL SITUATION, THE CROSSING FOR THIS LOCATION REQUIRES 4 PIPE CULVERTS; AND SUFFICIENT QUANTITIES ARE INCLUDED IN THE CONTRACT DOCUMENTS.

INCIDENTAL ITEMS

NO SEPARATE PAYMENT FOR JOINT SEALER, #5 BARS, OR VENT PIPES.

HAZARD MARKERS & DELINEATORS

XS-2 HAZARD MARKERS AS PER STANDARD SHEET TP5-2 ARE TO BE INSTALLED AT EACH CORNER OF STRUCTURE. U-CHANNEL (2.00 #/FT.) AS PER STANDARD SHEET TEI-7A SHALL BE USED FOR HAZARD MARKER SUPPORTS AND FOR MOUNTING BIDIRECTIONAL 3 1/4" DELINEATORS AT MAXIMUM 20' SPACING EACH SIDE OF STRUCTURE. COST OF ALL MATERIALS AND LABOR FOR INSTALLATION OF HAZARD MARKERS AND DELINEATORS IS TO BE INCLUDED IN THE VARIOUS BID ITEMS AND NO SEPARATE PAYMENT WILL BE MADE. AT LEAST ONE POST TO BE STRIPED WITH BLACK PAINT AS SHOWN IN DETAIL.

VENT PIPES

VENTS MAY BE COMMERCIALLY-AVAILABLE ABS, PVC, OR PE.

BLUESTONE CREEK LOW WATER CROSSING DETAIL

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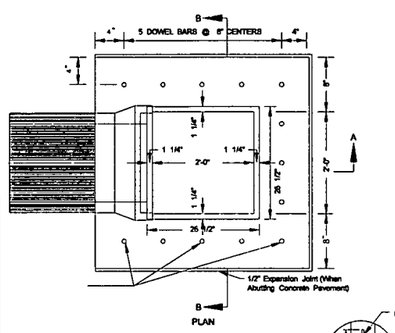
Mt. Morris, PA 15349
(724) 324-4411
HONESTY, INTEGRITY, QUALITY

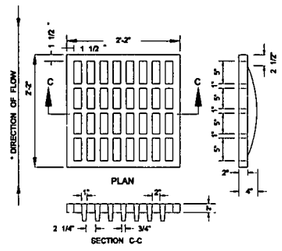
RICHARD L. GAINES REGISTERED 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

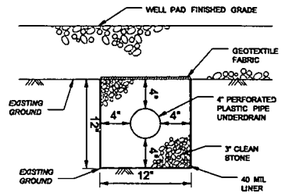
CONSTRUCTION DETAILS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE:	9/16/2013
SCALE:	AS SHOWN
DESIGNED BY:	RJH/JMR
FILE NO.:	SLS-8051
SHEET	50 OF 57
REV:	

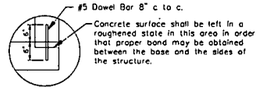




* The grate shall be placed so that the 4" deep bars will be parallel to Direction of Flow.



PAD UNDERDRAIN DETAIL
NTS



ALTERNATE CONSTRUCTION JOINT DETAIL

NOTES

All concrete shall be Class B Concrete.

The type and size of pipe to be used with the inlet shall be the type and size as called for on the Plans.

Details show pipe entering one side of the inlet, however pipes may enter any or all sides as called for on the Plans.

Footer up to construction joint shall be Class B Concrete.

Sidewalls shall be concrete above footer.

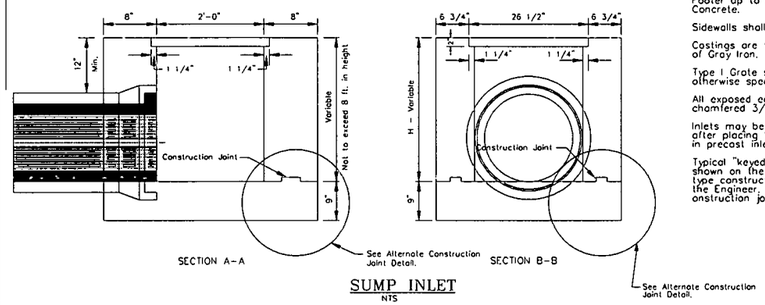
Castings are to be of the design shown and are to be of Gray Iron.

Type I Grate shall be used at all locations, unless otherwise specified on the Plans.

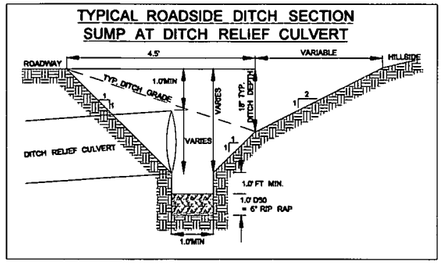
All exposed edges of construction joints shall be chamfered 3/4".

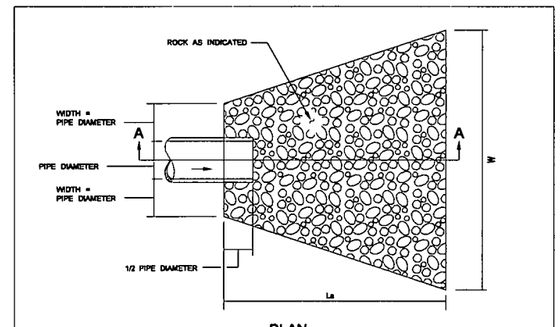
Inlets may be precast, with lifting hooks out of sight after placing. Sufficient reinforcement shall be included in precast inlets to resist handling stresses.

Typical "keyed" and "doweled" construction joints are shown on the details herein. Other "keyed" or "doweled" type construction joints may be used if acceptable to the Engineer. When precast construction is used, this construction joint will be omitted.



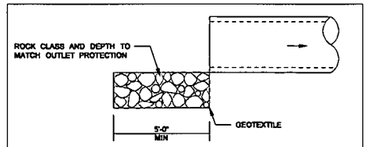
SUMP INLET
NTS





NOTES:
1. PROVIDE GEOTEXTILE MATERIAL ALONG ALL INTERFACE AREAS WITH GROUND CONTACT.
2. SLOPE SHOULD BE LEVEL OR AS CLOSE TO LEVEL AS POSSIBLE BASED ON EXISTING SITE CONDITIONS.

OUTLET PROTECTION
NOT TO SCALE



PIPE INLET PROTECTION
NOT TO SCALE

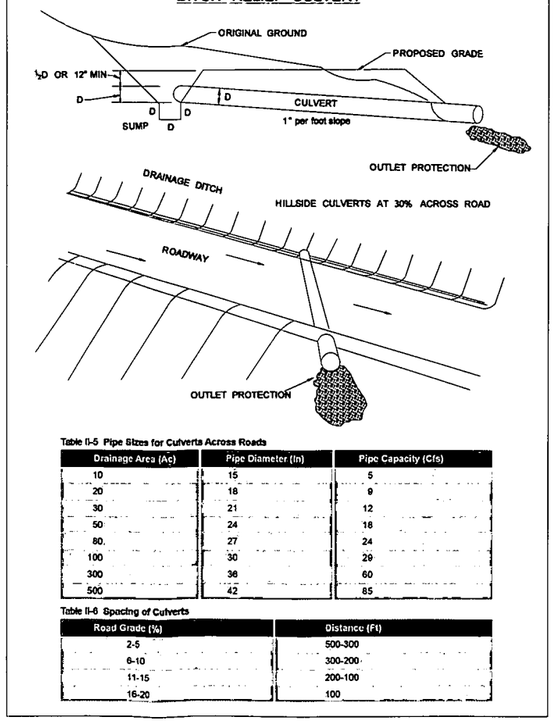


Table 11-5 Pipe Sizes for Culverts Across Roads

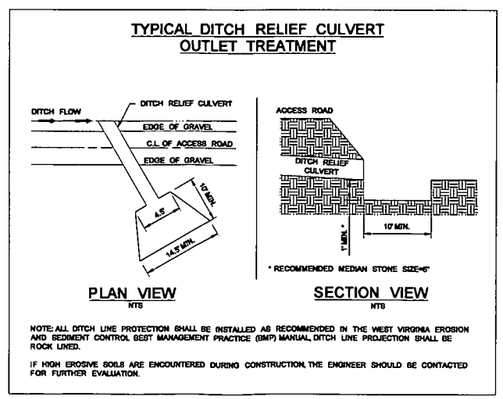
Drainage Area (Ac)	Pipe Diameter (In)	Pipe Capacity (Cfs)
10	15	5
20	18	9
30	21	12
50	24	18
80	27	24
100	30	29
300	36	60
500	42	85

Table 11-6 Spacing of Culverts

Road Grade (%)	Distance (Ft)
2-5	500-300
6-10	300-200
11-15	200-100
16-20	100

CORRUGATED METAL PIPE DESIGN TABLE

PIPE LOCATION (STA)	PIPE DIAMETER (IN)	PIPE LENGTH (FT)	OUTLET PROTECTION			
			MIN D50 (IN)	ROCK DEPTH (IN)	LENGTH (FT)	WIDTH (FT)
1+40	15	37	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
2+20	15	28	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
3+20	15	29	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
5+00	15	29	6	14	8	11.8
8+00	15	37	6	14	8	11.8
9+92	15	30	6	14	8	11.8
11+00	15	29	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
12+18	15	28	6	14	8	11.8
13+15	15	39	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
14+50	15	28	6	14	8	11.8
16+10	15	34	6	14	8	11.8
17+82	18	34	6	14	10	14.5
20+21	15	28	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
22+47	15	41	6	14	8	11.8
24+35	15	39	6	14	8	11.8
26+95	18	30	6	14	9	13.5
28+82	15	30	6	14	8	11.8
31+18	15	40	6	14	8	11.8
37+24	15	55	6	14	8	11.8
39+00	15	40	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
40+88	15	32	6	14	8	11.8
42+75	15	29	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
44+02	15	33	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
53+50	15	35	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
57+00	21	29	6	14	12	17.3
501+58	18	20	6	14	9	13.5
59+00	21	29	6	14	12	17.3
60+50	15	33	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
62+25	15	37	6	14	8	11.8
64+25	15	32	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
65+55	15	37	6	14	8	11.8
66+55	27	37	6	14	13	19.8
70+25	15	59	6	14	8	11.8
73+08	18	59	6	14	8	11.8
78+20	15	37	6	14	8	11.8
79+73	15	32	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
80+73	15	37	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
84+50	18	31	6	14	9	13.5
86+34	24	65	6	14	12	14
88+00	15	34	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
89+00	15	28	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
90+00	15	31	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
91+00	15	48	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
92+64	15	39	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
1+50 (IMPOUND. RD)	15	28	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
11+60 (IMPOUND. RD)	15	30	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
STOCKPILES	DUAL 24	35	12	27	26	38



PLAN VIEW
NTS

SECTION VIEW
NTS

NOTE: ALL DITCH LINE PROTECTION SHALL BE INSTALLED AS RECOMMENDED IN THE WEST VIRGINIA EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE (BMP) MANUAL. DITCH LINE PROJECTION SHALL BE ROCK LINED.

IF HIGH EROSIVE SOILS ARE ENCOUNTERED DURING CONSTRUCTION, THE ENGINEER SHOULD BE CONTACTED FOR FURTHER EVALUATION.

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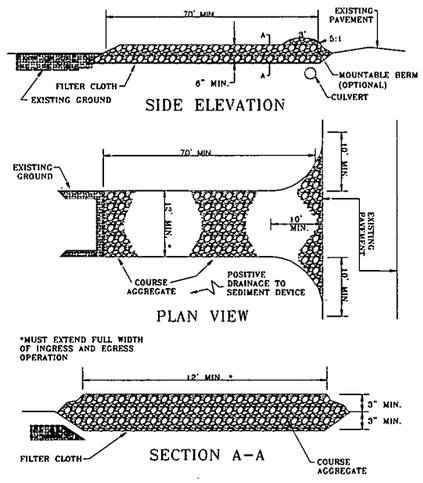
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

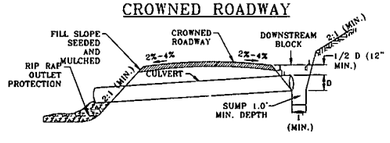
CONSTRUCTION DETAILS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 51 OF 57
REV:

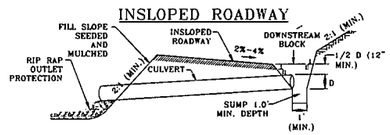
STONE CONSTRUCTION ENTRANCE



CROWNED ROADWAY



INSLOPED ROADWAY



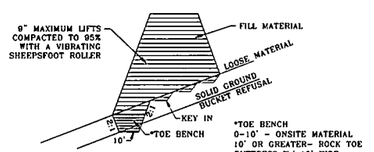
CUT AND FILL SLOPES SHALL BE STABILIZED IMMEDIATELY UPON COMPLETION OF ROADWAY GRADING. THESE AREA SHALL BE BLANKETED WHEREVER THEY ARE LOCATED WITHIN 50 FEET OF A SURFACE WATER OR WITHIN 100 FEET OF SURFACE WATER WHERE A SUITABLE VEGETATIVE FILTER STRIP DOES NOT EXIST.

A DURABLE TOP DRESSING SHALL BE PROVIDED FOR SOILS HAVING LOW STRENGTH.

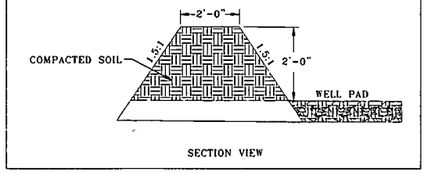
ROADSIDE DITCHES SHALL BE PROVIDED WITH ADEQUATE PROTECTIVE LINING.

ROADWAY SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED ROADWAYS, DITCHES OR CROSS DRAINS SHALL BE REPAIRED IMMEDIATELY.

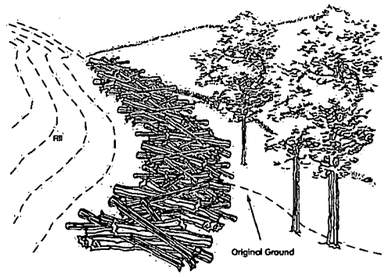
TOE BENCH DETAIL



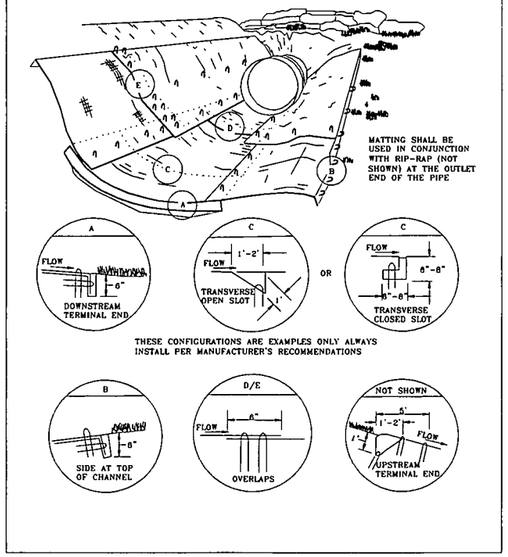
WELL PAD CONTAINMENT BERM DETAIL



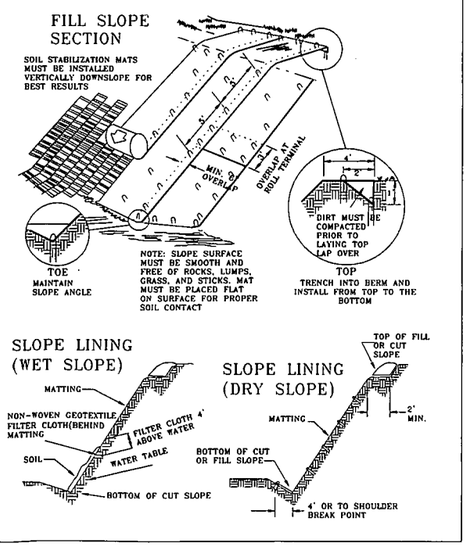
BRUSH PILE SEDIMENT BARRIER



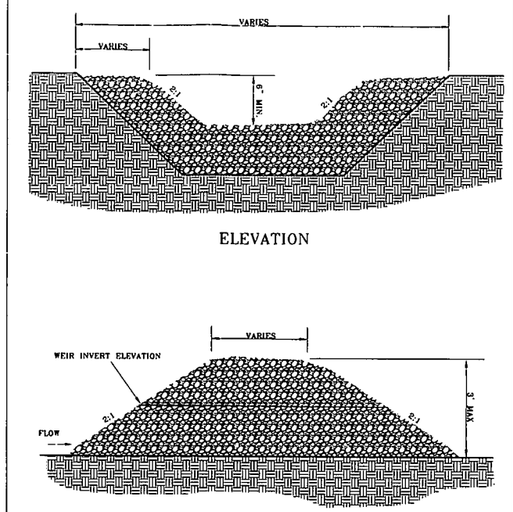
TYPICAL RECP CHANNEL INSTALLATION



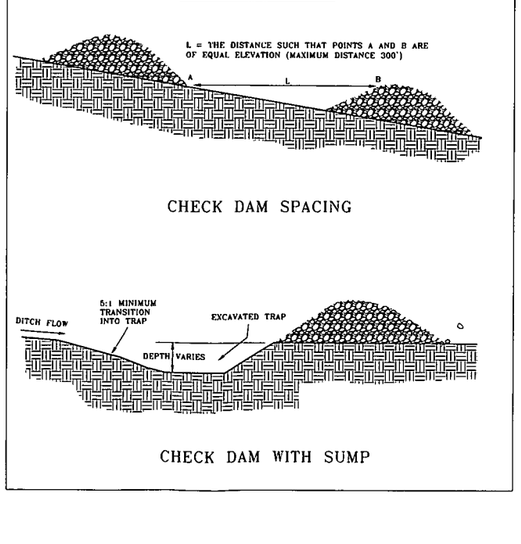
ROLLED EROSION CONTROL PRODUCTS



ROCK CHECK DAM



ROCK CHECK DAM



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PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

CONSTRUCTION DETAILS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

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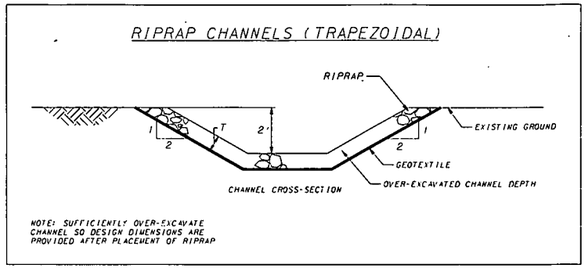
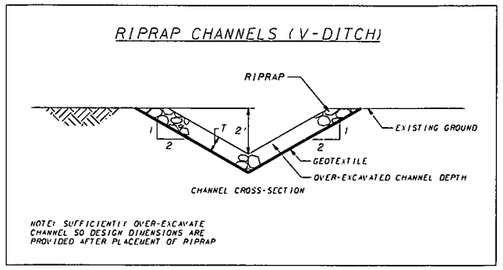
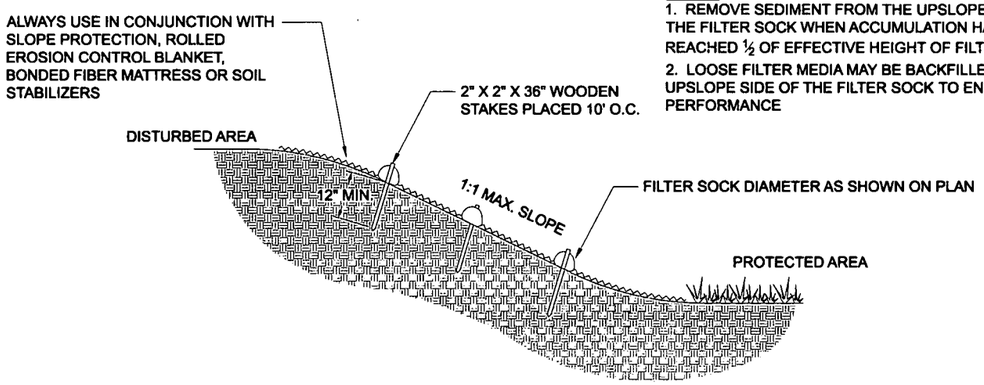
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 52 OF 57
REV:



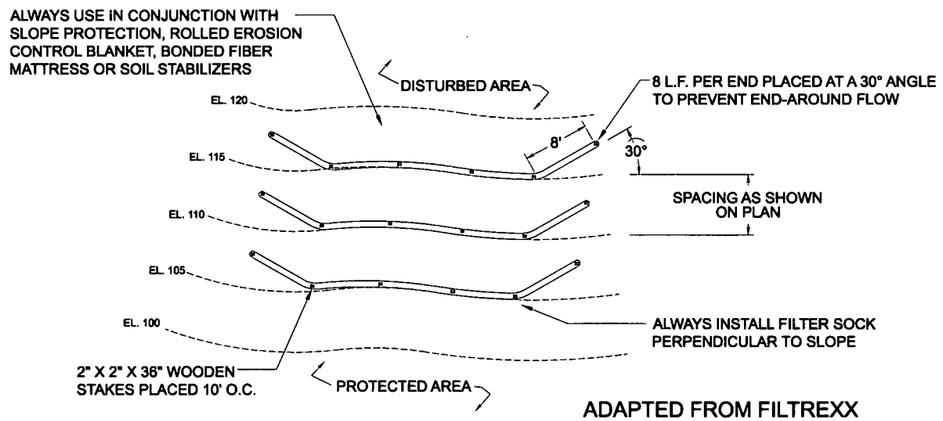




SECTION

NOTES:

1. REMOVE SEDIMENT FROM THE UPSLOPE SIDE OF THE FILTER SOCK WHEN ACCUMULATION HAS REACHED ½ OF EFFECTIVE HEIGHT OF FILTER SOCK
2. LOOSE FILTER MEDIA MAY BE BACKFILLED ON THE UPSLOPE SIDE OF THE FILTER SOCK TO ENHANCE PERFORMANCE



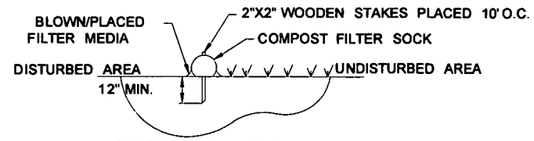
PLAN

ADAPTED FROM FILTREXX

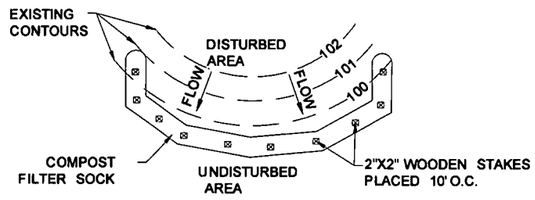
COMPOST FILTER SOCK SLOPE INTERRUPTION

NTS
(ADAPTED FROM FILTREXX)

STANDARD CONSTRUCTION DETAIL #4-1
COMPOST FILTER SOCK



SECTION VIEW
NTS



PLAN VIEW
NTS
ADAPTED FROM FILTREXX

SOCK FABRIC SHALL MEET STANDARDS OF TABLE 4.1. COMPOST SHALL MEET THE FOLLOWING STANDARDS:

ORGANIC MATTER CONTENT	80% -100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBROUS AND ELONGATED
pH	5.5-8.0
MOISTURE CONTENT	35%-55%
PARTICLE SIZE	98% PASS THROUGH 1" SCREEN
SOLUBLE SALT CONCENTRATION	5.0 DS MAXIMUM

COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP THE SLOPE AT 45 DEGREES TO THE MAIN SOCK ALIGNMENT (SEE FIGURE 4.1).
MAXIMUM SLOPE ABOVE ANY SOCK SHALL NOT EXCEED THAT SHOWN ON FIGURE 4.2.
TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE SOCK AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.
SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
BIODEGRADABLE FILTER SOCKS SHALL BE REPLACED AFTER 8 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.
IN THE EVENT THE GROUND IS FROZEN, #5 REBAR WITH SAFETY CAPS SHALL BE USED INSTEAD OF WOODEN STAKES TO ANCHOR THE FILTER SOCK. ONCE THE GROUND THAWS THE REBAR ANCHORS SHALL BE REMOVED AND REPLACED WITH 2" X 2" WOODEN STAKES AND INSTALLED AS SHOWN IN THE DETAIL ABOVE.

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FOR:
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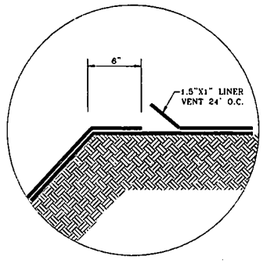
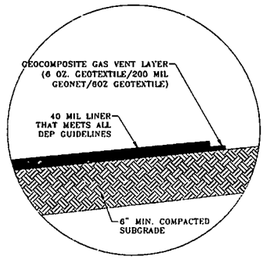
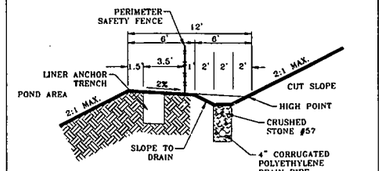


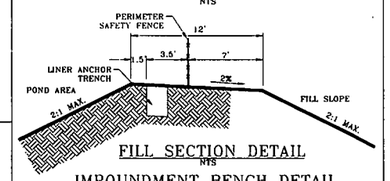
TYPICAL LINER VENT DETAIL
NTS



GEOMEMBRANE LINER SYSTEM
NTS

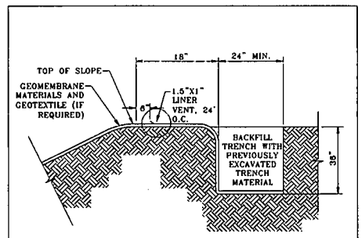


CUT SECTION DETAIL
NTS



FILL SECTION DETAIL
NTS

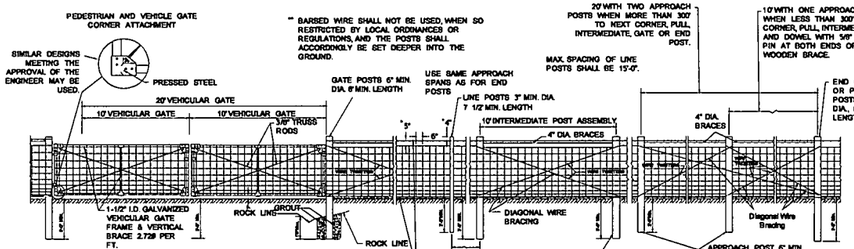
IMPOUNDMENT BENCH DETAIL
NTS

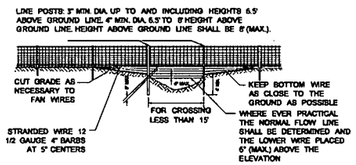


NOTE: USE SAND BAGS AS GEOMEMBRANE WEIGHTS IN TRENCH DURING GEOMEMBRANE INSTALLATION

TOP OF BERM ANCHOR TRENCH DETAIL
NTS

PERIMETER SAFETY FENCE





DETAIL SHOWING TYPICAL SECTION AT MINOR DEPRESSIONS AND WET WEATHER CROSSINGS

NOTES:

POSTS AND BRACES MAY BE EITHER ROUND OR SQUARE SHAPED. DIMENSIONS SHOWN ON THE PLANS ARE FOR ROUND POSTS AND BRACES ONLY. WHEN SQUARE POSTS ARE USED, LINE POSTS SHALL BE 3" SQUARE (MIN.); BRACES 4" SQUARE (MIN.); CORNER, END, PULL, GATE APPROACH, AND INTERMEDIATE POSTS 6" SQUARE (MIN.).
THE POSITIONING OF THE FENCE FABRIC AND BARBED WIRE ON THE POSTS, AS SHOWN ON THE TYPICAL FENCE SECTION/DETAIL, APPLIES FOR LEVEL AND GENTLE SLOPING TERRAIN FOR FENCE ERECTED ON SLOPES, THE POSITIONING MAY BE ADJUSTED TO MEET THE SLOPE CONDITIONS AS LONG AS THE ADJUSTMENT IS CONTINUED FROM POST TO POST IN A UNIFORM MANNER. TRENCHING ON SLOPES MAY BE WARRANTED ON SLOPES, POSTS WILL CONTINUE TO ERECTED VERTICALLY, UNLESS OTHERWISE DIRECTED, AND THE ENDS OF THE FENCING FABRIC SHALL BE CUT ON A SKEW AS MAY BE NECESSARY FOR PROPER CONNECTION TO THE POSTS.

DUMPED ROCK CHANNEL PROTECTION WILL BE USED AT CHANNEL CROSSINGS WHEN CALLED FOR ON THE PLANS.

INSTALL DRAINAGE STRUCTURE TERMINAL INSTALLATIONS CALLED FOR ON THE PLANS AND/OR AS SHOWN ON TYPICAL FENCE DETAILS.

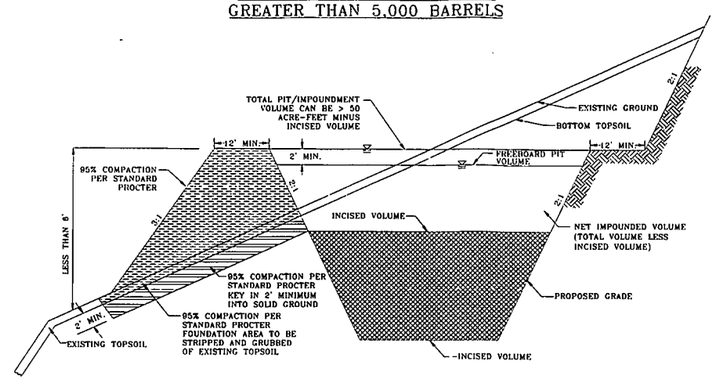
UNLESS OTHERWISE SPECIFIED, OR DIRECTED BY THE ENGINEER, THE FARM FIELD FENCE MAY BE INSTALLED WITH THE FENCE FABRIC AND BARBED WIRE POSITIONED ON EITHER SIDE OF THE FENCE POSTS.

HARDWARE AND MISCELLANEOUS FITTINGS, NOT SPECIFICALLY DESIGNATED HEREIN AS TO TYPE OR DIMENSIONS, SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF SECTION 606 OF THE SPECIFICATIONS AND SHALL BE OF GOOD QUALITY COMMERCIAL DESIGN ACCEPTABLE TO THE ENGINEER.

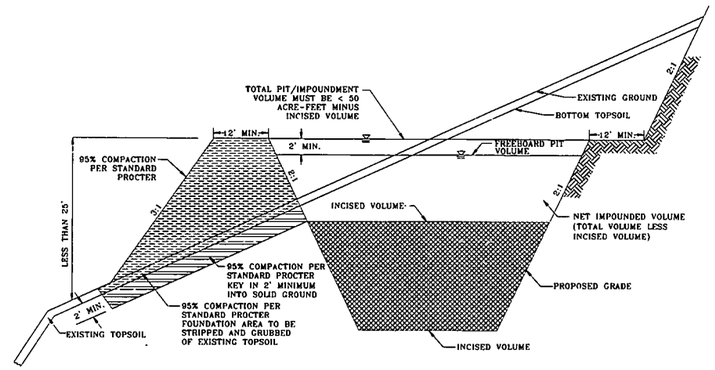
IN LIEU OF THE BARBED WIRE DETAILED HEREIN, THE FOLLOWING ADDITIONAL TYPES ARE ACCEPTABLE, PROVIDED THEY RETAIN THE "4-POINT BARB AT 5' CENTERS" REQUIREMENT AND PROVIDED THEY MEET OR EXCEED THE STRENGTH AND COATING REQUIREMENTS FOR THE STANDARD, 12 1/2 GAUGE, BARBED WIRE AS CALLED FOR IN 712.10 OF THE SPECIFICATIONS.
(A) STRANDED, 15 1/2 GAUGE, HIGH CARBON STEEL BARBED WIRE
(B) ORE STRAND, 12 GAUGE, STEEL BARBED WIRE

VEHICULAR GATE FRAMES (AND VERTICAL BRACES) MAY BE EITHER GALVANIZED STEEL PIPE MEMBERS AS SHOWN HEREIN OR MAY BE TRIPLE-COATED STEEL PIPE MEMBERS MEETING THE REQUIREMENTS SPECIFIED ON STANDARD SHEET F2. ALL OTHER METAL COMPONENTS OF THE GATE SHALL BE GALVANIZED, WITH THE EXCEPTION OF THE DIE-CAST ALUMINUM CORNER FITTINGS, OR PRESSED STEEL CORNER FITTINGS.

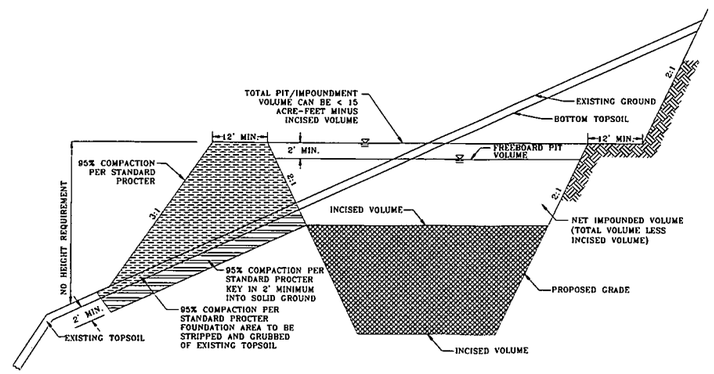
WEST VIRGINIA CODE 35 CSR 4
DESIGN AND CONSTRUCTION REQUIREMENTS FOR ASSOCIATED PITS, ASSOCIATED IMPOUNDMENTS, & CENTRALIZED IMPOUNDMENTS GREATER THAN 5,000 BARRELS



SECTION VIEW



SECTION VIEW



SECTION VIEW

NOTES:
1. ALL FILL SHOULD BE KEYED IN TO ORIGINAL GROUND EVERY 2-5 VERTICAL FEET DEPENDING ON EXISTING GROUND SLOPE

2. MINIMUM OUTSIDE AND INSIDE EMBANKMENT (FILL) SLOPES SHALL BE 2H:1V. THE INSIDE AND OUTSIDE SLOPES MUST ADD UP TO 5H:1V

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THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

CONSTRUCTION DETAILS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 54 OF 57
REV:

Table 2
Acceptable Fertilization Recommendation

Species	N (lbs/ac)	P205 (lbs/ac)	Example Rec. (per acre)
Cool Season Grass	40	80	400 lbs. 10-20-20
CS Grass & Legume	30	60	300 lbs. 10-20-20
Temporary Cover	40	40	200 lbs. 19-19-19

Table 3
Temporary Cover

Species	Seeding Rate (lbs/acre)	Optimum Seeding Dates	Drainage	pH Range
Annual Ryegrass	40	3/1 - 8/15 or 8/15 - 9/15	Well - Poorly	5.5 - 7.5
Field Bromegrass	40	3/1 - 8/15 or 8/15 - 9/15	Well - Mod. Well	6.0 - 7.0
Spring Oats	96	3/1 - 6/15	Well - Poorly	5.5 - 7.0
Sundangrass	40	5/15 - 8/15	Well - Poorly	5.5 - 7.5
Winter Rye	168	8/15 - 10/15	Well - Poorly	5.5 - 7.5
Winter Wheat	180	8/15 - 11/15	Well - Mod. Well	5.5 - 7.0
Japanese Millet	30	6/15 - 8/15	Well	4.5 - 7.0
Redtop	5	3/1 - 8/15	Well	4.0 - 7.5
Annual Ryegrass	28	3/1 - 6/15	Well - Poorly	5.5 - 7.5
Spring Oats	64	3/1 - 6/15	Well - Poorly	5.5 - 7.5

NOTE: These rates should be increased 50% if planted April 15 - August 1 and October 1 - March 1.

Table IV-5
Lime and Fertilizer Table

pH of Soil	Lime in Tons per Acre	Fertilizer, Lbs., per Acre (10-20-20 or Equivalent)
Above 6.0	2	500
5.0 to 6.0	3	500
Below 5.0	4	500

Table IV-6
Mulch Materials ls Rates and Used

Material	Minimum Rates per acre	Coverage	Remarks
Hay or straw	2 to 3 Tons 100 to 150 bales	Cover 75% to 90% of Surface	Subject to wind blowing or washing unless tied down
Wood Fiber Pulp Fiber Wood - Cellulose Recirculated Paper	1000 to 1500 lbs	Cover all Disturbed Areas	For hydroseeding

Tables IV 1-4 taken from Natural Resources Conservation Service Manual 'Critical Area Planting'

Table IV-1
Recommended Seeding Dates

Planting Dates	Suitability
March 1 - April 15 and August 1 - October 1	Best Seeding Periods
April 15 - August 1	HIGH RISK - moisture stress likely
October 1 - December 1	HIGH RISK - freeze damage to young seedlings
December 1 - March 1	Good seeding period. Dormant seeding

Table 4a
Permanent Seeding Mixture

Species/Mixtures	Seeding Rate (lbs/acre)	Drainage	pH Range
Crownvetch/ Tall Fescue	10 - 15 30	Well - Mod. Well	5.0 - 7.5
Crownvetch/ Perennial Ryegrass	10 - 15 20	Well - Mod. Well	5.0 - 7.5
Ladino Clover/ Serecia Lespedeza/ Tall Fescue	30 25 2	Well - Mod. Well	4.5 - 7.5
Tall Fescue/ Ladino Clover/ Redtop	40 3 3	Well - Mod. Well	5.0 - 7.5
Crownvetch/ Tall Fescue/ Redtop	10 20 3	Well - Mod. Well	5.0 - 7.5
Tall Fescue/ Birdsfoot Trefoil/ Redtop	40 10 3	Well - Mod. Well	5.0 - 7.5
Serecia Lespedeza/ Tall Fescue/ Redtop	25 30 3	Well - Mod. Well	4.5 - 7.5
Redtop/ Tall Fescue/ Creeping Red	30 3 50	Well - Mod. Well	5.0 - 7.5
Tall Fescue	50	Well - Poorly	4.5 - 7.5

* 'Lathco' Flatpea is potentially poisonous to some livestock. All legumes should be planted with proper inoculants prior to seeding. For unprepared seedbeds or seeding outside the optimum timeframe, add 50% more seed to the specified rate.

Mixtures listed in bold are suitable for use in shaded woodland settings; those in italics are suitable for use in filter strips.

Table 4b
Wildlife and Farm Friendly Seed Mixtures

Species/Mixtures	Seeding Rate (lbs/acre)	Drainage	pH Range
KY Bluegrass/ Redtop/ Ladino or Birdsfoot Trefoil	20 3 2/10	Well - Mod. Well	5.5 - 7.5
Timothy/ Alfalfa	5 12	Well - Mod. Well	6.5 - 8.0
Timothy/ Birdsfoot Trefroil	5 8	Well - Poorly	5.5 - 7.5
Orchardgrass/ Ladino Clover/ Redtop	10 2 3	Well - Mod. Well	5.5 - 7.5
Orchardgrass/ Ladino Clover	10 2	Well - Mod. Well	5.5 - 7.5
Orchardgrass/ Perennial Ryegrass	20 10	Well - Mod. Well	5.5 - 7.5
Creeping Red Fescue/ Perennial Ryegrass	30 10	Well - Mod. Well	5.5 - 7.5
Orchardgrass or KY Bluegrass	20	Well - Mod. Well	6.0 - 7.5
Birdsfoot Trefoil/ Redtop/ Orchardgrass	10 5 20	Well - Mod. Well	6.5 - 7.5
Lathco Flatpea*/ Perennial Ryegrass	30 20	Well - Mod. Well	5.5 - 7.5
Lathco Flatpea*/ Orchardgrass	30 20	Well - Mod. Well	6.5 - 7.5

* 'Lathco' Flatpea is potentially poisonous to some livestock. All legumes should be planted with proper inoculants prior to seeding. For unprepared seedbeds or seeding outside the optimum timeframe, add 50% more seed to the specified rate.

Mixtures listed in bold are suitable for use in shaded woodland settings; those in italics are suitable for use in filter strips.

REVEGETATION

Taken from the
West Virginia Erosion and Sediment Control Field Manual
West Virginia Division of Environmental Protection Office of Oil and Gas
Charleston, W.Va.
Section IV

Temporary Seeding

A. General Conditions Where Practice Applies

Where exposed soil surfaces are not to be fine-graded or worked for periods longer than 21 days. Temporary vegetative cover with sediment controls must be established where runoff will go directly into a stream. Immediately upon construction of the site (site includes road and location), vegetation must be established on road bank and location slopes. A permanent vegetative cover shall be applied to areas that will be left un-worked for a period of more than six months.

B. Seed Mixtures and Planting Dates

Refer to Tables 2 through 4 for recommended dates to establish vegetative cover and the approved lists of temporary and permanent plant species, and planting rates. Table 3 gives recommended types of temporary vegetation, rates of application, and optimum seeding dates. In situations where another cover is desired, contact the local soil conservation district for seeding recommendations.

C. Seed Application

Apply seed by broadcasting, drilling, or by hydroseed according to the rates indicates in Table IV-3. Perform all planting operations at right angles to the slope. Necessary site preparation and roughening of the soil surface should be done just prior to seeding. Seedbed preparation may not be required on newly disturbed areas.

Permanent Seeding

A. General

Permanent vegetative cover will be established where no further soil disturbance is anticipated or needed. Soil fertility and pH level should be tested and adjusted according to seed species planted. Planting of permanent vegetative covers must be performed on all disturbed areas after completion of the drilling process. Any site that contains significant amounts of topsoil shall have the topsoil removed and stockpiled when feasible. Topsoil should not be added to slopes steeper than 2:1 unless a good bonding to the sub-layer can be achieved. After proper grading and seedbed preparation, the vegetation will reestablish ground cover for the control of surface water runoff erosion. All required seedbed preparation and loosening of soil by disking or dozer tracking should be performed just prior to seeding. If seedbed preparation is not feasible, 50% more seed shall be added to the recommended rates shown in Tables IV-3 and IV-4. When hydroseeding, seedbed preparation may not be necessary if adequate site preparation was performed. Incorporate the appropriate amount of lime and/or fertilizer in the slurry mix when hydroseeding.

When hydroseeding, first mix the lime, fertilizer, and hydro-mulch in the recommended amount of water. Mix the seed and inoculants together within one hour prior to planting, and add to the slurry just before seeding. Apply the slurry uniformly over the prepared site. Assure that agitation is continuous throughout the seeding operation and the mix is applied within one hour of initial mixing.

B. Lime and Fertilizer

1. Lime shall be applied to all permanent seedings. The pH of the soil is to be determined and lime applied accordingly. Once the pH is known, select the amount of lime to be applied from Table IV-5.

2.Fertilizer shall be applied in all permanent seedings. Apply the equivalent for 500 lbs. minimum 10-20-20 fertilizer per acre or use the amount of fertilizer and lime recommended by a certified soil test.

3.Application: For best results and maximum benefits, the lime and fertilizer are to be applied at the time of seedbed preparation.

C. Permanent Seed Mixtures

Planners should take into consideration the species makeup of the existing pasture and the landowner's future pasture management plans when recommending seed mixtures. Selection: From Tables IV 4a and b, Permanent Seeding Mixtures Suitable for Establishment in West Virginia.

Notes:

1. All legumes must be planted with the proper inoculants prior to seeding.
2. 'Lathco' Flatpea is potentially poisonous to some livestock.
3. Only endophyte free varieties of Tall Fescue should be used. Tall Fescue and Crownvetch are also very invasive species, non-native to WV.
4. For unprepared seedbeds or seeding outside the optimum timeframes, add 50% more seed to the specified rate. Mixtures in Table 4b are more wildlife and farm friendly; those listed in bold are suitable for use in shaded woodland settings. Mixtures in italic are suitable for use in filter strips.

D. Seeding for Wildlife Habitat

Consider the use of the native plants or locally adapted plants when selecting cover types and species for wildlife habitat. Wildlife friendly species or mixes that have multiple values should be considered. See wildlife friendly species/mixtures in Table IV-4b. Consider selecting no or low maintenance long-lived plants adaptable to sites which may be difficult to maintain with equipment.

Mulching

A. General Organic Mulches

The application of straw, hay or other suitable materials to the soil surface to prevent erosion. Straw made from wheat or oats is the preferred mulch, the use of hay is permissible, but not encouraged due to the risk of spreading invasive species. Mulch must be applied to all temporary and permanent seeding on all disturbed areas. Depending on site conditions, in critical areas such as waterways or steep slopes, additional or substitute soil protective measures may be used if deemed necessary. Examples include jute mesh and soil stabilization blankets or erosion control matting.

Areas that have been temporarily or permanently seeded should be mulched immediately following seeding. Mulches conserve desirable soil properties, reduce soil moisture loss, prevent crusting and sealing of the soil surface and provide a suitable microclimate for seed germination.

Areas that cannot be seeded because of the season should be mulched to provide some protection to the soil surface. An organic mulch, straw or hay should be used and the area then seeded as soon as weather or seasonal conditions permit. Do not use fiber mulch (cellulose -hydroseed) alone for this practice; at normal application rates it will not give the soil protection of other types of mulch.

Wood cellulose fiber mulch is used in hydroseeding operations and applied as part of the slurry. It creates the best seed-soil contact when applied over the top of (as a separate operation) newly seeded areas. Fiber mulch does not alone provide sufficient protection on highly erodible soils, or during less than favorable growing conditions. Fiber mulch should not be used alone during the dry summer months or when used for late fall mulch cover. Use straw mulch during these periods and fiber mulch may be used to tack (anchor) the straw mulch. Fiber mulch is well suited for steep slopes, critical areas and areas susceptible to wind.

B. Chemical Mulches, Soil Binders and Tackifiers

A wide range of synthetic spray on materials are marketed to stabilize and protect the soil surface. These are mixed with water and sprayed over the mulch and to the soil. They may be used alone in some cases as temporary stabilizers, or in conjunction with fiber mulch, straw or hay.

When used alone most chemical mulches do not have the capability to insulate the soil or retain soil moisture that organic mulches have.

C. Specifications

From Table IV-6 select the type of mulch and rate of application that will best suit the conditions at the site.

D. Anchoring

Depending on the field situation, mulch may not stay in place because of wind action or rapid water runoff. In such cases, mulch is to be anchored mechanically or with mulch netting.

1. Mechanical Anchoring

Apply mulch and pull mulch anchoring tool over the mulch. When a disk is used set the disk straight and pull across slope. Mulch material should be tucked into the soil about three inches.

2. Mulch netting

Follow manufacturer's recommendation when positioning and stapling the mulch netting in the soil.

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PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

CONSTRUCTION DETAILS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 55 OF 57
REV:

EQT WEU 51 MATERIAL QUANTITIES
WELL PAD

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM TOTAL
1.0 CLEARING AND GRUBBING				
1.a. TREE CLEARING	3.06	AC	$	$
1.b. MOWING	0	AC	$	$
2.0 COMPOST FILTER SOCK (INCLUDES ASSOC. PIT AND IMPOUNDMENT)				
2.a. 12" COMPOST FILTER SOCK	1,981	LF	$	$
2.b. 18" COMPOST FILTER SOCK	33	LF	$	$
2.c. 24" COMPOST FILTER SOCK	3,194	LF	$	$
3.0 AGGREGATE SURFACING				
3.a. 6" of 3"-6" BASE	2,500	TONS	$	$
3.b. 2" of 3/4" CRUSHER RUN	1,029	TONS	$	$
3.c. GEOTEXTILE	10,000	SY	$	$
4.0 COCONUT SLOPE MATTING	8,166	SY	$	$
5.0 SEED & MULCH				
5.a. SEEDING (INCLUDES AREA OF SLOPE MATTING AND DITCH LINING)	2.6	AC	$	$
5.b. MULCH (EXCLUDES AREA OF SLOPE MATTING AND DITCH LINING)	0.9	AC	$	$
6.0 DITCH LINING				
6.a. HIGH VELOCITY EROSION CONTROL BLANKET (MIN SHEAR 2.25 PSF)	318	SY	$	$
7.0 EXCAVATION				
7.a. WELL PAD (CUT W/ NO SWELL) - INCLUDES EXC. FOR AGGREGATE	49,320	CY	$	$
7.b.TOPSOIL (ESTIMATED 6")	3,020	CY	$	$
8.0 DITCH LENGTH	715	LF	$	$
9.0 KEYWAY EXCAVATION	872	CY	$	$
10.0 UNDERDRAIN SUMP				
10.a. 4" CORRUGATED UNDERDRAIN	554	LF	$	$

EQT WEU 51 MATERIAL QUANTITIES
ACCESS ROAD

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM TOTAL
1.0 CLEARING AND GRUBBING				
1.a. TREE CLEARING	14.56	AC	$	$
1.b. MOWING	0	AC	$	$
2.0 COMPOST FILTER SOCK				
2.a. 12" COMPOST FILTER SOCK	5,511	LF	$	$
2.b. 18" COMPOST FILTER SOCK	841	LF	$	$
2.c. 24" COMPOST FILTER SOCK	15,996	LF	$	$
			$	$
3.0 AGGREGATE SURFACING				
3.a. 6" of 3"-6" BASE	6,466	TONS	$	$
3.b. 2" of 3/4" CRUSHER RUN	2,661	TONS	$	$
3.c. GEOTEXTILE	25,859	SY	$	$
4.0 COCONUT SLOPE MATTING	70,112	SY	$	$
5.0 SEED & MULCH				
5.a. SEEDING (INCLUDES AREA OF SLOPE MATTING)	29.3	AC	$	$
5.b. MULCH (EXCLUDES AREA OF SLOPE MATTING)	14.8	AC	$	$
6.0 DITCH LINING				
6.a. d50 = 6" MIN	4,701	TON	$	$
6.b. d50 = 12" MIN	456	TON	$	$
7.0 CMP CULVERT				
7.a. 15" CMP	1,292	LF	$	$
7.b. 18" CMP	174	LF	$	$
7.c. 21" CMP	58	LF	$	$
7.d. 24" CMP	135	LF	$	$
7.e. 27" CMP	37	LF	$	$
8.0 EXCAVATION				
8.a. ACCESS ROAD (CUT W/ NO SWELL) - INCLUDES EXC. FOR AGGREGATE	47,206	CY	$	$
8.b. TOPSOIL (ESTIMATED 6")	15,149	CY	$	$
9.0 DITCH LENGTH	8,797	LF	$	$
10.0 RIP RAP APRONS				
10.a. d50 = 6" MIN	379	TON	$	$
10.b. d50 = 12" MIN	121	TON	$	$
11.0 KEYWAY EXCAVATION	22,339	CY	$	$
12.0 BLUESTONE CREEK LOW WATER CROSSING				
12.a. 9" REINFORCED PORTLAND CEMENT CONCRETE PAVEMENT	14	CY	$	$
12.b. 6" CONCRETE SLOPE PROTECTION	5	CY	$	$
12.c. TYPE A FABRIC	56	SY	$	$
12.d. TYPE B FABRIC	32	SY	$	$
12.e. ROCK BORROW EXCAVATION (6" MAX)	92	TON	$	$
12.f. 15" ALUMINUM CMP (4 BARRELS)	140	LF	$	$
12.g. OUTLET PROTECTION (18" MIN, 48" MAX)	43	TON	$	$
12.h. REFLECTIVE DELINEATORS	4	EACH	$	$

NOTE:

GEOTEXTILE FABRIC, ROLLED EROSION CONTROL PRODUCT AND LINER SYSTEM QUANTITIES DO NOT ACCOUNT FOR OVERLAP.

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PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

CONSTRUCTION QUANTITIES

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 56 OF 57
REV:

EQT WEU 51 MATERIAL QUANTITIES
ASSOCIATED IMPOUNDMENT

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM TOTAL
1.0 CLEARING AND GRUBBING				
1.a. TREE CLEARING	3.73	AC	$	$
1.b. MOWING	0	AC	$	$
2.0 COMPOST FILTER SOCK (SEE WELL PAD QUANTITIES)				
2.a. 12" COMPOST FILTER SOCK		LF	$	$
2.b. 18" COMPOST FILTER SOCK		LF	$	$
2.c. 24" COMPOST FILTER SOCK		LF	$	$
3.0 AGGREGATE SURFACING (MANIFOLD PAD)				
3.a. 6" of 3"-6" BASE	209	TONS	$	$
3.b. 2" of 3/4" CRUSHER RUN	86	TONS	$	$
3.c. GEOTEXTILE	834	SY	$	$
4.0 COCONUT SLOPE MATTING	3,897	SY	$	$
5.0 SEED & MULCH				
5.a. SEEDING (INCLUDES AREA OF SLOPE MATTING AND DITCH LINING)	3.3	AC	$	$
5.b. MULCH (EXCLUDES AREA OF SLOPE MATTING AND DITCH LINING)	2.5	AC	$	$
6.0 KEYWAY EXCAVATION	1,339	CY	$	$
7.0 LINER SYSTEM				
7.a. PRIMARY LINER (60 MIL)	4,834	SY	$	$
7.b. NON-WOVEN GEOTEXTILE FABRIC CUSHION (16 OZ FELT)	4,834	SY	$	$
8.0 EXCAVATION				
8.a. ASSOC. PIT (CUT W/ NO SWELL) - INCLUDES EXC. FOR AGGREGATE	80,982	CY	$	$
8.b. TOPSOIL (ESTIMATED 6")	2,025	CY	$	$
9.0 MISCELLANEOUS				
9.a. ACCESS GATE W/ EMERGENCY LIFE LINE	1	EACH	$	$
9.b. PERIMETER SAFETY FENCE	1,021	LF	$	$

EQT WEU 51 MATERIAL QUANTITIES
ASSOCIATED PIT

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM TOTAL
1.0 CLEARING AND GRUBBING				
1.a. TREE CLEARING	5.54	AC	$	$
1.b. MOWING	0	AC	$	$
2.0 COMPOST FILTER SOCK (SEE WELL PAD QUANTITIES)				
2.a. 12" COMPOST FILTER SOCK		LF	$	$
2.b. 18" COMPOST FILTER SOCK		LF	$	$
2.c. 24" COMPOST FILTER SOCK		LF	$	$
3.0 AGGREGATE SURFACING (MANIFOLD PAD)				
3.a. 6" of 3"-6" BASE	209	TONS	$	$
3.b. 2" of 3/4" CRUSHER RUN	86	TONS	$	$
3.c. GEOTEXTILE	834	SY	$	$
4.0 COCONUT SLOPE MATTING	2,143	SY	$	$
5.0 SEED & MULCH				
5.a. SEEDING (INCLUDES AREA OF SLOPE MATTING AND DITCH LINING)	5.4	AC	$	$
5.b. MULCH (EXCLUDES AREA OF SLOPE MATTING AND DITCH LINING)	4.9	AC	$	$
6.0 KEYWAY EXCAVATION	1,027	CY	$	$
7.0 LINER SYSTEM				
7.a. PRIMARY LINER (60 MIL)	2,685	SY	$	$
7.b. NON-WOVEN GEOTEXTILE FABRIC CUSHION (16 OZ FELT)	2,685	SY	$	$
8.0 EXCAVATION				
8.a. ASSOC. PIT (CUT W/ NO SWELL) - INCLUDES EXC. FOR AGGREGATE	28,483	CY	$	$
8.b. TOPSOIL (ESTIMATED 6")	1,263	CY	$	$
9.0 MISCELLANEOUS				
9.a. ACCESS GATE W/ EMERGENCY LIFE LINE	1	EACH	$	$
9.b. PERIMETER SAFETY FENCE	810	LF	$	$

NOTE:

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PROJECT MGMT.
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HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

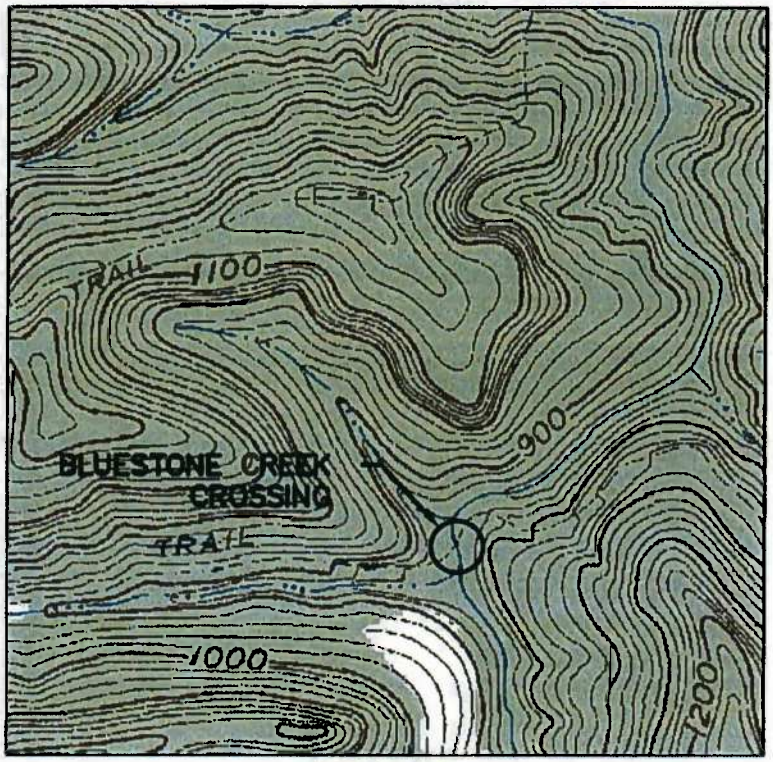
THIS DOCUMENT WAS PREPARED BY:
STANTEC
FOR:
EQT PRODUCTION COMPANY

CONSTRUCTION QUANTITIES
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-6051
SHEET 57 OF 57
REV:

EQT Well Site - WEU 51
(Bluestone Creek)

Hydrologic and Hydraulic Report



Location Map
1" = 1,000
(West Union, WV USGS Quad; West Union District, Doddridge County)
Coordinates: 39°15'12.50"N, 80°45'14.60"W

Prepared For/Operator:

EQT Production Company
Operator # 306686
115 Professional Place
Bridgeport, WV 26330
(304) 348-3870

Prepared By:

Stantec
111 Elkins Street
Fairmont, WV 26554

Professional Energy Consultants
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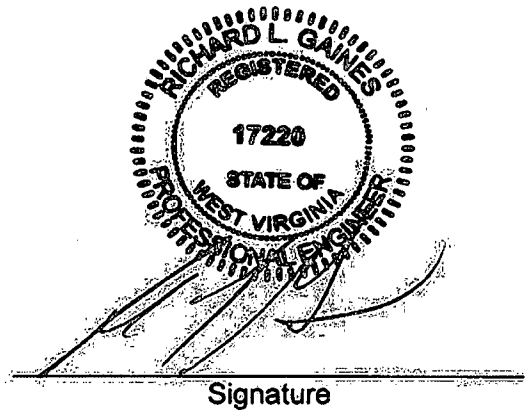
HONESTY, INTEGRITY, QUALITY

Prepared: September 2013

CERTIFICATION OF THE ENGINEER



Signature

9-13-13

Date

Printed Name:	Richard L. Gaines, PE
Company:	Stantec Consulting, Inc.
Address:	111 Elkins Street Fairmont, WV 26554
Phone:	(304) 367-9401

TABLE OF CONTENTS

OVERVIEW

This project includes the construction of a site for a natural gas well site access. The proposed site is located approximately 0.4 miles west of the intersection of and old jeep trail and CR 13 (Maxwell Ridge Road) Latitude 39°15'12.50"N Longitude 80°45'14.60"W.

DRAINAGE NARRATIVE

Based upon the drainage area at the site and the rural characteristics of the watershed, the USGS Water Resources Investigation Report (WRIR) 00-4080 method for Estimating Magnitude and Frequency of Peak Discharges for Rural, Unregulated Streams in West Virginia was utilized to determine the 2- through 100-year storm events for the watershed.

Stream base-flow discharge was determined using estimated flow depth measurements witnessed by Stantec staff during a site visit on July 31, 2013 From the above mentioned site visit, a range of flow depths (0.30' to 0.60) was measured in the project vicinity.

The drainage area consisted mostly of forested area comprised 2,967 acres or 4.64 square miles at the crossing site. The Bluestone Creek is located in the Upper Middle Island Creek Watershed. The crossing is located within a FEMA Floodplain Zone A. See Appendix A for peak discharge calculations and resulting flows.

A flood plain analysis was performed utilizing the US Army Corp of Engineers Hydrologic Engineering Center River Analysis System (HEC-RAS). Bluestone Creek is approximately 20 feet wide at the proposed site and varies up to 25 feet wide up and down stream. The overbank slopes (looking downstream) are sloped approximately 2:1 to 3:1. The main stream channel can be described as a stony bottom with some weeds. A Mannings 'n' value of 0.035 was used for the main stream channel. The overbank areas are described as vegetated with trees and underbrush. A Mannings 'n' value of 0.055 was used for the overbank areas.

Both the existing and proposed conditions were modeled for the stream crossing location. Supporting background information for the HEC-RAS model can be found in Appendix B.

Existing Conditions Model

The creek was modeled utilizing existing conditions to establish a baseline in which to compare the proposed scenarios with a temporary stream crossing and a permanent stream crossing installed at separate times. The model assumes the temporary crossing will be removed before the permanent low water crossing is installed fifteen cross sections, as shown in the provided exhibits, covering about 1100 linear feet of stream

channel were used for the HEC-RAS model. See Appendix B for the existing condition HEC-RAS Model.

Proposed Conditions Model with Temporary Bridge

The proposed condition model consisted of filling a portion of the right overbank for a future compressor station. This assumes placing a 40' long x 13.5' wide temporary bridge over the existing stream with a 35 foot opening between the timber abutments. (Bridge Deck elevation of 849.30. In comparing the proposed model to the existing model, the proposed improvements results in less than a 1-foot increase in the 100-yr water surface elevation. See Table 1 below. See Appendix C for the temporary bridge condition HEC-RAS Model.

TABLE 1

HEC-RAS CROSS SECTION	EXISTING 100-YR WSEL	PROPOSED 100-YR WSEL	INCREASE IN 100-YR WSEL
1500	854.88	854.86	-0.02
1400	854.64	854.62	-0.02
1300	854.32	854.29	-0.03
1200	854.02	853.99	-0.03
1100	853.11	852.83	-0.28
1000	852.93	852.57	-0.36
900	852.08	852.21	0.13
800	852.70	852.70	0.00
700	851.99	851.99	0.00
600	851.95	851.95	0.00
500	851.92	851.92	0.00
400	850.89	850.89	0.00
300	849.93	849.93	0.00
200	848.51	848.51	0.00
100	847.25	847.25	0.00

Proposed Conditions Model with Permanent Low Water Crossing

The proposed condition model consisted of filling a portion of the stream with four 15" CMP (Aluminum) pipes and a low water crossing for a future well access road. This assumes placing approximately two feet of fill on the pipes (minimum pad elevation of

849.30. This scenario provides adequate capacity to pass the computed stream base-flow discharge. In comparing the proposed model to the existing model, the proposed improvements results in less than a 1-foot increase in the 100-yr water surface elevation at any place along the stream which was modeled. See Table 2 below. See Appendix D for the temporary bridge condition HEC-RAS Model.

TABLE 2

HEC-RAS CROSS SECTION	EXISTING 100-YR WSEL	PROPOSED 100-YR WSEL	INCREASE IN 100-YR WSEL
1500	854.88	854.90	0.02
1400	854.64	854.67	0.03
1300	854.32	854.35	0.03
1200	854.02	854.06	0.04
1100	853.11	853.26	0.15
1000	852.93	853.11	0.18
900	852.08	853.04	0.96
800	852.70	852.68	-0.02
700	851.99	851.95	-0.04
600	851.95	851.90	-0.05
500	851.92	851.87	-0.05
400	850.89	850.85	-0.04
300	849.93	849.93	0.00
200	848.51	848.51	0.00
100	847.25	847.24	-0.01

CONCLUSIONS

The proposed fill in the existing floodplain will not impact the upstream water surface elevation more than 0.96 feet as shown in the model for either condition.

Appendix A

Stantec Consulting Services Inc.
111 Elkins Street
Fairmont WV 26554
Tel: (304) 367-9401

Stantec

Drainage Calculations for WEU 51 - Crossing
Stream: Bluestone Creek

Located on an old jeep trail off of Maxwell Ridge Road (CR 13)

Doddridge County, West Virginia
Coordinates: 39°15'12.50"N, 80°45'14.60"W
Located in a FEMA Flood Zone A; (No base flood elevation determined)

Located in rural area, unregulated, no gaging stations near site
Use WRIR 00-4080 to Estimate Peak Discharge

- Located in North Region (Figure 7)
- Use Regression Equations for an ungaged stream (Table 4)

Upstream to Stream Station 13+00

Drainage area = 2575.92 Acres = 4.025 Square Mile

$Q_2 = 138\,A^{0.724} = 138(4.025)^{0.724} = 378.21$ CFS

$Q_{10} = 341\,A^{0.653} = 341(4.025)^{0.653} = 846.58$ CFS

$Q_{25} = 478\,A^{0.626} = 478\,(4.025)^{0.626} = 1{,}142.91$CFS

$Q_{50} = 594\,A^{0.609} = 594\,(4.025)^{0.609} = 1{,}387.04$ CFS

$Q_{100} = 722\,A^{0.594} = 722\,(4.025)^{0.594} = 1{,}651.08$ CFS

Stream Station 13+00 and Downstream

Drainage area = 2966.92 Acres = 4.64 Square Mile

$Q_2 = 138\,A^{0.724} = 138(4.6359)^{0.724} = 418.95$ CFS

$Q_{10} = 341\,A^{0.653} = 341(4.6359)^{0.653} = 928.41$ CFS

$Q_{25} = 478\,A^{0.626} = 478\,(4.63594.025)^{0.626} = 1{,}248.61$ CFS

$Q_{50} = 594\,A^{0.609} = 594\,(4.6359)^{0.609} = 1{,}511.69$ CFS

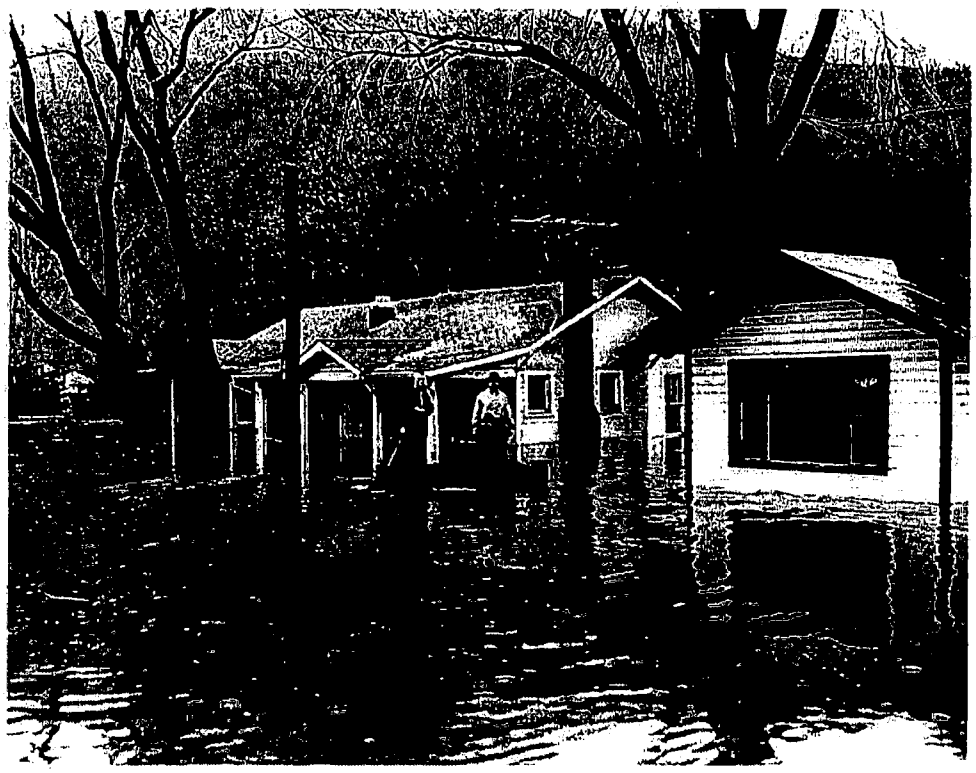
$Q_{100} = 722\,A^{0.594} = 722\,(4.6359)^{0.594} = 1{,}795.65$ CFS

USGS
science for a changing world

In cooperation with the
West Virginia Department of Transportation
Division of Highways

Estimating Magnitude and Frequency of Peak Discharges for Rural, Unregulated, Streams in West Virginia

Water-Resources Investigation Report 00-4080



U.S. Department of the Interior
U.S. Geological Survey

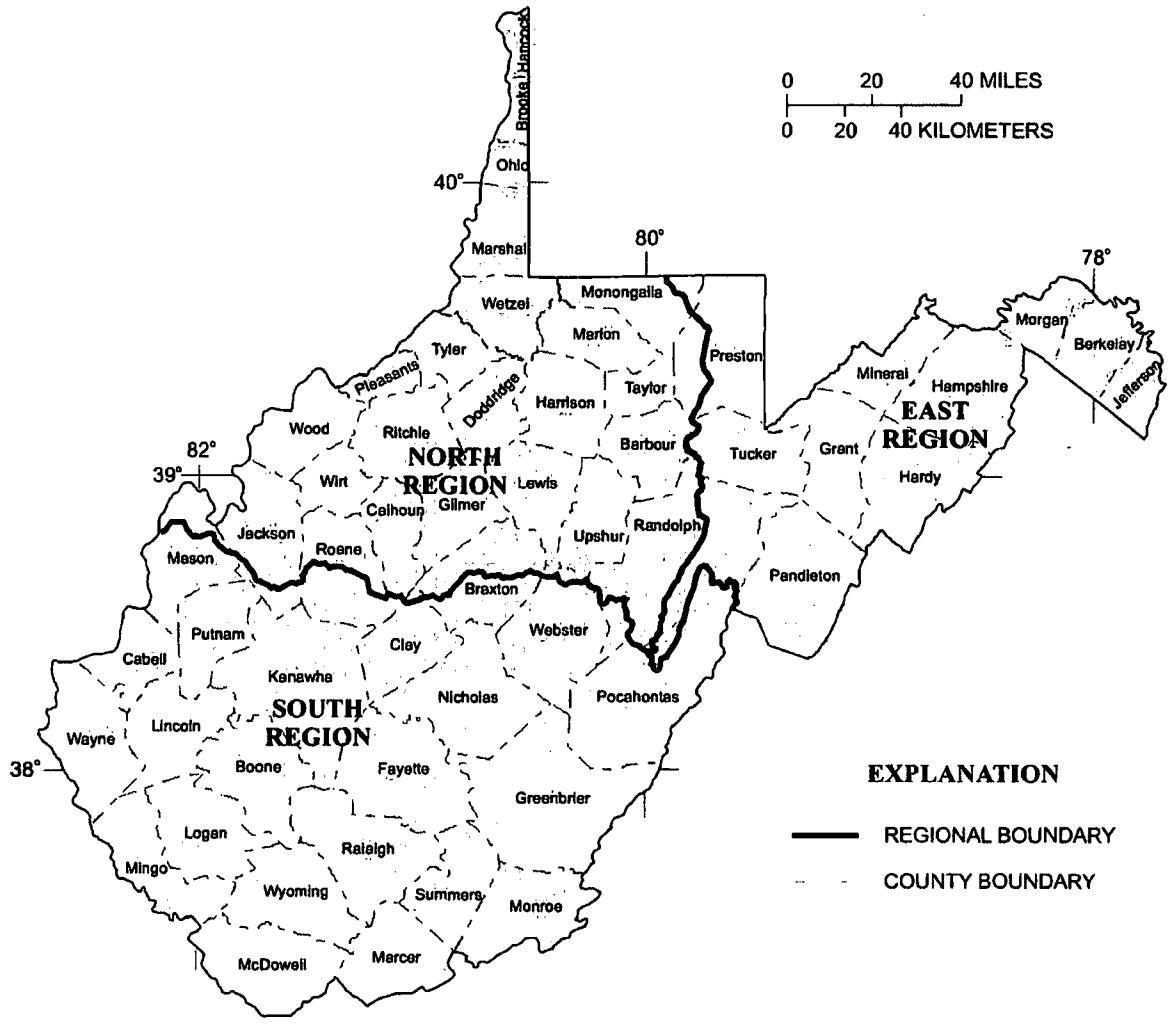


Figure 7. Regional boundaries for the estimating equations.

representative of frequency discharges expected in West Virginia. Log_{10}-transformed drainage area was determined as the most significant independent variable. An areal plot of residuals did not indicate additional subregions. A generalized least-squares regression model was executed with log_{10}-transformed drainage area as the independent variable to determine frequency-discharge equations for the North Region (table 4).

South Region.-Regional regression procedures for the log_{10}-transformed 100-year discharge were completed for the South Region. The number of gaging stations included in the analysis of the South Region was reduced from 110 to 100 by the exclusion of 10 Virginia stations. Stations 03207400, 03207500, 03207800, 03208500, 03208950, and 03209000 were not used because high regression residuals for these headwater streams of the Levisa Fork, which tend to be more rocky than the sandy streams common in the South Region, indicated that stations in this geographic area were not representative of frequency discharges expected in West Virginia. Stations 02009500, 02011400, and 02011460 were excluded because a high regression residual resulted for station 02009500, and Bisese (1995, p. 45) had omitted all three of these stations from the regional regression analysis for Virginia. Station 02012950 was excluded because it is located in carbonate rock (D.C. Hayes, U.S. Geological Survey, oral commun., 1999) (the equations developed for West Virginia are not applicable in karst areas

Table 4. Estimating equations and regression statistics determined from the regional regression analysis

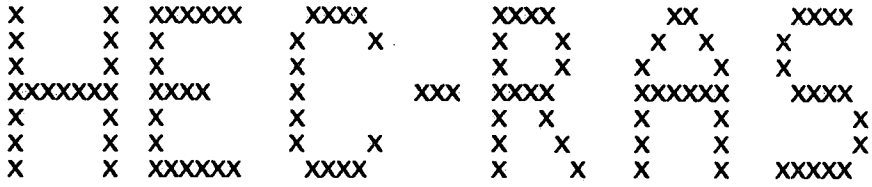
[Q(n) is the discharge in cubic feet per second for the (n)-year recurrence interval; A is the drainage area in square miles.]

Regression equation	Standard error of the model, in percent	Average standard error of sampling, in percent	Average perdiction error, in percent	Equivalent years of record	Number of streamflow stations	Range of drainage area, in square miles
			East Region			
$Q(2)=62.6A^{0.842}$	37.7	8.3	38.8	2.3	74	0.22-1,486
$Q(5)=102A^{0.849}$	32.4	8.9	33.7	5.2		
$Q(10)=133A^{0.855}$	30.7	9.5	32.3	8.3		
$Q(25)=174A^{0.863}$	30.3	10.6	32.3	12.6		
$Q(50)=206A^{0.869}$	31.0	11.3	33.2	33.2		
$Q(100)=240A^{0.875}$	32.2	12.0	34.6	17.4		
$Q(200)=276A^{0.881}$	34.0	12.9	36.6	18.8		
$Q(500)=326A^{0.889}$	36.8	14.1	39.8	20.0		
			North Region			
$Q(2)=138A^{0.724}$	27.0	6.9	28.0	3.3	62	0.13-1,516
$Q(5)=249A^{0.678}$	26.6	7.3	27.7	4.7		
$Q(10)=341A^{0.653}$	26.7	8.0	28.0	6.3		
$Q(25)=478A^{0.626}$	27.6	8.6	29.0	8.3		
$Q(50)=594A^{0.609}$	28.5	8.9	29.9	9.5		
$Q(100)=722A^{0.594}$	29.7	9.5	31.3	10.5		
$Q(200)=862A^{0.580}$	31.1	10.3	32.9	11.2		
$Q(500)=1069A^{0.563}$	33.2	11.1	35.2	11.8		
			South Region			
$Q(2)=95.4A^{0.785}$	38.4	7.3	39.2	1.6	100	0.10-8,371
$Q(5)=153A^{0.772}$	35.8	7.3	36.6	2.7		
$Q(10)=197A^{0.766}$	35.3	8.0	36.3	3.8		
$Q(25)=257A^{0.759}$	35.9	8.6	37.0	5.3		
$Q(50)=305A^{0.755}$	37.0	8.9	38.2	6.2		
$Q(100)=355A^{0.751}$	38.5	9.5	39.9	6.9		
$Q(200)=408A^{0.748}$	40.3	10.0	41.7	7.4		
$Q(500)=481A^{0.744}$	43.1	10.8	44.7	7.9		

Appendix B

existing.rep

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



PROJECT DATA
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Project File : existing.prj
Run Date and Time: 9/13/2013 7:30:15 AM

Project in English units

PLAN DATA

Plan Title: Plan 20
Plan File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.p20

Geometry Title: Existing Stream
Geometry File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.g01

Flow Title : Existing
Flow File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.f01

Plan Summary Information:

Number of:	Cross Sections	= 15	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information

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

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

FLOW DATA

Flow Title: Existing
Flow File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.f01

Flow Data (cfs)

River	Reach	RS	2 Year	10 Year	25 Year	50 Year	100 Year
Bluestone Creek	1	1500	378	847	1143	1387	1651
Bluestone Creek	1	1300	419	928	1249	1512	1796

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Bluestone Creek	1	2 Year		Critical
Bluestone Creek	1	10 Year		Critical
Bluestone Creek	1	25 Year		Critical
Bluestone Creek	1	50 Year		Critical
Bluestone Creek	1	100 Year		Critical

GEOMETRY DATA

Geometry Title: Existing Stream
Geometry File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.g01

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1500

INPUT
Description: X-1500
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	867	23	855	47	854	68	854	77	853
94	852	99	849	107	849	115	849	129	850
137	854	142	855	159	868				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	94	.035	137	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
94	137	97	101	105	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	852.39	Element	Left OB	Channel
Right OB Vel Head (ft)	0.22	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	852.18	Reach Len. (ft)	97.00	101.00
105.00 Crit W.S. (ft)		Flow Area (sq ft)	0.27	101.51
E.G. Slope (ft/ft)	0.002277	Area (sq ft)	0.27	101.51
Q Total (cfs)	378.00	Flow (cfs)	0.07	377.93
Top Width (ft)	42.40	Top Width (ft)	3.04	39.36
Vel Total (ft/s)	3.71	Avg. Vel. (ft/s)	0.26	3.72
Max Chl Dpth (ft)	3.18	Hydr. Depth (ft)	0.09	2.58
Conv. Total (cfs)	7921.8	Conv. (cfs)	1.5	7920.4
Length Wtd. (ft)	100.96	Wetted Per. (ft)	3.05	40.74
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.01	0.35
Alpha 0.00	1.00	Stream Power (lb/ft s)	159.00	0.00
Frctn Loss (ft) 0.16	0.29	Cum Volume (acre-ft)	0.07	1.82
C & E Loss (ft) 0.13	0.01	Cum SA (acres)	0.15	0.76

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.86	Element	Left OB	Channel
Right OB Vel Head (ft)	0.45	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.41	Reach Len. (ft)	97.00	101.00
105.00 Crit W.S. (ft)		Flow Area (sq ft)	16.15	151.32
E.G. Slope (ft/ft)	0.003137	Area (sq ft)	16.15	151.32
Q Total (cfs)	847.00	Flow (cfs)	20.70	826.30
Top Width (ft)	62.47	Top Width (ft)	20.66	41.81
Vel Total (ft/s)	5.06	Avg. Vel. (ft/s)	1.28	5.46
Max Chl Dpth (ft)	4.41	Hydr. Depth (ft)	0.78	3.62
Conv. Total (cfs)	15123.0	Conv. (cfs)	369.7	14753.4
Length Wtd. (ft)	100.63	Wetted Per. (ft)	20.71	43.48
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.15	0.68

Alpha	1.14	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	0.59	2.92
0.45				
C & E Loss (ft)	0.00	Cum SA (acres)	0.50	0.81
0.35				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	854.56	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.57	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.99	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	29.61	175.85
E.G. Slope (ft/ft)	0.003451	Area (sq ft)	29.61	175.85
Q Total (cfs)	1143.00	Flow (cfs)	51.32	1091.68
Top Width (ft)	68.83	Top Width (ft)	25.86	42.97
Vel Total (ft/s)	5.56	Avg. Vel. (ft/s)	1.73	6.21
Max Chl Dpth (ft)	4.98	Hydr. Depth (ft)	1.14	4.09
Conv. Total (cfs)	19457.8	Conv. (cfs)	873.6	18584.2
Length Wtd. (ft)	100.48	Wetted Per. (ft)	25.95	44.78
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.25	0.85
Alpha	1.19	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	0.95	3.40
0.69				
C & E Loss (ft)	0.01	Cum SA (acres)	0.62	0.82
0.47				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	855.08	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.67	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.42	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	51.74	194.48
0.44				
E.G. Slope (ft/ft)	0.003550	Area (sq ft)	51.74	194.48
0.44				
Q Total (cfs)	1387.00	Flow (cfs)	77.97	1308.78
0.24				
Top Width (ft)	102.12	Top Width (ft)	57.03	43.00
2.09				

Vel Total (ft/s)	5.62	Avg. Vel. (ft/s)	1.51	6.73
0.56				
Max Chl Dpth (ft)	5.42	Hydr. Depth (ft)	0.91	4.52
0.21				
Conv. Total (cfs)	23280.2	Conv. (cfs)	1308.7	21967.4
4.1				
Length Wtd. (ft)	100.39	Wetted Per. (ft)	57.13	44.81
2.13				
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.20	0.96
0.05				
Alpha	1.36	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)	1.26	3.72
0.87				
C & E Loss (ft)	0.03	Cum SA (acres)	0.73	0.82
0.51				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	855.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.71	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.88	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	80.59	214.30
1.93				
E.G. Slope (ft/ft)	0.003406	Area (sq ft)	80.59	214.30
1.93				
Q Total (cfs)	1651.00	Flow (cfs)	142.03	1507.23
1.74				
Top Width (ft)	115.49	Top Width (ft)	68.10	43.00
4.40				
Vel Total (ft/s)	5.56	Avg. Vel. (ft/s)	1.76	7.03
0.90				
Max Chl Dpth (ft)	5.88	Hydr. Depth (ft)	1.18	4.98
0.44				
Conv. Total (cfs)	28288.6	Conv. (cfs)	2433.6	25825.3
29.8				
Length Wtd. (ft)	100.27	Wetted Per. (ft)	68.20	44.81
4.48				
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.25	1.02
0.09				
Alpha	1.47	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	1.60	4.03
1.05				
C & E Loss (ft)	0.04	Cum SA (acres)	0.81	0.82
0.56				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1400

INPUT
Description: X-1400

existing.rep

Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	863	17	855	48	853	57	851	85	852
101	852	110	848	117	848	126	849	135	854
142	855	168	868						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	101	.035	135	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
101	135	120	109	100	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	852.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.34	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	851.76	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	9.30	78.32
E.G. Slope (ft/ft)	0.003599	Area (sq ft)	9.30	78.32
Q Total (cfs)	378.00	Flow (cfs)	7.86	370.14
Top Width (ft)	54.00	Top Width (ft)	24.59	29.41
Vel Total (ft/s)	4.31	Avg. Vel. (ft/s)	0.85	4.73
Max Chl Dpth (ft)	3.76	Hydr. Depth (ft)	0.38	2.66
Conv. Total (cfs)	6301.2	Conv. (cfs)	131.1	6170.1
Length Wtd. (ft)	109.23	Wetted Per. (ft)	24.68	30.98
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.08	0.57
Alpha	1.18	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.61	Cum Volume (acre-ft)	0.06	1.61
0.16				
C & E Loss (ft)	0.03	Cum SA (acres)	0.12	0.68
0.13				

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.49	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.01	Reach Len. (ft)	120.00	109.00
100.00				

Crit W.S. (ft)		Flow Area (sq ft)	67.27	117.06
E.G. Slope (ft/ft)	0.003983	Area (sq ft)	67.27	117.06
Q Total (cfs)	847.00	Flow (cfs)	133.92	713.08
Top Width (ft)	85.29	Top Width (ft)	53.08	32.21
Vel Total (ft/s)	4.59	Avg. Vel. (ft/s)	1.99	6.09
Max Chl Dpth (ft)	5.01	Hydr. Depth (ft)	1.27	3.63
Conv. Total (cfs)	13420.6	Conv. (cfs)	2122.0	11298.6
Length Wtd. (ft)	110.89	Wetted Per. (ft)	53.32	34.15
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.31	0.85
Alpha	1.51	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.47	Cum Volume (acre-ft)	0.49	2.61
0.45				
C & E Loss (ft)	0.01	Cum SA (acres)	0.42	0.72
0.35				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	854.18	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.54	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.65	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	104.51	138.10
E.G. Slope (ft/ft)	0.003836	Area (sq ft)	104.51	138.10
Q Total (cfs)	1143.00	Flow (cfs)	244.34	898.66
Top Width (ft)	96.39	Top Width (ft)	63.02	33.36
Vel Total (ft/s)	4.71	Avg. Vel. (ft/s)	2.34	6.51
Max Chl Dpth (ft)	5.65	Hydr. Depth (ft)	1.66	4.14
Conv. Total (cfs)	18454.2	Conv. (cfs)	3945.0	14509.2
Length Wtd. (ft)	111.52	Wetted Per. (ft)	63.28	35.47
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.40	0.93
Alpha	1.55	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.41	Cum Volume (acre-ft)	0.80	3.03
0.69				
C & E Loss (ft)	0.00	Cum SA (acres)	0.52	0.73
0.47				

CROSS SECTION OUTPUT Profile #50 Year

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	854.69				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	854.14	Reach Len. (ft)	120.00	109.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)	137.40	154.72	0.07
E.G. Slope (ft/ft)	0.003615	Area (sq ft)	137.40	154.72	0.07
Q Total (cfs)	1387.00	Flow (cfs)	346.86	1040.12	0.02
Top Width (ft)	105.62	Top Width (ft)	70.65	34.00	0.97
Vel Total (ft/s)	4.75	Avg. Vel. (ft/s)	2.52	6.72	0.27
Max Chl Dpth (ft)	6.14	Hydr. Depth (ft)	1.94	4.55	0.07
Conv. Total (cfs)	23068.1	Conv. (cfs)	5768.9	17298.9	0.3
Length Wtd. (ft)	111.87	Wetted Per. (ft)	70.92	36.20	0.98
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.44	0.96	0.02
Alpha	1.57	Stream Power (lb/ft s)	168.00	0.00	0.00
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	1.05	3.32	0.87
C & E Loss (ft)	0.00	Cum SA (acres)	0.59	0.73	0.51

CROSS SECTION OUTPUT Profile #100 Year

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	855.20				
Vel Head (ft)	0.56	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	854.64	Reach Len. (ft)	120.00	109.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)	174.92	171.83	1.44
E.G. Slope (ft/ft)	0.003317	Area (sq ft)	174.92	171.83	1.44
Q Total (cfs)	1651.00	Flow (cfs)	463.36	1186.59	1.05
Top Width (ft)	116.94	Top Width (ft)	78.45	34.00	4.49
Vel Total (ft/s)	4.74	Avg. Vel. (ft/s)	2.65	6.91	0.72
Max Chl Dpth (ft)	6.64	Hydr. Depth (ft)	2.23	5.05	0.32
Conv. Total (cfs)	28667.3	Conv. (cfs)	8045.6	20603.5	18.1
Length Wtd. (ft)	112.13	Wetted Per. (ft)	78.74	36.20	4.54
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.46	0.98	0.07

Alpha	1.61	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	1.31	3.58
1.04				
C & E Loss (ft)	0.01	Cum SA (acres)	0.65	0.73
0.55				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1300

INPUT
Description: X-1300
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	860	45	852	66	851	80	851	100	850
110	848	116	848	123	848	129	851	147	854
183	876								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	100	.035	129	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
100	129	95	88	88	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.46	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.67	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	850.78	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)	850.53	Flow Area (sq ft)	6.12	61.73
E.G. Slope (ft/ft)	0.009134	Area (sq ft)	6.12	61.73
Q Total (cfs)	419.00	Flow (cfs)	8.44	410.56
Top Width (ft)	44.21	Top Width (ft)	15.65	28.56
Vel Total (ft/s)	6.18	Avg. Vel. (ft/s)	1.38	6.65
Max Chl Dpth (ft)	2.78	Hydr. Depth (ft)	0.39	2.16
Conv. Total (cfs)	4384.1	Conv. (cfs)	88.4	4295.8
Length Wtd. (ft)	88.07	Wetted Per. (ft)	15.67	29.42
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.22	1.20
Alpha	1.14	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	0.04	1.44
0.16				
C & E Loss (ft)	0.14	Cum SA (acres)	0.07	0.61
0.13				

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.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.03	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.57	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.45	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	80.07	110.17
6.34				
E.G. Slope (ft/ft)	0.004402	Area (sq ft)	80.07	110.17
6.34				
Q Total (cfs)	928.00	Flow (cfs)	178.66	740.23
9.11				
Top Width (ft)	95.28	Top Width (ft)	57.56	29.00
8.73				
Vel Total (ft/s)	4.72	Avg. Vel. (ft/s)	2.23	6.72
1.44				
Max Chl Dpth (ft)	4.45	Hydr. Depth (ft)	1.39	3.80
0.73				
Conv. Total (cfs)	13987.3	Conv. (cfs)	2692.8	11157.1
137.4				
Length Wtd. (ft)	88.72	Wetted Per. (ft)	57.64	29.91
8.85				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.38	1.01
0.20				
Alpha	1.66	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.26	Cum Volume (acre-ft)	0.29	2.32
0.44				
C & E Loss (ft)	0.06	Cum SA (acres)	0.27	0.65
0.34				

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.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.78	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.54	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.24	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	126.92	132.91
15.03				
E.G. Slope (ft/ft)	0.003468	Area (sq ft)	126.92	132.91
15.03				
Q Total (cfs)	1249.00	Flow (cfs)	325.15	898.30
25.54				
Top Width (ft)	104.40	Top Width (ft)	61.97	29.00

13.43				
Vel Total (ft/s)	4.54	Avg. Vel. (ft/s)	2.56	6.76
1.70				
Max Chl Dpth (ft)	5.24	Hydr. Depth (ft)	2.05	4.58
1.12				
Conv. Total (cfs)	21207.9	Conv. (cfs)	5521.0	15253.1
433.7				
Length Wtd. (ft)	89.02	Wetted Per. (ft)	62.12	29.91
13.62				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.44	0.96
0.24				
Alpha	1.68	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.48	2.69
0.68				
C & E Loss (ft)	0.02	Cum SA (acres)	0.35	0.65
0.45				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	854.31	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.54	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.77	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	160.84	148.41
23.07				
E.G. Slope (ft/ft)	0.003128	Area (sq ft)	160.84	148.41
23.07				
Q Total (cfs)	1512.00	Flow (cfs)	443.82	1025.24
42.94				
Top Width (ft)	110.61	Top Width (ft)	64.97	29.00
16.64				
Vel Total (ft/s)	4.55	Avg. Vel. (ft/s)	2.76	6.91
1.86				
Max Chl Dpth (ft)	5.77	Hydr. Depth (ft)	2.48	5.12
1.39				
Conv. Total (cfs)	27035.0	Conv. (cfs)	7935.6	18331.6
767.8				
Length Wtd. (ft)	89.18	Wetted Per. (ft)	65.18	29.91
16.87				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.48	0.97
0.27				
Alpha	1.68	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	0.64	2.94
0.84				
C & E Loss (ft)	0.00	Cum SA (acres)	0.40	0.65
0.49				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.54	Wt. n-Val.	0.055	0.035
0.055				

W.S. Elev (ft)	854.32	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	197.13	164.23
32.81				
E.G. Slope (ft/ft)	0.002826	Area (sq ft)	197.13	164.23
32.81				
Q Total (cfs)	1796.00	Flow (cfs)	574.00	1153.82
68.18				
Top Width (ft)	115.56	Top Width (ft)	68.04	29.00
18.52				
Vel Total (ft/s)	4.56	Avg. Vel. (ft/s)	2.91	7.03
2.08				
Max Chl Dpth (ft)	6.32	Hydr. Depth (ft)	2.90	5.66
1.77				
Conv. Total (cfs)	33782.7	Conv. (cfs)	10796.9	21703.3
1282.5				
Length Wtd. (ft)	89.32	Wetted Per. (ft)	68.29	29.91
18.86				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.51	0.97
0.31				
Alpha	1.67	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	0.80	3.16
1.00				
C & E Loss (ft)	0.01	Cum SA (acres)	0.44	0.65
0.52				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1200

INPUT
Description: X-1200
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	27	856	58	854	79	852	94	851
102	848	115	847	125	848	134	848	137	850
149	855	190	876						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	94	.035	137	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
94	137	35	44	47	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	850.99	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.20	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.79	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)		116.65
0.75				
E.G. Slope (ft/ft)	0.001926	Area (sq ft)		116.65
0.75				

Q Total (cfs)	419.00	Flow (cfs)		418.54
0.46				
Top Width (ft)	44.35	Top Width (ft)		42.45
1.90				
Vel Total (ft/s)	3.57	Avg. Vel. (ft/s)		3.59
0.61				
Max Chl Dpth (ft)	3.79	Hydr. Depth (ft)		2.75
0.40				
Conv. Total (cfs)	9547.7	Conv. (cfs)		9537.3
10.4				
Length Wtd. (ft)	44.00	Wetted Per. (ft)		43.65
2.06				
Min Ch El (ft)	847.00	Shear (lb/sq ft)		0.32
0.04				
Alpha	1.01	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.03	1.26
0.16				
C & E Loss (ft)	0.03	Cum SA (acres)	0.05	0.54
0.13				

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.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.71	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.37	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.34	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	13.13	182.95
6.55				
E.G. Slope (ft/ft)	0.002053	Area (sq ft)	13.13	182.95
6.55				
Q Total (cfs)	928.00	Flow (cfs)	12.76	906.81
8.43				
Top Width (ft)	67.14	Top Width (ft)	18.53	43.00
5.61				
Vel Total (ft/s)	4.58	Avg. Vel. (ft/s)	0.97	4.96
1.29				
Max Chl Dpth (ft)	5.34	Hydr. Depth (ft)	0.71	4.25
1.17				
Conv. Total (cfs)	20480.0	Conv. (cfs)	281.6	20012.3
186.0				
Length Wtd. (ft)	43.82	Wetted Per. (ft)	18.58	44.24
6.07				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.09	0.53
0.14				
Alpha	1.15	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	0.19	2.02
0.43				
C & E Loss (ft)	0.04	Cum SA (acres)	0.19	0.57
0.32				

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.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.46	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.05	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	29.08	213.72
11.17				
E.G. Slope (ft/ft)	0.002116	Area (sq ft)	29.08	213.72
11.17				
Q Total (cfs)	1249.00	Flow (cfs)	38.82	1192.74
17.45				
Top Width (ft)	76.37	Top Width (ft)	26.04	43.00
7.32				
Vel Total (ft/s)	4.92	Avg. Vel. (ft/s)	1.33	5.58
1.56				
Max Chl Dpth (ft)	6.05	Hydr. Depth (ft)	1.12	4.97
1.53				
Conv. Total (cfs)	27153.5	Conv. (cfs)	843.8	25930.3
379.3				
Length Wtd. (ft)	43.66	Wetted Per. (ft)	26.13	44.24
7.93				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.15	0.64
0.19				
Alpha	1.23	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	0.31	2.34
0.65				
C & E Loss (ft)	0.05	Cum SA (acres)	0.25	0.58
0.43				

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.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	854.08	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.53	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.55	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	43.24	234.98
15.09				
E.G. Slope (ft/ft)	0.002180	Area (sq ft)	43.24	234.98
15.09				
Q Total (cfs)	1512.00	Flow (cfs)	67.60	1417.97
26.43				
Top Width (ft)	82.75	Top Width (ft)	31.23	43.00
8.51				

Vel Total (ft/s)	5.15	Avg. Vel. (ft/s)	1.56	6.03
1.75				
Max Chl Dpth (ft)	6.55	Hydr. Depth (ft)	1.38	5.46
1.77				
Conv. Total (cfs)	32385.3	Conv. (cfs)	1447.9	30371.2
566.2				
Length Wtd. (ft)	43.54	Wetted Per. (ft)	31.34	44.24
9.22				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.19	0.72
0.22				
Alpha	1.29	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.41	2.55
0.80				
C & E Loss (ft)	0.06	Cum SA (acres)	0.29	0.58
0.46				

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.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.62	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.60	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.02	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	59.25	255.40
19.40				
E.G. Slope (ft/ft)	0.002246	Area (sq ft)	59.25	255.40
19.40				
Q Total (cfs)	1796.00	Flow (cfs)	104.88	1653.61
37.51				
Top Width (ft)	88.97	Top Width (ft)	36.32	43.00
9.65				
Vel Total (ft/s)	5.38	Avg. Vel. (ft/s)	1.77	6.47
1.93				
Max Chl Dpth (ft)	7.02	Hydr. Depth (ft)	1.63	5.94
2.01				
Conv. Total (cfs)	37899.4	Conv. (cfs)	2213.2	34894.7
791.5				
Length Wtd. (ft)	43.42	Wetted Per. (ft)	36.45	44.24
10.45				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.23	0.81
0.26				
Alpha	1.34	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.52	2.74
0.95				
C & E Loss (ft)	0.07	Cum SA (acres)	0.33	0.58
0.49				

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.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1100

INPUT
Description: X-1100
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	53	856	67	854	92	852	113	850
118	847	127	848	140	848	142	849	148	850
158	856	171	869						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	113	.035	148	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
113	148	80	58	55	.1 .3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	850.81	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.52	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.29	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.43	72.02
0.07				
E.G. Slope (ft/ft)	0.007496	Area (sq ft)	0.43	72.02
0.07				
Q Total (cfs)	419.00	Flow (cfs)	0.27	418.69
0.04				
Top Width (ft)	38.48	Top Width (ft)	3.01	35.00
0.48				
Vel Total (ft/s)	5.78	Avg. Vel. (ft/s)	0.64	5.81
0.58				
Max Chl Dpth (ft)	3.29	Hydr. Depth (ft)	0.14	2.06
0.14				
Conv. Total (cfs)	4839.4	Conv. (cfs)	3.2	4835.8
0.5				
Length Wtd. (ft)	58.01	Wetted Per. (ft)	3.02	36.21
0.56				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.07	0.93
0.06				
Alpha	1.01	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	0.03	1.16
0.15				
C & E Loss (ft)	0.08	Cum SA (acres)	0.05	0.50
0.13				

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.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.52	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.81	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.72	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)		Flow Area (sq ft)	15.45	122.04
2.45				
E.G. Slope (ft/ft)	0.005904	Area (sq ft)	15.45	122.04
2.45				
Q Total (cfs)	928.00	Flow (cfs)	28.86	894.99
4.15				
Top Width (ft)	55.87	Top Width (ft)	18.01	35.00
2.86				
Vel Total (ft/s)	6.63	Avg. Vel. (ft/s)	1.87	7.33
1.69				
Max Chl Dpth (ft)	4.72	Hydr. Depth (ft)	0.86	3.49
0.86				
Conv. Total (cfs)	12077.0	Conv. (cfs)	375.6	11647.4
54.0				
Length Wtd. (ft)	58.34	Wetted Per. (ft)	18.09	36.21
3.33				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.31	1.24
0.27				
Alpha	1.18	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)	0.18	1.87
0.42				
C & E Loss (ft)	0.08	Cum SA (acres)	0.17	0.54
0.32				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.32	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.97	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.35	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)		Flow Area (sq ft)	29.04	144.15
4.59				
E.G. Slope (ft/ft)	0.005832	Area (sq ft)	29.04	144.15
4.59				
Q Total (cfs)	1249.00	Flow (cfs)	65.44	1174.05
9.51				
Top Width (ft)	64.25	Top Width (ft)	25.34	35.00
3.91				
Vel Total (ft/s)	7.03	Avg. Vel. (ft/s)	2.25	8.14
2.07				
Max Chl Dpth (ft)	5.35	Hydr. Depth (ft)	1.15	4.12
1.17				
Conv. Total (cfs)	16355.1	Conv. (cfs)	856.9	15373.6
124.6				
Length Wtd. (ft)	58.64	Wetted Per. (ft)	25.45	36.21
4.56				

Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.42	1.45
0.37				
Alpha	1.27	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	0.29	2.16
0.64				
C & E Loss (ft)	0.07	Cum SA (acres)	0.23	0.54
0.43				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.87	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.12	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.75	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)	852.17	Flow Area (sq ft)	40.26	158.25
6.30				
E.G. Slope (ft/ft)	0.006038	Area (sq ft)	40.26	158.25
6.30				
Q Total (cfs)	1512.00	Flow (cfs)	101.71	1395.52
14.76				
Top Width (ft)	69.96	Top Width (ft)	30.37	35.00
4.58				
Vel Total (ft/s)	7.38	Avg. Vel. (ft/s)	2.53	8.82
2.34				
Max Chl Dpth (ft)	5.75	Hydr. Depth (ft)	1.33	4.52
1.37				
Conv. Total (cfs)	19458.7	Conv. (cfs)	1309.0	17959.7
190.0				
Length Wtd. (ft)	58.86	Wetted Per. (ft)	30.50	36.21
5.34				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.50	1.65
0.44				
Alpha	1.33	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.29	Cum Volume (acre-ft)	0.38	2.35
0.79				
C & E Loss (ft)	0.07	Cum SA (acres)	0.27	0.54
0.46				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.29	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.11	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)	852.61	Flow Area (sq ft)	52.15	170.99
8.08				
E.G. Slope (ft/ft)	0.006351	Area (sq ft)	52.15	170.99
8.08				
Q Total (cfs)	1796.00	Flow (cfs)	146.32	1628.59
21.10				
Top Width (ft)	75.12	Top Width (ft)	34.93	35.00

5.19				
Vel Total (ft/s)	7.77	Avg. Vel. (ft/s)	2.81	9.52
2.61				
Max Chl Dpth (ft)	6.11	Hydr. Depth (ft)	1.49	4.89
1.56				
Conv. Total (cfs)	22536.2	Conv. (cfs)	1836.0	20435.5
264.7				
Length Wtd. (ft)	59.09	Wetted Per. (ft)	35.07	36.21
6.05				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.59	1.87
0.53				
Alpha	1.38	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	0.48	2.52
0.94				
C & E Loss (ft)	0.06	Cum SA (acres)	0.30	0.54
0.49				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1000

INPUT
Description: X-1000
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	9	856	17	855	35	853	60	851
62	847	91	847	95	850	111	853	125	863

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	60	.035	95	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
60	95	25	69	95	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	850.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.25	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.25	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)		104.04
0.17				
E.G. Slope (ft/ft)	0.002319	Area (sq ft)		104.04
0.17				
Q Total (cfs)	419.00	Flow (cfs)		418.94
0.06				
Top Width (ft)	35.98	Top Width (ft)		34.63
1.36				
Vel Total (ft/s)	4.02	Avg. Vel. (ft/s)		4.03
0.33				
Max Chl Dpth (ft)	3.25	Hydr. Depth (ft)		3.00
0.13				
Conv. Total (cfs)	8700.4	Conv. (cfs)		8699.3
1.2				

Length Wtd. (ft)	68.86	Wetted Per. (ft)		37.64
1.38				
Min Ch El (ft)	847.00	Shear (lb/sq ft)		0.40
0.02				
Alpha	1.00	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	0.03	1.04
0.15				
C & E Loss (ft)	0.04	Cum SA (acres)	0.04	0.45
0.12				

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.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.20	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.64	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	2.60	152.57
7.21				
E.G. Slope (ft/ft)	0.003190	Area (sq ft)	2.60	152.57
7.21				
Q Total (cfs)	928.00	Flow (cfs)	1.86	916.59
9.55				
Top Width (ft)	51.83	Top Width (ft)	8.06	35.00
8.77				
Vel Total (ft/s)	5.72	Avg. Vel. (ft/s)	0.72	6.01
1.32				
Max Chl Dpth (ft)	4.64	Hydr. Depth (ft)	0.32	4.36
0.82				
Conv. Total (cfs)	16429.6	Conv. (cfs)	32.9	16227.6
169.1				
Length Wtd. (ft)	67.57	Wetted Per. (ft)	8.08	38.47
8.92				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.06	0.79
0.16				
Alpha	1.09	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	0.16	1.69
0.41				
C & E Loss (ft)	0.04	Cum SA (acres)	0.15	0.49
0.31				

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.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	852.98	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.74	Wt. n-Val.	0.055	0.035

0.055				
W.S. Elev (ft)	852.24	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	9.64	173.47
13.40				
E.G. Slope (ft/ft)	0.003649	Area (sq ft)	9.64	173.47
13.40				
Q Total (cfs)	1249.00	Flow (cfs)	11.43	1214.23
23.34				
Top Width (ft)	62.48	Top Width (ft)	15.53	35.00
11.96				
Vel Total (ft/s)	6.36	Avg. Vel. (ft/s)	1.19	7.00
1.74				
Max Chl Dpth (ft)	5.24	Hydr. Depth (ft)	0.62	4.96
1.12				
Conv. Total (cfs)	20676.4	Conv. (cfs)	189.2	20100.8
386.3				
Length Wtd. (ft)	67.21	Wetted Per. (ft)	15.58	38.47
12.17				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.14	1.03
0.25				
Alpha	1.18	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	0.25	1.95
0.63				
C & E Loss (ft)	0.06	Cum SA (acres)	0.19	0.49
0.42				

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.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.52	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.90	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.61	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	16.23	186.39
18.18				
E.G. Slope (ft/ft)	0.004099	Area (sq ft)	16.23	186.39
18.18				
Q Total (cfs)	1512.00	Flow (cfs)	24.25	1450.61
37.14				
Top Width (ft)	69.07	Top Width (ft)	20.14	35.00
13.93				
Vel Total (ft/s)	6.85	Avg. Vel. (ft/s)	1.49	7.78
2.04				
Max Chl Dpth (ft)	5.61	Hydr. Depth (ft)	0.81	5.33
1.31				
Conv. Total (cfs)	23616.7	Conv. (cfs)	378.7	22657.8
580.1				
Length Wtd. (ft)	66.88	Wetted Per. (ft)	20.21	38.47
14.17				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.21	1.24
0.33				

Alpha	1.24	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	0.33	2.12
0.77				
C & E Loss (ft)	0.05	Cum SA (acres)	0.22	0.49
0.45				

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.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.02	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.09	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.93	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	23.33	197.63
22.93				
E.G. Slope (ft/ft)	0.004634	Area (sq ft)	23.33	197.63
22.93				
Q Total (cfs)	1796.00	Flow (cfs)	41.85	1700.36
53.79				
Top Width (ft)	74.79	Top Width (ft)	24.15	35.00
15.64				
Vel Total (ft/s)	7.36	Avg. Vel. (ft/s)	1.79	8.60
2.35				
Max Chl Dpth (ft)	5.93	Hydr. Depth (ft)	0.97	5.65
1.47				
Conv. Total (cfs)	26384.4	Conv. (cfs)	614.8	24979.3
790.3				
Length Wtd. (ft)	66.64	Wetted Per. (ft)	24.23	38.47
15.91				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.28	1.49
0.42				
Alpha	1.30	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.41	Cum Volume (acre-ft)	0.41	2.28
0.92				
C & E Loss (ft)	0.04	Cum SA (acres)	0.25	0.50
0.47				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 900

INPUT
Description: X-900
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	855	19	854	29	854	52	850	70	849
71	849	80	846	87	846	100	850	128	852

148 854 157 860

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	70	.035	100	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
70	100	20	34	75	.1 .3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	850.19	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.65	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	849.54	Reach Len. (ft)	20.00	34.00
75.00				
Crit W.S. (ft)	849.13	Flow Area (sq ft)	2.63	64.05
E.G. Slope (ft/ft)	0.008345	Area (sq ft)	2.63	64.05
Q Total (cfs)	419.00	Flow (cfs)	2.71	416.29
Top Width (ft)	38.23	Top Width (ft)	9.73	28.51
Vel Total (ft/s)	6.28	Avg. Vel. (ft/s)	1.03	6.50
Max Chl Dpth (ft)	3.54	Hydr. Depth (ft)	0.27	2.25
Conv. Total (cfs)	4586.7	Conv. (cfs)	29.6	4557.1
Length Wtd. (ft)	35.65	Wetted Per. (ft)	9.74	29.53
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.14	1.13
Alpha	1.06	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.03	0.91
0.15				
C & E Loss (ft)	0.16	Cum SA (acres)	0.04	0.40
0.12				

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.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.83	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.00	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.84	Reach Len. (ft)	20.00	34.00
75.00				
Crit W.S. (ft)	850.60	Flow Area (sq ft)	26.07	102.60
4.90				
E.G. Slope (ft/ft)	0.007815	Area (sq ft)	26.07	102.60

4.90				
Q Total (cfs)	928.00	Flow (cfs)	67.88	853.58
6.54				
Top Width (ft)	64.53	Top Width (ft)	22.81	30.00
11.71				
Vel Total (ft/s)	6.95	Avg. Vel. (ft/s)	2.60	8.32
1.33				
Max Chl Dpth (ft)	4.84	Hydr. Depth (ft)	1.14	3.42
0.42				
Conv. Total (cfs)	10497.6	Conv. (cfs)	767.9	9655.8
73.9				
Length Wtd. (ft)	37.25	Wetted Per. (ft)	22.91	31.09
11.74				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.56	1.61
0.20				
Alpha	1.33	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.15	1.49
0.40				
C & E Loss (ft)	0.26	Cum SA (acres)	0.14	0.44
0.29				

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.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	852.56	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.32	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.23	Reach Len. (ft)	20.00	34.00
75.00				
Crit W.S. (ft)	851.23	Flow Area (sq ft)	35.58	114.50
10.65				
E.G. Slope (ft/ft)	0.009216	Area (sq ft)	35.58	114.50
10.65				
Q Total (cfs)	1249.00	Flow (cfs)	116.04	1112.99
19.98				
Top Width (ft)	72.36	Top Width (ft)	25.09	30.00
17.27				
Vel Total (ft/s)	7.77	Avg. Vel. (ft/s)	3.26	9.72
1.88				
Max Chl Dpth (ft)	5.23	Hydr. Depth (ft)	1.42	3.82
0.62				
Conv. Total (cfs)	13010.7	Conv. (cfs)	1208.7	11593.9
208.1				
Length Wtd. (ft)	37.88	Wetted Per. (ft)	25.23	31.09
17.31				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.81	2.12
0.35				
Alpha	1.41	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.24	1.72
0.60				
C & E Loss (ft)	0.35	Cum SA (acres)	0.18	0.44
0.38				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.41	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	851.67	Reach Len. (ft)	20.00	34.00	75.00
Crit W.S. (ft)	851.67	Flow Area (sq ft)	46.97	127.48	19.43
E.G. Slope (ft/ft)	0.008785	Area (sq ft)	46.97	127.48	19.43
Q Total (cfs)	1512.00	Flow (cfs)	168.91	1299.60	43.48
Top Width (ft)	80.90	Top Width (ft)	27.58	30.00	23.32
Vel Total (ft/s)	7.80	Avg. Vel. (ft/s)	3.60	10.19	2.24
Max Chl Dpth (ft)	5.67	Hydr. Depth (ft)	1.70	4.25	0.83
Conv. Total (cfs)	16131.5	Conv. (cfs)	1802.1	13865.5	463.9
Length Wtd. (ft)	38.36	Wetted Per. (ft)	27.75	31.09	23.38
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.93	2.25	0.46
Alpha	1.49	Stream Power (lb/ft s)	157.00	0.00	0.00
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.31	1.87	0.73
C & E Loss (ft)	0.37	Cum SA (acres)	0.21	0.44	0.41

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water

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

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	853.57	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.50	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	852.08	Reach Len. (ft)	20.00	34.00	75.00
Crit W.S. (ft)	852.08	Flow Area (sq ft)	58.77	139.80	30.17
E.G. Slope (ft/ft)	0.008494	Area (sq ft)	58.77	139.80	30.17
Q Total (cfs)	1796.00	Flow (cfs)	228.39	1490.19	77.42
Top Width (ft)	88.71	Top Width (ft)	29.94	30.00	28.77
Vel Total (ft/s)	7.85	Avg. Vel. (ft/s)	3.89	10.66	2.57
Max Chl Dpth (ft)	6.08	Hydr. Depth (ft)	1.96	4.66	1.05
Conv. Total (cfs)	19487.3	Conv. (cfs)	2478.1	16169.2	840.1
Length Wtd. (ft)	38.81	Wetted Per. (ft)	30.15	31.09	28.84
Min Ch El (ft)	846.00	Shear (lb/sq ft)	1.03	2.38	0.55
Alpha	1.57	Stream Power (lb/ft s)	157.00	0.00	0.00
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.38	2.01	0.86
C & E Loss (ft)	0.39	Cum SA (acres)	0.23	0.44	0.42

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 800

INPUT
Description: X-800
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	854	19	852	39	850	63	848	80	847
89	846.2	97	846.2	107	848	163	850	188	851
216	856	233	858	245	859				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	63	.035	107	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
63	107	90	48	15	.1 .3

CROSS SECTION OUTPUT Profile #2 Year

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	849.94				
Vel Head (ft)	0.11	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	849.83	Reach Len. (ft)	90.00	48.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)	20.08	124.99	46.85
E.G. Slope (ft/ft)	0.001159	Area (sq ft)	20.08	124.99	46.85
Q Total (cfs)	419.00	Flow (cfs)	17.36	361.06	40.58
Top Width (ft)	117.17	Top Width (ft)	21.95	44.00	51.22
Vel Total (ft/s)	2.18	Avg. Vel. (ft/s)	0.86	2.89	0.87
Max Chl Dpth (ft)	3.63	Hydr. Depth (ft)	0.91	2.84	0.91
Conv. Total (cfs)	12309.0	Conv. (cfs)	509.9	10607.0	1192.1
Length Wtd. (ft)	47.27	Wetted Per. (ft)	22.03	44.23	51.25
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.07	0.20	0.07
Alpha	1.53	Stream Power (lb/ft s)	245.00	0.00	0.00
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.02	0.84	0.11
C & E Loss (ft)	0.01	Cum SA (acres)	0.03	0.37	0.08

CROSS SECTION OUTPUT Profile #10 Year

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	851.50				
Vel Head (ft)	0.14	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	851.36	Reach Len. (ft)	90.00	48.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)	65.92	192.37	154.09
E.G. Slope (ft/ft)	0.000918	Area (sq ft)	65.92	192.37	154.09
Q Total (cfs)	928.00	Flow (cfs)	78.23	659.41	190.36

Top Width (ft)	164.63	Top Width (ft)	37.61	44.00
83.02				
Vel Total (ft/s)	2.25	Avg. Vel. (ft/s)	1.19	3.43
1.24				
Max Chl Dpth (ft)	5.16	Hydr. Depth (ft)	1.75	4.37
1.86				
Conv. Total (cfs)	30627.9	Conv. (cfs)	2582.0	21763.2
6282.7				
Length Wtd. (ft)	45.38	Wetted Per. (ft)	37.76	44.23
83.11				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.10	0.25
0.11				
Alpha	1.73	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.13	1.37
0.26				
C & E Loss (ft)	0.03	Cum SA (acres)	0.12	0.41
0.21				

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.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	852.06	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.17	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.89	Reach Len. (ft)	90.00	48.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	87.37	215.82
199.11				
E.G. Slope (ft/ft)	0.000998	Area (sq ft)	87.37	215.82
199.11				
Q Total (cfs)	1249.00	Flow (cfs)	119.40	832.57
297.03				
Top Width (ft)	172.94	Top Width (ft)	42.94	44.00
86.00				
Vel Total (ft/s)	2.49	Avg. Vel. (ft/s)	1.37	3.86
1.49				
Max Chl Dpth (ft)	5.69	Hydr. Depth (ft)	2.03	4.90
2.32				
Conv. Total (cfs)	39545.1	Conv. (cfs)	3780.3	26360.4
9404.5				
Length Wtd. (ft)	44.55	Wetted Per. (ft)	43.11	44.23
86.14				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.13	0.30
0.14				
Alpha	1.72	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.21	1.60
0.42				
C & E Loss (ft)	0.04	Cum SA (acres)	0.16	0.41
0.30				

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.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	852.29	Reach Len. (ft)	90.00	48.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)	105.36	233.45	234.04
E.G. Slope (ft/ft)	0.001034	Area (sq ft)	105.36	233.45	234.04
Q Total (cfs)	1512.00	Flow (cfs)	156.80	966.17	389.03
Top Width (ft)	179.05	Top Width (ft)	46.80	44.00	88.25
Vel Total (ft/s)	2.64	Avg. Vel. (ft/s)	1.49	4.14	1.66
Max Chl Dpth (ft)	6.09	Hydr. Depth (ft)	2.25	5.31	2.65
Conv. Total (cfs)	47022.4	Conv. (cfs)	4876.2	30047.5	12098.7
Length Wtd. (ft)	43.98	Wetted Per. (ft)	46.99	44.23	88.42
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.14	0.34	0.17
Alpha	1.71	Stream Power (lb/ft s)	245.00	0.00	0.00
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.28	1.73	0.52
C & E Loss (ft)	0.05	Cum SA (acres)	0.19	0.41	0.31

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.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	852.68	Reach Len. (ft)	90.00	48.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)	124.37	250.64	268.93
E.G. Slope (ft/ft)	0.001069	Area (sq ft)	124.37	250.64	268.93
Q Total (cfs)	1796.00	Flow (cfs)	199.73	1105.81	490.46
Top Width (ft)	184.94	Top Width (ft)	50.51	44.00	90.44
Vel Total (ft/s)	2.79	Avg. Vel. (ft/s)	1.61	4.41	1.82

Max Chl Dpth (ft)	6.48	Hydr. Depth (ft)	2.46	5.70
2.97				
Conv. Total (cfs)	54934.7	Conv. (cfs)	6109.1	33823.6
15001.9				
Length Wtd. (ft)	43.49	Wetted Per. (ft)	50.73	44.23
90.64				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.16	0.38
0.20				
Alpha	1.69	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.34	1.86
0.60				
C & E Loss (ft)	0.06	Cum SA (acres)	0.21	0.41
0.32				

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.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 700

INPUT
Description: X-700
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	853	15	857	20	857	33	850	35	849
39	847	53	846	66	846	72	850	85	850
110	850	160	852	183	856	195	860		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	33	.035	72	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33	72	95	67	8	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.24	Wt. n-Val.		0.035
W.S. Elev (ft)	849.62	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)		107.47
E.G. Slope (ft/ft)	0.002214	Area (sq ft)		107.47
Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	37.67	Top Width (ft)		37.67
Vel Total (ft/s)	3.90	Avg. Vel. (ft/s)		3.90

Max Chl Dpth (ft)	3.62	Hydr. Depth (ft)		2.85
Conv. Total (cfs)	8904.0	Conv. (cfs)		8904.0
Length Wtd. (ft)	66.98	Wetted Per. (ft)		39.42
Min Ch El (ft)	846.00	Shear (lb/sq ft)		0.38
Alpha	1.00	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	0.00	0.71
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.33
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.43	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.97	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.87	159.76
48.51				
E.G. Slope (ft/ft)	0.002679	Area (sq ft)	0.87	159.76
48.51				
Q Total (cfs)	928.00	Flow (cfs)	0.69	869.86
57.45				
Top Width (ft)	103.00	Top Width (ft)	1.80	39.00
62.21				
Vel Total (ft/s)	4.44	Avg. Vel. (ft/s)	0.79	5.44
1.18				
Max Chl Dpth (ft)	4.97	Hydr. Depth (ft)	0.48	4.10
0.78				
Conv. Total (cfs)	17930.9	Conv. (cfs)	13.3	16807.5
1110.1				
Length Wtd. (ft)	61.94	Wetted Per. (ft)	2.04	40.95
62.22				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.07	0.65
0.13				
Alpha	1.42	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.06	1.18
0.23				
C & E Loss (ft)	0.01	Cum SA (acres)	0.08	0.36
0.18				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.94	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.59	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.35	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	1.70	174.76

74.29				
E.G. Slope (ft/ft)	0.003342	Area (sq ft)	1.70	174.76
74.29				
Q Total (cfs)	1249.00	Flow (cfs)	1.88	1128.48
118.65				
Top Width (ft)	113.34	Top Width (ft)	2.51	39.00
71.82				
Vel Total (ft/s)	4.98	Avg. Vel. (ft/s)	1.11	6.46
1.60				
Max Chl Dpth (ft)	5.35	Hydr. Depth (ft)	0.68	4.48
1.03				
Conv. Total (cfs)	21604.5	Conv. (cfs)	32.5	19519.7
2052.3				
Length Wtd. (ft)	58.29	Wetted Per. (ft)	2.85	40.95
71.85				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.12	0.89
0.22				
Alpha	1.53	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.12	1.38
0.38				
C & E Loss (ft)	0.01	Cum SA (acres)	0.12	0.37
0.27				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.35	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.69	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.66	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	2.54	186.56
97.16				
E.G. Slope (ft/ft)	0.003710	Area (sq ft)	2.54	186.56
97.16				
Q Total (cfs)	1512.00	Flow (cfs)	3.39	1325.71
182.90				
Top Width (ft)	121.46	Top Width (ft)	3.07	39.00
79.39				
Vel Total (ft/s)	5.28	Avg. Vel. (ft/s)	1.33	7.11
1.88				
Max Chl Dpth (ft)	5.66	Hydr. Depth (ft)	0.83	4.78
1.22				
Conv. Total (cfs)	24823.8	Conv. (cfs)	55.7	21765.3
3002.8				
Length Wtd. (ft)	55.90	Wetted Per. (ft)	3.49	40.95
79.42				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.17	1.06
0.28				
Alpha	1.60	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.16	1.50
0.46				
C & E Loss (ft)	0.04	Cum SA (acres)	0.14	0.37
0.28				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.75	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.80	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.95	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	3.53	198.08
121.70				
E.G. Slope (ft/ft)	0.004040	Area (sq ft)	3.53	198.08
121.70				
Q Total (cfs)	1796.00	Flow (cfs)	5.48	1528.73
261.79				
Top Width (ft)	129.39	Top Width (ft)	3.62	39.00
86.77				
Vel Total (ft/s)	5.55	Avg. Vel. (ft/s)	1.55	7.72
2.15				
Max Chl Dpth (ft)	5.95	Hydr. Depth (ft)	0.98	5.08
1.40				
Conv. Total (cfs)	28255.6	Conv. (cfs)	86.3	24050.8
4118.6				
Length Wtd. (ft)	53.85	Wetted Per. (ft)	4.11	40.95
86.81				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.22	1.22
0.35				
Alpha	1.67	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.21	1.61
0.53				
C & E Loss (ft)	0.07	Cum SA (acres)	0.16	0.37
0.29				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 600

INPUT
Description: X-600
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	859	16	857	36	856	45	852	54	846
64	845	74	847	81	849	92	850	144	850
190	850	210	862						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	45	.035	81	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
45	81	63	43	1	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.67	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.34	Wt. n-Val.		0.035
0.055				

W.S. Elev (ft)	849.32	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		88.96
0.57				
E.G. Slope (ft/ft)	0.003345	Area (sq ft)		88.96
0.57				
Q Total (cfs)	419.00	Flow (cfs)		418.74
0.26				
Top Width (ft)	35.52	Top Width (ft)		31.98
3.54				
Vel Total (ft/s)	4.68	Avg. Vel. (ft/s)		4.71
0.46				
Max Chl Dpth (ft)	4.32	Hydr. Depth (ft)		2.78
0.16				
Conv. Total (cfs)	7244.9	Conv. (cfs)		7240.4
4.5				
Length Wtd. (ft)	43.02	Wetted Per. (ft)		33.52
3.55				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.55
0.03				
Alpha	1.01	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.00	0.56
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.28
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.20	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.53	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.66	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)	849.57	Flow Area (sq ft)		133.18
78.03				
E.G. Slope (ft/ft)	0.003720	Area (sq ft)		133.18
78.03				
Q Total (cfs)	928.00	Flow (cfs)		825.93
102.07				
Top Width (ft)	144.10	Top Width (ft)		33.99
110.10				
Vel Total (ft/s)	4.39	Avg. Vel. (ft/s)		6.20
1.31				
Max Chl Dpth (ft)	5.66	Hydr. Depth (ft)		3.92
0.71				
Conv. Total (cfs)	15214.2	Conv. (cfs)		13540.9
1673.4				
Length Wtd. (ft)	39.78	Wetted Per. (ft)		35.93
110.33				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.86
0.16				
Alpha	1.78	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.06	0.95
0.22				
C & E Loss (ft)	0.00	Cum SA (acres)	0.08	0.31
0.17				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.73	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.56	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.17	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		150.69
134.34				
E.G. Slope (ft/ft)	0.003722	Area (sq ft)		150.69
134.34				
Q Total (cfs)	1249.00	Flow (cfs)		998.02
250.98				
Top Width (ft)	145.71	Top Width (ft)		34.76
110.95				
Vel Total (ft/s)	4.38	Avg. Vel. (ft/s)		6.62
1.87				
Max Chl Dpth (ft)	6.17	Hydr. Depth (ft)		4.34
1.21				
Conv. Total (cfs)	20473.7	Conv. (cfs)		16359.6
4114.1				
Length Wtd. (ft)	35.98	Wetted Per. (ft)		36.85
111.32				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.95
0.28				
Alpha	1.86	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	0.12	1.13
0.36				
C & E Loss (ft)	0.02	Cum SA (acres)	0.12	0.31
0.25				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.11	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.56	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.54	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		163.62
175.42				
E.G. Slope (ft/ft)	0.003677	Area (sq ft)		163.62
175.42				
Q Total (cfs)	1512.00	Flow (cfs)		1124.50
387.50				
Top Width (ft)	146.88	Top Width (ft)		35.31
111.57				
Vel Total (ft/s)	4.46	Avg. Vel. (ft/s)		6.87
2.21				
Max Chl Dpth (ft)	6.54	Hydr. Depth (ft)		4.63
1.57				
Conv. Total (cfs)	24933.3	Conv. (cfs)		18543.4
6390.0				
Length Wtd. (ft)	33.79	Wetted Per. (ft)		37.52
112.04				

Min Ch El (ft)	845.00	Shear (lb/sq ft)		1.00
0.36				
Alpha	1.83	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	0.16	1.23
0.43				
C & E Loss (ft)	0.03	Cum SA (acres)	0.14	0.31
0.26				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.48	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.58	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.90	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		176.31
215.32				
E.G. Slope (ft/ft)	0.003652	Area (sq ft)		176.31
215.32				
Q Total (cfs)	1796.00	Flow (cfs)		1254.85
541.15				
Top Width (ft)	148.01	Top Width (ft)		35.85
112.16				
Vel Total (ft/s)	4.59	Avg. Vel. (ft/s)		7.12
2.51				
Max Chl Dpth (ft)	6.90	Hydr. Depth (ft)		4.92
1.92				
Conv. Total (cfs)	29720.1	Conv. (cfs)		20765.2
8954.9				
Length Wtd. (ft)	32.05	Wetted Per. (ft)		38.16
112.73				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		1.05
0.44				
Alpha	1.77	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.21	1.32
0.50				
C & E Loss (ft)	0.03	Cum SA (acres)	0.15	0.31
0.27				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 500

INPUT
Description: X-500
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	856	50	850	70	848.5	80	846.77	95	845.64
100	846.5	106	849.5	163	850	185	850.45	215	850
223	852	240	862						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

0	.055	70	.035	106	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
70	106	85	68	5	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.47	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.46	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	849.01	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)		Flow Area (sq ft)	1.74	76.84
E.G. Slope (ft/ft)	0.005935	Area (sq ft)	1.74	76.84
Q Total (cfs)	419.00	Flow (cfs)	1.45	417.55
Top Width (ft)	41.83	Top Width (ft)	6.81	35.02
Vel Total (ft/s)	5.33	Avg. Vel. (ft/s)	0.84	5.43
Max Chl Dpth (ft)	3.37	Hydr. Depth (ft)	0.26	2.19
Conv. Total (cfs)	5438.9	Conv. (cfs)	18.8	5420.0
Length Wtd. (ft)	68.03	Wetted Per. (ft)	6.82	35.88
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.09	0.79
Alpha	1.03	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.47	Cum Volume (acre-ft)	0.00	0.48
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.24
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.04	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.49	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)	849.78	Flow Area (sq ft)	25.79	129.85
56.40				
E.G. Slope (ft/ft)	0.004133	Area (sq ft)	25.79	129.85
56.40				
Q Total (cfs)	928.00	Flow (cfs)	46.78	818.85
62.37				
Top Width (ft)	171.04	Top Width (ft)	24.08	36.00
110.96				
Vel Total (ft/s)	4.38	Avg. Vel. (ft/s)	1.81	6.31
1.11				
Max Chl Dpth (ft)	4.85	Hydr. Depth (ft)	1.07	3.61
0.51				
Conv. Total (cfs)	14435.8	Conv. (cfs)	727.8	12737.8

970.2				
Length Wtd. (ft)	64.91	Wetted Per. (ft)	24.17	36.97
111.03				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.28	0.91
0.13				
Alpha	1.85	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)	0.04	0.82
0.22				
C & E Loss (ft)	0.05	Cum SA (acres)	0.06	0.27
0.16				

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.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.49	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.09	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)	850.64	Flow Area (sq ft)	41.74	151.45
123.68				
E.G. Slope (ft/ft)	0.003397	Area (sq ft)	41.74	151.45
123.68				
Q Total (cfs)	1249.00	Flow (cfs)	83.39	959.38
206.23				
Top Width (ft)	178.44	Top Width (ft)	29.08	36.00
113.36				
Vel Total (ft/s)	3.94	Avg. Vel. (ft/s)	2.00	6.33
1.67				
Max Chl Dpth (ft)	5.45	Hydr. Depth (ft)	1.44	4.21
1.09				
Conv. Total (cfs)	21429.9	Conv. (cfs)	1430.8	16460.6
3538.5				
Length Wtd. (ft)	59.76	Wetted Per. (ft)	29.20	36.97
113.50				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.30	0.87
0.23				
Alpha	2.03	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)	0.09	0.98
0.35				
C & E Loss (ft)	0.06	Cum SA (acres)	0.09	0.27
0.25				

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.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	851.96	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.47	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.49	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)	850.91	Flow Area (sq ft)	54.09	165.90
169.53				
E.G. Slope (ft/ft)	0.003104	Area (sq ft)	54.09	165.90
169.53				
Q Total (cfs)	1512.00	Flow (cfs)	114.16	1067.61
330.22				
Top Width (ft)	183.39	Top Width (ft)	32.43	36.00
114.96				
Vel Total (ft/s)	3.88	Avg. Vel. (ft/s)	2.11	6.44
1.95				
Max Chl Dpth (ft)	5.85	Hydr. Depth (ft)	1.67	4.61
1.47				
Conv. Total (cfs)	27137.6	Conv. (cfs)	2049.0	19161.7
5926.9				
Length Wtd. (ft)	56.72	Wetted Per. (ft)	32.57	36.97
115.16				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.32	0.87
0.29				
Alpha	2.02	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	0.12	1.07
0.43				
C & E Loss (ft)	0.06	Cum SA (acres)	0.11	0.28
0.26				

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.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.34	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.47	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.87	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)		Flow Area (sq ft)	66.98	179.55
213.39				
E.G. Slope (ft/ft)	0.002921	Area (sq ft)	66.98	179.55
213.39				
Q Total (cfs)	1796.00	Flow (cfs)	148.62	1181.49
465.89				
Top Width (ft)	188.07	Top Width (ft)	35.58	36.00
116.48				
Vel Total (ft/s)	3.91	Avg. Vel. (ft/s)	2.22	6.58
2.18				
Max Chl Dpth (ft)	6.23	Hydr. Depth (ft)	1.88	4.99
1.83				
Conv. Total (cfs)	33229.9	Conv. (cfs)	2749.8	21860.2
8619.9				
Length Wtd. (ft)	54.36	Wetted Per. (ft)	35.75	36.97

116.72				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.34	0.89
0.33				
Alpha	1.98	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)	0.16	1.15
0.50				
C & E Loss (ft)	0.07	Cum SA (acres)	0.13	0.28
0.27				

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.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 400

INPUT
Description: X-400
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	875	7	859	22	851	36	851	42	847
48	846	55	845.52	67	846	72	849	83	849
108	849	141	851	168	849	170	850	175	852
190	860								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	36	.035	72	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
36	72	125	105	45	.1 .3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	848.99	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.60	Wt. n-Val.		0.035
W.S. Elev (ft)	848.39	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)		Flow Area (sq ft)		67.38
E.G. Slope (ft/ft)	0.008031	Area (sq ft)		67.38
Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	31.05	Top Width (ft)		31.05
Vel Total (ft/s)	6.22	Avg. Vel. (ft/s)		6.22
Max Chl Dpth (ft)	2.87	Hydr. Depth (ft)		2.17
Conv. Total (cfs)	4675.5	Conv. (cfs)		4675.5

Length Wtd. (ft)	105.00	Wetted Per. (ft)		32.24
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.05
Alpha	1.00	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	1.13	Cum Volume (acre-ft)		0.36
0.11				
C & E Loss (ft)	0.04	Cum SA (acres)		0.19
0.07				

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

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	850.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.03	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	849.58	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)	849.58	Flow Area (sq ft)		106.31
26.03				
E.G. Slope (ft/ft)	0.008968	Area (sq ft)		106.31
26.03				
Q Total (cfs)	928.00	Flow (cfs)		886.58
41.42				
Top Width (ft)	88.29	Top Width (ft)		33.86
54.42				
Vel Total (ft/s)	7.01	Avg. Vel. (ft/s)		8.34
1.59				
Max Chl Dpth (ft)	4.06	Hydr. Depth (ft)		3.14
0.48				
Conv. Total (cfs)	9799.5	Conv. (cfs)		9362.1
437.4				
Length Wtd. (ft)	102.85	Wetted Per. (ft)		35.58
54.60				
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.67
0.27				
Alpha	1.35	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.91	Cum Volume (acre-ft)	0.02	0.64
0.21				
C & E Loss (ft)	0.01	Cum SA (acres)	0.04	0.22
0.15				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.06	Wt. n-Val.		0.035	0.055
W.S. Elev (ft)	850.16	Reach Len. (ft)	125.00	105.00	45.00
Crit W.S. (ft)	850.16	Flow Area (sq ft)		126.41	63.43
E.G. Slope (ft/ft)	0.008144	Area (sq ft)		126.41	63.43
Q Total (cfs)	1249.00	Flow (cfs)		1105.86	143.14
Top Width (ft)	108.00	Top Width (ft)		34.74	73.26
Vel Total (ft/s)	6.58	Avg. Vel. (ft/s)		8.75	2.26
Max Chl Dpth (ft)	4.64	Hydr. Depth (ft)		3.64	0.87
Conv. Total (cfs)	13840.2	Conv. (cfs)		12254.1	1586.1
Length Wtd. (ft)	98.42	Wetted Per. (ft)		36.64	73.61
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.75	0.44
Alpha	1.58	Stream Power (lb/ft s)	190.00	0.00	0.00
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)	0.05	0.76	0.34
C & E Loss (ft)	0.03	Cum SA (acres)	0.07	0.22	0.24

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	851.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.10	Wt. n-Val.		0.035	0.055
W.S. Elev (ft)	850.54	Reach Len. (ft)	125.00	105.00	45.00
Crit W.S. (ft)	850.54	Flow Area (sq ft)		139.58	93.27
E.G. Slope (ft/ft)	0.007912	Area (sq ft)		139.58	93.27
Q Total (cfs)	1512.00	Flow (cfs)		1270.14	241.86
Top Width (ft)	120.79	Top Width (ft)		35.31	85.48

Vel Total (ft/s)	6.49	Avg. Vel. (ft/s)		9.10
2.59				
Max Chl Dpth (ft)	5.02	Hydr. Depth (ft)		3.95
1.09				
Conv. Total (cfs)	16998.2	Conv. (cfs)		14279.1
2719.1				
Length Wtd. (ft)	95.71	Wetted Per. (ft)		37.32
85.92				
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.85
0.54				
Alpha	1.68	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.67	Cum Volume (acre-ft)	0.07	0.83
0.41				
C & E Loss (ft)	0.03	Cum SA (acres)	0.08	0.22
0.25				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.02	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.17	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.85	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)	850.85	Flow Area (sq ft)		150.61
121.36				
E.G. Slope (ft/ft)	0.008098	Area (sq ft)		150.61
121.36				
Q Total (cfs)	1796.00	Flow (cfs)		1444.17
351.83				
Top Width (ft)	131.34	Top Width (ft)		35.77
95.56				
Vel Total (ft/s)	6.60	Avg. Vel. (ft/s)		9.59
2.90				
Max Chl Dpth (ft)	5.33	Hydr. Depth (ft)		4.21
1.27				
Conv. Total (cfs)	19958.3	Conv. (cfs)		16048.5
3909.8				
Length Wtd. (ft)	93.76	Wetted Per. (ft)		37.88
96.09				
Min Ch El (ft)	845.52	Shear (lb/sq ft)		2.01
0.64				
Alpha	1.73	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)	0.09	0.89
0.48				
C & E Loss (ft)	0.02	Cum SA (acres)	0.09	0.22
0.26				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 300

INPUT
Description: X-300
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	885	7	878	9	849	21	850	26	848
33	848	37	845	49	844	57	845	64	848
84	848	88	849	112	848	126	849	152	849
162	853	180	860						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	33	.035	64	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33	64	125	98	20	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	847.81	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.00	Wt. n-Val.		0.035
W.S. Elev (ft)	846.81	Reach Len. (ft)	125.00	98.00
20.00				
Crit W.S. (ft)	846.81	Flow Area (sq ft)		52.28
E.G. Slope (ft/ft)	0.015301	Area (sq ft)		52.28
Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	26.65	Top Width (ft)		26.65
Vel Total (ft/s)	8.01	Avg. Vel. (ft/s)		8.01
Max Chl Dpth (ft)	2.81	Hydr. Depth (ft)		1.96
Conv. Total (cfs)	3387.3	Conv. (cfs)		3387.3
Length Wtd. (ft)	81.71	Wetted Per. (ft)		27.73
Min Ch El (ft)	844.00	Shear (lb/sq ft)		1.80
Alpha	1.00	Stream Power (lb/ft s)	180.00	0.00
0.00				

Frctn Loss (ft)	0.66	Cum Volume (acre-ft)	0.22
0.11			
C & E Loss (ft)	0.23	Cum SA (acres)	0.12
0.07			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	849.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.10	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	848.58	Reach Len. (ft)	125.00	98.00	20.00
Crit W.S. (ft)	848.58	Flow Area (sq ft)	4.46	104.41	18.57
E.G. Slope (ft/ft)	0.008644	Area (sq ft)	4.46	104.41	18.57
Q Total (cfs)	928.00	Flow (cfs)	7.26	893.27	27.47
Top Width (ft)	83.71	Top Width (ft)	8.44	31.00	44.27
Vel Total (ft/s)	7.28	Avg. Vel. (ft/s)	1.63	8.56	1.48
Max Chl Dpth (ft)	4.58	Hydr. Depth (ft)	0.53	3.37	0.42
Conv. Total (cfs)	9981.4	Conv. (cfs)	78.1	9607.9	295.4
Length Wtd. (ft)	81.24	Wetted Per. (ft)	8.56	32.72	44.37
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.28	1.72	0.23
Alpha	1.33	Stream Power (lb/ft s)	180.00	0.00	0.00
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.01	0.38	0.19
C & E Loss (ft)	0.20	Cum SA (acres)	0.03	0.14	0.10

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

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	850.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.95	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	849.38	Reach Len. (ft)	125.00	98.00	20.00
Crit W.S. (ft)	849.38	Flow Area (sq ft)	12.85	129.15	74.25
E.G. Slope (ft/ft)	0.006228	Area (sq ft)	12.85	129.15	74.25
Q Total (cfs)	1249.00	Flow (cfs)	28.16	1080.74	140.10
Top Width (ft)	134.92	Top Width (ft)	14.98	31.00	88.94
Vel Total (ft/s)	5.78	Avg. Vel. (ft/s)	2.19	8.37	1.89
Max Chl Dpth (ft)	5.38	Hydr. Depth (ft)	0.86	4.17	0.83
Conv. Total (cfs)	15826.9	Conv. (cfs)	356.9	13694.8	1775.3
Length Wtd. (ft)	78.24	Wetted Per. (ft)	15.61	32.72	89.19
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.32	1.53	0.32
Alpha	1.83	Stream Power (lb/ft s)	180.00	0.00	0.00
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	0.03	0.46	0.27
C & E Loss (ft)	0.10	Cum SA (acres)	0.04	0.14	0.15

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	850.70	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.00	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	849.70	Reach Len. (ft)	125.00	98.00
20.00				
Crit W.S. (ft)	849.70	Flow Area (sq ft)	18.40	139.09
102.88				
E.G. Slope (ft/ft)	0.006282	Area (sq ft)	18.40	139.09
102.88				
Q Total (cfs)	1512.00	Flow (cfs)	43.16	1228.10
240.74				
Top Width (ft)	140.38	Top Width (ft)	19.64	31.00
89.74				
Vel Total (ft/s)	5.81	Avg. Vel. (ft/s)	2.35	8.83
2.34				
Max Chl Dpth (ft)	5.70	Hydr. Depth (ft)	0.94	4.49
1.15				
Conv. Total (cfs)	19076.9	Conv. (cfs)	544.5	15494.9
3037.5				
Length Wtd. (ft)	76.59	Wetted Per. (ft)	20.65	32.72
90.05				
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.35	1.67
0.45				
Alpha	1.91	Stream Power (lb/ft s)	180.00	0.00
0.00				
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.04	0.49
0.31				
C & E Loss (ft)	0.07	Cum SA (acres)	0.05	0.14
0.16				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	851.05	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.12	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	849.93	Reach Len. (ft)	125.00	98.00
20.00				
Crit W.S. (ft)	849.93	Flow Area (sq ft)	23.39	146.34
123.95				
E.G. Slope (ft/ft)	0.006844	Area (sq ft)	23.39	146.34
123.95				
Q Total (cfs)	1796.00	Flow (cfs)	59.62	1395.20
341.18				
Top Width (ft)	144.38	Top Width (ft)	23.05	31.00

90.33				
Vel Total (ft/s)	6.12	Avg. Vel. (ft/s)	2.55	9.53
2.75				
Max Chl Dpth (ft)	5.93	Hydr. Depth (ft)	1.01	4.72
1.37				
Conv. Total (cfs)	21710.1	Conv. (cfs)	720.7	16865.1
4124.2				
Length Wtd. (ft)	75.20	Wetted Per. (ft)	24.33	32.72
90.68				
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.41	1.91
0.58				
Alpha	1.93	Stream Power (lb/ft s)	180.00	0.00
0.00				
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	0.06	0.53
0.35				
C & E Loss (ft)	0.07	Cum SA (acres)	0.06	0.14
0.16				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 200

INPUT
Description: X-200
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	873	8	857	23	848	31	847	35	844
44	843	50	845	62	847	68	848	81	847
84	847	93	845	109	844	117	844	123	848
141	850	156	852	172	860				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	31	.035	62	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
31	62	115	105	75	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	846.77	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.24	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	846.53	Reach Len. (ft)	115.00	105.00

75.00				
Crit W.S. (ft)	845.76	Flow Area (sq ft)		53.69
62.72				
E.G. Slope (ft/ft)	0.005017	Area (sq ft)		53.69
62.72				
Q Total (cfs)	419.00	Flow (cfs)		244.03
174.97				
Top Width (ft)	62.21	Top Width (ft)		27.54
34.67				
Vel Total (ft/s)	3.60	Avg. Vel. (ft/s)		4.55
2.79				
Max Chl Dpth (ft)	3.53	Hydr. Depth (ft)		1.95
1.81				
Conv. Total (cfs)	5915.6	Conv. (cfs)		3445.3
2470.3				
Length Wtd. (ft)	91.70	Wetted Per. (ft)		28.89
35.63				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		0.58
0.55				
Alpha	1.18	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)	0.85	Cum Volume (acre-ft)		0.10
0.09				
C & E Loss (ft)	0.04	Cum SA (acres)		0.06
0.06				

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	848.14	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.41	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	847.72	Reach Len. (ft)	115.00	105.00
75.00				
Crit W.S. (ft)	846.73	Flow Area (sq ft)	2.08	89.86
114.30				
E.G. Slope (ft/ft)	0.005393	Area (sq ft)	2.08	89.86
114.30				
Q Total (cfs)	928.00	Flow (cfs)	2.08	551.42
374.50				
Top Width (ft)	92.06	Top Width (ft)	5.77	31.00
55.29				
Vel Total (ft/s)	4.50	Avg. Vel. (ft/s)	1.00	6.14
3.28				
Max Chl Dpth (ft)	4.72	Hydr. Depth (ft)	0.36	2.90
2.07				
Conv. Total (cfs)	12637.1	Conv. (cfs)	28.4	7509.0
5099.7				
Length Wtd. (ft)	91.64	Wetted Per. (ft)	5.82	32.55
56.75				
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.12	0.93
0.68				
Alpha	1.32	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)	0.00	0.16

0.16					
C & E Loss (ft)	0.07	Cum SA (acres)	0.01	0.07	
0.08					

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	848.59	Element	Left OB	Channel	
Right OB					
Vel Head (ft)	0.63	Wt. n-Val.	0.055	0.035	
0.055					
W.S. Elev (ft)	847.96	Reach Len. (ft)	115.00	105.00	
75.00					
Crit W.S. (ft)	847.10	Flow Area (sq ft)	3.72	97.38	
128.31					
E.G. Slope (ft/ft)	0.007417	Area (sq ft)	3.72	97.38	
128.31					
Q Total (cfs)	1249.00	Flow (cfs)	5.29	739.33	
504.39					
Top Width (ft)	98.97	Top Width (ft)	7.71	31.00	
60.26					
Vel Total (ft/s)	5.44	Avg. Vel. (ft/s)	1.42	7.59	
3.93					
Max Chl Dpth (ft)	4.96	Hydr. Depth (ft)	0.48	3.14	
2.13					
Conv. Total (cfs)	14502.5	Conv. (cfs)	61.4	8584.5	
5856.5					
Length Wtd. (ft)	91.76	Wetted Per. (ft)	7.77	32.55	
61.83					
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.22	1.39	
0.96					
Alpha	1.36	Stream Power (lb/ft s)	172.00	0.00	
0.00					
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	0.01	0.20	
0.22					
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07	
0.12					

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	849.00	Element	Left OB	Channel	
Right OB					
Vel Head (ft)	0.76	Wt. n-Val.	0.055	0.035	
0.055					
W.S. Elev (ft)	848.24	Reach Len. (ft)	115.00	105.00	
75.00					

Crit W.S. (ft)	847.51	Flow Area (sq ft)	5.93	105.79
145.10				
E.G. Slope (ft/ft)	0.008200	Area (sq ft)	5.93	105.79
145.10				
Q Total (cfs)	1512.00	Flow (cfs)	11.39	892.49
608.12				
Top Width (ft)	102.51	Top Width (ft)	8.39	31.00
63.12				
Vel Total (ft/s)	5.89	Avg. Vel. (ft/s)	1.92	8.44
4.19				
Max Chl Dpth (ft)	5.24	Hydr. Depth (ft)	0.71	3.41
2.30				
Conv. Total (cfs)	16697.5	Conv. (cfs)	125.8	9856.0
6715.7				
Length Wtd. (ft)	91.54	Wetted Per. (ft)	8.52	32.55
64.71				
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.36	1.66
1.15				
Alpha	1.42	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)	0.98	Cum Volume (acre-ft)	0.01	0.22
0.26				
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07
0.12				

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

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	849.39	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.87	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	848.51	Reach Len. (ft)	115.00	105.00
75.00				
Crit W.S. (ft)	847.83	Flow Area (sq ft)	8.32	114.38
162.93				
E.G. Slope (ft/ft)	0.008588	Area (sq ft)	8.32	114.38
162.93				
Q Total (cfs)	1796.00	Flow (cfs)	19.67	1040.27
736.06				
Top Width (ft)	105.46	Top Width (ft)	8.85	31.00
65.61				
Vel Total (ft/s)	6.29	Avg. Vel. (ft/s)	2.37	9.09
4.52				
Max Chl Dpth (ft)	5.51	Hydr. Depth (ft)	0.94	3.69
2.48				
Conv. Total (cfs)	19379.8	Conv. (cfs)	212.3	11225.0
7942.5				
Length Wtd. (ft)	91.24	Wetted Per. (ft)	9.06	32.55
67.22				
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.49	1.88
1.30				
Alpha	1.42	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)	1.02	Cum Volume (acre-ft)	0.01	0.24
0.29				
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07

0.13

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

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 100

INPUT
Description: X-100
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	861	23	846	26	845	38	843	45	844
50	846	72	846	90	846	94	844	116	844
126	844	136	851	141	852	160	856	172	860

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	23	.035	50	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23	50	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	845.88	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.60	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	845.28	Reach Len. (ft)		
Crit W.S. (ft)	845.28	Flow Area (sq ft)		29.91
43.65				
E.G. Slope (ft/ft)	0.022329	Area (sq ft)		29.91
43.65				
Q Total (cfs)	419.00	Flow (cfs)		222.54
196.46				
Top Width (ft)	59.40	Top Width (ft)		23.02
36.38				
Vel Total (ft/s)	5.70	Avg. Vel. (ft/s)		7.44
4.50				
Max Chl Dpth (ft)	2.28	Hydr. Depth (ft)		1.30
1.20				
Conv. Total (cfs)	2804.0	Conv. (cfs)		1489.3
1314.7				
Length Wtd. (ft)		Wetted Per. (ft)		23.55
37.08				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		1.77
1.64				
Alpha	1.20	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	847.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.15	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	845.95	Reach Len. (ft)		
Crit W.S. (ft)	845.95	Flow Area (sq ft)		46.72
69.01				
E.G. Slope (ft/ft)	0.028303	Area (sq ft)		46.72
69.01				
Q Total (cfs)	928.00	Flow (cfs)		475.06
452.94				
Top Width (ft)	65.43	Top Width (ft)		26.74
38.69				
Vel Total (ft/s)	8.02	Avg. Vel. (ft/s)		10.17
6.56				
Max Chl Dpth (ft)	2.95	Hydr. Depth (ft)		1.75
1.78				
Conv. Total (cfs)	5516.1	Conv. (cfs)		2823.8
2692.3				
Length Wtd. (ft)		Wetted Per. (ft)		27.51
39.77				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		3.00
3.07				
Alpha	1.15	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	847.64	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.86	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	846.78	Reach Len. (ft)		
Crit W.S. (ft)	846.78	Flow Area (sq ft)	0.47	69.14
133.03				
E.G. Slope (ft/ft)	0.014462	Area (sq ft)	0.47	69.14
133.03				
Q Total (cfs)	1249.00	Flow (cfs)	0.73	648.21
600.06				
Top Width (ft)	108.18	Top Width (ft)	1.20	27.00
79.98				
Vel Total (ft/s)	6.16	Avg. Vel. (ft/s)	1.54	9.38
4.51				
Max Chl Dpth (ft)	3.78	Hydr. Depth (ft)	0.39	2.56
1.66				

Conv. Total (cfs)	10385.8	Conv. (cfs)	6.0	5390.1 4989.7
Length Wtd. (ft)		Wetted Per. (ft)	1.43	27.78 81.32
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.30	2.25 1.48
Alpha	1.46	Stream Power (lb/ft s)	172.00	0.00 0.00
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	847.99	Element	Left OB	Channel Right OB
Vel Head (ft)	0.97	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	847.02	Reach Len. (ft)		
Crit W.S. (ft)	847.02	Flow Area (sq ft)	0.79	75.49 151.90
E.G. Slope (ft/ft)	0.014734	Area (sq ft)	0.79	75.49 151.90
Q Total (cfs)	1512.00	Flow (cfs)	1.48	757.56 752.97
Top Width (ft)	108.87	Top Width (ft)	1.56	27.00 80.31
Vel Total (ft/s)	6.63	Avg. Vel. (ft/s)	1.86	10.03 4.96
Max Chl Dpth (ft)	4.02	Hydr. Depth (ft)	0.51	2.80 1.89
Conv. Total (cfs)	12456.4	Conv. (cfs)	12.2	6241.0 6203.2
Length Wtd. (ft)		Wetted Per. (ft)	1.86	27.78 81.74
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.39	2.50 1.71
Alpha	1.43	Stream Power (lb/ft s)	172.00	0.00 0.00
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	848.34	Element	Left OB	Channel Right OB
Vel Head (ft)	1.10	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	847.25	Reach Len. (ft)		
Crit W.S. (ft)	847.25	Flow Area (sq ft)	1.19	81.62 170.16
E.G. Slope (ft/ft)	0.015134	Area (sq ft)	1.19	81.62

170.16					
Q Total (cfs)	1796.00	Flow (cfs)		2.56	874.37
919.07					
Top Width (ft)	109.55	Top Width (ft)		1.91	27.00
80.64					
Vel Total (ft/s)	7.10	Avg. Vel. (ft/s)		2.15	10.71
5.40					
Max Chl Dpth (ft)	4.25	Hydr. Depth (ft)		0.62	3.02
2.11					
Conv. Total (cfs)	14599.3	Conv. (cfs)		20.8	7107.6
7470.9					
Length Wtd. (ft)		Wetted Per. (ft)		2.28	27.78
82.13					
Min Ch El (ft)	843.00	Shear (lb/sq ft)		0.49	2.78
1.96					
Alpha	1.40	Stream Power (lb/ft s)		172.00	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:Bluestone Creek

Reach	River Sta.	n1	n2	n3
1	1500	.055	.035	.055
1	1400	.055	.035	.055
1	1300	.055	.035	.055
1	1200	.055	.035	.055
1	1100	.055	.035	.055
1	1000	.055	.035	.055
1	900	.055	.035	.055
1	800	.055	.035	.055
1	700	.055	.035	.055
1	600	.055	.035	.055
1	500	.055	.035	.055
1	400	.055	.035	.055
1	300	.055	.035	.055
1	200	.055	.035	.055
1	100	.055	.035	.055

SUMMARY OF REACH LENGTHS

River: Bluestone Creek

Reach	River Sta.	Left	Channel	Right
1	1500	97	101	105
1	1400	120	109	100
1	1300	95	88	88
1	1200	35	44	47
1	1100	80	58	55
1	1000	25	69	95

existing.rep

1	900	20	34	75
1	800	90	48	15
1	700	95	67	8
1	600	63	43	1
1	500	85	68	5
1	400	125	105	45
1	300	125	98	20
1	200	115	105	75
1	100	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Bluestone Creek

Reach	River Sta.	Contr.	Expan.
1	1500	.1	.3
1	1400	.1	.3
1	1300	.1	.3
1	1200	.1	.3
1	1100	.1	.3
1	1000	.1	.3
1	900	.1	.3
1	800	.1	.3
1	700	.1	.3
1	600	.1	.3
1	500	.1	.3
1	400	.1	.3
1	300	.1	.3
1	200	.1	.3
1	100	.1	.3

HEC-RAS Plan: 19 River: Bluestone Creek Reach: 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	1600	2 Year	378.00	849.00	852.18		852.39	0.002277	3.72	101.78	42.40	0.41
1	1500	10 Year	847.00	849.00	853.41		853.86	0.003137	5.46	167.47	62.47	0.51
1	1500	25 Year	1143.00	849.00	853.99		854.56	0.003451	6.21	205.47	68.63	0.54
1	1500	50 Year	1387.00	849.00	854.42		855.08	0.003550	6.73	246.66	102.12	0.56
1	1500	100 Year	1651.00	849.00	854.88		855.58	0.003406	7.03	296.82	115.49	0.56
1	1400	2 Year	378.00	848.00	851.76		852.10	0.003599	4.73	87.62	54.00	0.51
1	1400	10 Year	847.00	848.00	853.01		853.50	0.003983	6.09	184.33	85.29	0.56
1	1400	25 Year	1143.00	848.00	853.65		854.18	0.003836	6.51	242.61	96.39	0.56
1	1400	50 Year	1387.00	848.00	854.14		854.69	0.003615	6.72	292.19	105.62	0.56
1	1400	100 Year	1651.00	848.00	854.64		855.20	0.003317	6.91	348.19	116.94	0.54
1	1300	2 Year	419.00	848.00	850.78	850.53	851.46	0.009134	6.65	67.85	44.21	0.80
1	1300	10 Year	928.00	848.00	852.45		853.03	0.004402	6.72	196.59	95.28	0.61
1	1300	25 Year	1249.00	848.00	853.24		853.78	0.003468	6.76	274.86	104.40	0.56
1	1300	50 Year	1512.00	848.00	853.77		854.31	0.003128	6.91	332.32	110.61	0.54
1	1300	100 Year	1796.00	848.00	854.32		854.86	0.002826	7.03	394.18	115.56	0.52
1	1200	2 Year	419.00	847.00	850.79		850.99	0.001926	3.59	117.40	44.35	0.38
1	1200	10 Year	928.00	847.00	852.34		852.71	0.002053	4.96	202.64	67.14	0.42
1	1200	25 Year	1249.00	847.00	853.05		853.51	0.002116	5.58	253.98	76.37	0.44
1	1200	50 Year	1512.00	847.00	853.55		854.08	0.002180	6.03	293.32	82.75	0.45
1	1200	100 Year	1796.00	847.00	854.02		854.62	0.002246	6.47	334.05	88.97	0.47
1	1100	2 Year	419.00	847.00	850.29		850.81	0.007496	5.81	72.52	38.48	0.71
1	1100	10 Year	928.00	847.00	851.72		852.52	0.005904	7.33	139.94	55.87	0.69
1	1100	25 Year	1249.00	847.00	852.35		853.32	0.005832	8.14	177.79	64.25	0.71
1	1100	50 Year	1512.00	847.00	852.75	852.17	853.87	0.006038	8.82	204.81	69.96	0.73
1	1100	100 Year	1796.00	847.00	853.11	852.61	854.40	0.006351	9.52	231.23	75.12	0.76
1	1000	2 Year	419.00	847.00	850.25		850.51	0.002319	4.03	104.21	35.98	0.41
1	1000	10 Year	928.00	847.00	851.64		852.20	0.003190	6.01	162.38	51.83	0.51
1	1000	25 Year	1249.00	847.00	852.24		852.98	0.003649	7.00	196.52	62.48	0.55
1	1000	50 Year	1512.00	847.00	852.61		853.62	0.004099	7.78	220.80	69.07	0.59
1	1000	100 Year	1796.00	847.00	852.93		854.02	0.004634	8.60	243.89	74.79	0.64
1	900	2 Year	419.00	846.00	849.54	849.13	850.19	0.008345	6.50	66.68	38.23	0.76
1	900	10 Year	928.00	846.00	850.84	850.60	851.83	0.007815	8.32	133.58	64.53	0.79
1	900	25 Year	1249.00	846.00	851.23	851.23	852.56	0.009216	9.72	160.73	72.36	0.88
1	900	50 Year	1512.00	846.00	851.67	851.67	853.08	0.008785	10.19	193.88	80.90	0.87
1	900	100 Year	1796.00	846.00	852.08	852.08	853.57	0.008494	10.66	228.74	88.71	0.87
1	800	2 Year	419.00	846.20	849.83		849.94	0.001159	2.89	191.91	117.17	0.30
1	800	10 Year	928.00	846.20	851.36		851.50	0.000918	3.43	412.38	164.63	0.29
1	800	25 Year	1249.00	846.20	851.89		852.06	0.000998	3.86	502.30	172.94	0.31
1	800	50 Year	1512.00	846.20	852.29		852.48	0.001034	4.14	572.85	179.05	0.32
1	800	100 Year	1796.00	846.20	852.68		852.89	0.001069	4.41	643.93	184.94	0.33
1	700	2 Year	419.00	846.00	849.62		849.86	0.002214	3.90	107.47	37.67	0.41
1	700	10 Year	928.00	846.00	850.97		851.40	0.002679	5.44	209.14	103.00	0.47
1	700	25 Year	1249.00	846.00	851.35		851.94	0.003342	6.46	250.75	113.34	0.54
1	700	50 Year	1512.00	846.00	851.66		852.35	0.003710	7.11	286.27	121.46	0.57
1	700	100 Year	1796.00	846.00	851.95		852.75	0.004040	7.72	323.32	129.39	0.60
1	600	2 Year	419.00	845.00	849.32		849.67	0.003345	4.71	89.53	35.52	0.50
1	600	10 Year	928.00	845.00	850.66	849.57	851.20	0.003720	6.20	211.20	144.10	0.55
1	600	25 Year	1249.00	845.00	851.17		851.73	0.003722	6.62	285.04	145.71	0.56
1	600	50 Year	1512.00	845.00	851.54		852.11	0.003677	6.87	339.04	146.88	0.56
1	600	100 Year	1796.00	845.00	851.90		852.48	0.003652	7.12	391.63	148.01	0.57
1	500	2 Year	419.00	845.64	849.01		849.47	0.005935	5.43	78.57	41.83	0.65
1	500	10 Year	928.00	845.64	850.49	849.78	851.04	0.004133	6.31	212.05	171.04	0.59
1	500	25 Year	1249.00	845.64	851.09	850.64	851.58	0.003397	6.33	316.87	178.44	0.54
1	500	50 Year	1512.00	845.64	851.49	850.91	851.96	0.003104	6.44	389.51	183.39	0.53
1	500	100 Year	1796.00	845.64	851.87		852.34	0.002921	6.58	459.92	188.07	0.52
1	400	2 Year	419.00	845.52	848.39		848.99	0.008031	6.22	67.38	31.06	0.74
1	400	10 Year	928.00	845.52	849.58	849.58	850.61	0.008968	8.34	132.34	88.29	0.83
1	400	25 Year	1249.00	845.52	850.16	850.16	851.22	0.008144	8.75	189.85	108.00	0.81
1	400	50 Year	1512.00	845.52	850.54	850.54	851.63	0.007912	9.10	232.86	120.79	0.81
1	400	100 Year	1796.00	845.52	850.85	850.85	852.02	0.008098	9.59	271.97	131.34	0.82
1	300	2 Year	419.00	844.00	846.81	846.81	847.81	0.015301	8.01	52.28	26.65	1.01
1	300	10 Year	928.00	844.00	848.58	848.58	849.67	0.008644	8.56	127.44	83.71	0.82
1	300	25 Year	1249.00	844.00	849.38	849.38	850.32	0.006228	8.37	216.25	134.92	0.72
1	300	50 Year	1512.00	844.00	849.70	849.70	850.70	0.006282	8.83	260.36	140.38	0.73

HEC-RAS Plan: 19 River: Bluestone Creek Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	300	100 Year	1796.00	844.00	849.93	849.93	851.05	0.006844	9.53	293.68	144.38	0.77
1	200	2 Year	419.00	843.00	846.53	845.76	846.77	0.005017	4.55	116.41	62.21	0.57
1	200	10 Year	928.00	843.00	847.72	846.73	848.14	0.005393	5.14	206.25	92.06	0.64
1	200	25 Year	1249.00	843.00	847.96	847.10	848.59	0.007417	7.59	229.41	98.97	0.75
1	200	50 Year	1512.00	843.00	848.24	847.51	849.00	0.008200	8.44	256.82	102.51	0.80
1	200	100 Year	1796.00	843.00	848.51	847.83	849.39	0.008588	9.09	285.63	105.46	0.83
1	100	2 Year	419.00	843.00	845.28	845.28	845.88	0.022329	7.44	73.56	59.40	1.15
1	100	10 Year	928.00	843.00	845.95	845.95	847.10	0.028303	10.17	115.73	65.43	1.36
1	100	25 Year	1249.00	843.00	846.78	846.78	847.64	0.014462	9.38	202.64	108.18	1.03
1	100	50 Year	1512.00	843.00	847.02	847.02	847.99	0.014734	10.03	228.19	108.87	1.06
1	100	100 Year	1796.00	843.00	847.25	847.25	848.34	0.015134	10.71	252.96	109.55	1.09

Appendix C

Temp Bridge.rep.txt

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

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  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: Bluestone Creek WEU 51
Project File : existing.prj
Run Date and Time: 9/13/2013 7:31:51 AM

Project in English units

PLAN DATA

Plan Title: Plan 21
Plan File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.p21

Geometry Title: Proposed Temporary Bridge Crossing
Geometry File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.g05

Flow Title : Existing
Flow File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.f01

Plan Summary Information:

Number of:	Cross Sections	= 15	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: Existing
Flow File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.f01

Flow Data (cfs)

River	Reach	RS	2 Year	10 Year	25 Year	50 Year	100 Year
Bluestone Creek	1	1500	378	847	1143	1387	1651
Bluestone Creek	1	1300	419	928	1249	1512	1796

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Bluestone Creek	1	2 Year		Critical
Bluestone Creek	1	10 Year		Critical
Bluestone Creek	1	25 Year		Critical
Bluestone Creek	1	50 Year		Critical
Bluestone Creek	1	100 Year		Critical

GEOMETRY DATA

Geometry Title: Proposed Temporary Bridge Crossing
Geometry File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.g05

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1500

INPUT
Description: X-1500
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	867	23	855	47	854	68	854	77	853
94	852	99	849	107	849	115	849	129	850
137	854	142	855	159	868				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	94	.035	137	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
94	137	97	101	105	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	852.40	Element	Left OB	Channel
Right OB Vel Head (ft)	0.21	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	852.18	Reach Len. (ft)	97.00	101.00
105.00 Crit W.S. (ft)		Flow Area (sq ft)	0.28	101.57
E.G. Slope (ft/ft)	0.002272	Area (sq ft)	0.28	101.57
Q Total (cfs)	378.00	Flow (cfs)	0.07	377.93
Top Width (ft)	42.43	Top Width (ft)	3.07	39.36
Vel Total (ft/s)	3.71	Avg. Vel. (ft/s)	0.26	3.72
Max Chl Dpth (ft)	3.18	Hydr. Depth (ft)	0.09	2.58
Conv. Total (cfs)	7930.1	Conv. (cfs)	1.5	7928.6
Length Wtd. (ft)	100.96	Wetted Per. (ft)	3.07	40.74
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.01	0.35
Alpha 0.00	1.00	Stream Power (lb/ft s)	159.00	0.00
Frctn Loss (ft) 0.16	0.28	Cum Volume (acre-ft)	0.11	1.94
C & E Loss (ft) 0.14	0.01	Cum SA (acres)	0.23	0.77

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.86	Element	Left OB	Channel
Right OB Vel Head (ft)	0.45	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.41	Reach Len. (ft)	97.00	101.00
105.00 Crit W.S. (ft)		Flow Area (sq ft)	16.24	151.50
E.G. Slope (ft/ft)	0.003125	Area (sq ft)	16.24	151.50
Q Total (cfs)	847.00	Flow (cfs)	20.83	826.17
Top Width (ft)	62.52	Top Width (ft)	20.69	41.82
Vel Total (ft/s)	5.05	Avg. Vel. (ft/s)	1.28	5.45
Max Chl Dpth (ft)	4.41	Hydr. Depth (ft)	0.78	3.62
Conv. Total (cfs)	15152.4	Conv. (cfs)	372.6	14779.8
Length Wtd. (ft)	100.63	Wetted Per. (ft)	20.75	43.49
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.15	0.68

Alpha	1.14	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	0.63	2.95
0.43				
C & E Loss (ft)	0.00	Cum SA (acres)	0.52	0.81
0.33				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	854.55	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.58	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.98	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	29.43	175.55
E.G. Slope (ft/ft)	0.003471	Area (sq ft)	29.43	175.55
Q Total (cfs)	1143.00	Flow (cfs)	51.02	1091.98
Top Width (ft)	68.76	Top Width (ft)	25.80	42.96
Vel Total (ft/s)	5.58	Avg. Vel. (ft/s)	1.73	6.22
Max Chl Dpth (ft)	4.98	Hydr. Depth (ft)	1.14	4.09
Conv. Total (cfs)	19401.1	Conv. (cfs)	866.0	18535.1
Length Wtd. (ft)	100.49	Wetted Per. (ft)	25.88	44.76
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.25	0.85
Alpha	1.19	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	0.97	3.40
0.66				
C & E Loss (ft)	0.01	Cum SA (acres)	0.63	0.82
0.44				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	855.07	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.67	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.40	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	50.79	193.76
0.40				
E.G. Slope (ft/ft)	0.003602	Area (sq ft)	50.79	193.76
0.40				
Q Total (cfs)	1387.00	Flow (cfs)	76.51	1310.27
0.22				
Top Width (ft)	101.64	Top Width (ft)	56.63	43.00
2.01				

Vel Total (ft/s)	5.66	Avg. Vel. (ft/s)	1.51	6.76
0.55				
Max Chl Dpth (ft)	5.40	Hydr. Depth (ft)	0.90	4.51
0.20				
Conv. Total (cfs)	23110.8	Conv. (cfs)	1274.9	21832.2
3.7				
Length Wtd. (ft)	100.39	Wetted Per. (ft)	56.72	44.81
2.05				
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.20	0.97
0.04				
Alpha	1.35	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	1.27	3.70
0.81				
C & E Loss (ft)	0.03	Cum SA (acres)	0.74	0.82
0.48				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	855.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.71	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.86	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	79.58	213.66
1.87				
E.G. Slope (ft/ft)	0.003448	Area (sq ft)	79.58	213.66
1.87				
Q Total (cfs)	1651.00	Flow (cfs)	140.41	1508.91
1.67				
Top Width (ft)	115.06	Top Width (ft)	67.74	43.00
4.32				
Vel Total (ft/s)	5.59	Avg. Vel. (ft/s)	1.76	7.06
0.89				
Max Chl Dpth (ft)	5.86	Hydr. Depth (ft)	1.17	4.97
0.43				
Conv. Total (cfs)	28116.5	Conv. (cfs)	2391.3	25696.8
28.5				
Length Wtd. (ft)	100.27	Wetted Per. (ft)	67.84	44.81
4.41				
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.25	1.03
0.09				
Alpha	1.46	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	1.60	3.99
0.96				
C & E Loss (ft)	0.04	Cum SA (acres)	0.81	0.82
0.51				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1400

INPUT
Description: X-1400

Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	863	17	855	48	853	57	851	85	852
101	852	110	848	117	848	126	849	135	854
142	855	168	868						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	101	.035	135	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
101	135	120	109	100	.1 .3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	852.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.34	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	851.76	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	9.38	78.42
E.G. Slope (ft/ft)	0.003584	Area (sq ft)	9.38	78.42
Q Total (cfs)	378.00	Flow (cfs)	7.94	370.06
Top Width (ft)	54.13	Top Width (ft)	24.70	29.43
Vel Total (ft/s)	4.31	Avg. Vel. (ft/s)	0.85	4.72
Max Chl Dpth (ft)	3.76	Hydr. Depth (ft)	0.38	2.66
Conv. Total (cfs)	6314.1	Conv. (cfs)	132.7	6181.5
Length Wtd. (ft)	109.31	Wetted Per. (ft)	24.80	31.00
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.08	0.57
Alpha	1.18	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.49	Cum Volume (acre-ft)	0.09	1.73
0.16				
C & E Loss (ft)	0.01	Cum SA (acres)	0.20	0.69
0.14				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.49	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.02	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	67.80	117.39
E.G. Slope (ft/ft)	0.003941	Area (sq ft)	67.80	117.39

Q Total (cfs)	847.00	Flow (cfs)	134.72	712.28
Top Width (ft)	85.46	Top Width (ft)	53.23	32.23
Vel Total (ft/s)	4.57	Avg. Vel. (ft/s)	1.99	6.07
Max Chl Dpth (ft)	5.02	Hydr. Depth (ft)	1.27	3.64
Conv. Total (cfs)	13491.8	Conv. (cfs)	2145.9	11345.9
Length Wtd. (ft)	110.92	Wetted Per. (ft)	53.47	34.17
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.31	0.85
Alpha	1.51	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	0.53	2.64
0.43				
C & E Loss (ft)	0.01	Cum SA (acres)	0.44	0.73
0.33				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	854.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.54	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.63	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	103.77	137.70
E.G. Slope (ft/ft)	0.003879	Area (sq ft)	103.77	137.70
Q Total (cfs)	1143.00	Flow (cfs)	243.26	899.74
Top Width (ft)	96.18	Top Width (ft)	62.84	33.34
Vel Total (ft/s)	4.73	Avg. Vel. (ft/s)	2.34	6.53
Max Chl Dpth (ft)	5.63	Hydr. Depth (ft)	1.65	4.13
Conv. Total (cfs)	18352.5	Conv. (cfs)	3905.8	14446.7
Length Wtd. (ft)	111.51	Wetted Per. (ft)	63.10	35.45
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.40	0.94
Alpha	1.55	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.41	Cum Volume (acre-ft)	0.83	3.04
0.66				
C & E Loss (ft)	0.00	Cum SA (acres)	0.53	0.73
0.44				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	854.67	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.56	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.11	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	135.62	153.86
0.05				
E.G. Slope (ft/ft)	0.003699	Area (sq ft)	135.62	153.86
0.05				
Q Total (cfs)	1387.00	Flow (cfs)	344.59	1042.40
0.01				
Top Width (ft)	105.05	Top Width (ft)	70.26	34.00
0.79				
Vel Total (ft/s)	4.79	Avg. Vel. (ft/s)	2.54	6.78
0.24				
Max Chl Dpth (ft)	6.11	Hydr. Depth (ft)	1.93	4.53
0.06				
Conv. Total (cfs)	22805.1	Conv. (cfs)	5665.8	17139.1
0.2				
Length Wtd. (ft)	111.85	Wetted Per. (ft)	70.53	36.20
0.80				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.44	0.98
0.01				
Alpha	1.57	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	1.06	3.30
0.81				
C & E Loss (ft)	0.00	Cum SA (acres)	0.59	0.73
0.47				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	855.19	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.57	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.62	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	173.34	171.14
1.35				
E.G. Slope (ft/ft)	0.003373	Area (sq ft)	173.34	171.14
1.35				
Q Total (cfs)	1651.00	Flow (cfs)	461.45	1188.58
0.97				
Top Width (ft)	116.49	Top Width (ft)	78.14	34.00
4.35				
Vel Total (ft/s)	4.77	Avg. Vel. (ft/s)	2.66	6.95
0.72				
Max Chl Dpth (ft)	6.62	Hydr. Depth (ft)	2.22	5.03
0.31				
Conv. Total (cfs)	28428.9	Conv. (cfs)	7945.9	20466.4
16.7				
Length Wtd. (ft)	112.12	Wetted Per. (ft)	78.43	36.20
4.40				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.47	1.00
0.06				
Alpha	1.61	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	1.32	3.55

0.95					
C & E Loss (ft)	0.01	Cum SA (acres)		0.65	0.74
0.50					

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1300

INPUT
Description: X-1300
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	860	45	852	66	851	80	851	100	850
110	848	116	848	123	848	129	851	147	854
183	876								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	100	.035	129	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
100	129	95	88	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.59	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.48	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.11	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)	850.53	Flow Area (sq ft)	13.94	71.24
0.04				
E.G. Slope (ft/ft)	0.005610	Area (sq ft)	13.94	71.24
0.04				
Q Total (cfs)	419.00	Flow (cfs)	14.87	404.11
0.01				
Top Width (ft)	66.02	Top Width (ft)	36.35	29.00
0.67				
Vel Total (ft/s)	4.92	Avg. Vel. (ft/s)	1.07	5.67
0.29				
Max Chl Dpth (ft)	3.11	Hydr. Depth (ft)	0.38	2.46
0.06				
Conv. Total (cfs)	5593.9	Conv. (cfs)	198.6	5395.2
0.1				
Length Wtd. (ft)	88.12	Wetted Per. (ft)	36.38	29.91
0.68				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.13	0.83
0.02				
Alpha	1.29	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.06	1.54
0.16				
C & E Loss (ft)	0.10	Cum SA (acres)	0.11	0.62
0.14				

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.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.05	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.51	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	83.06	111.68
6.81				
E.G. Slope (ft/ft)	0.004144	Area (sq ft)	83.06	111.68
6.81				
Q Total (cfs)	928.00	Flow (cfs)	183.66	734.63
9.71				
Top Width (ft)	95.88	Top Width (ft)	57.85	29.00
9.04				
Vel Total (ft/s)	4.60	Avg. Vel. (ft/s)	2.21	6.58
1.43				
Max Chl Dpth (ft)	4.51	Hydr. Depth (ft)	1.44	3.85
0.75				
Conv. Total (cfs)	14416.5	Conv. (cfs)	2853.1	11412.5
150.8				
Length Wtd. (ft)	88.74	Wetted Per. (ft)	57.94	29.91
9.16				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.37	0.97
0.19				
Alpha	1.66	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.33	2.35
0.42				
C & E Loss (ft)	0.06	Cum SA (acres)	0.29	0.65
0.32				

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.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.76	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.21	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	125.43	132.21
14.71				
E.G. Slope (ft/ft)	0.003550	Area (sq ft)	125.43	132.21
14.71				
Q Total (cfs)	1249.00	Flow (cfs)	323.02	900.87
25.11				
Top Width (ft)	104.12	Top Width (ft)	61.83	29.00
13.29				
Vel Total (ft/s)	4.59	Avg. Vel. (ft/s)	2.58	6.81
1.71				

Max Chl Dpth (ft)	5.21	Hydr. Depth (ft)	2.03	4.56
1.11				
Conv. Total (cfs)	20962.3	Conv. (cfs)	5421.3	15119.6
421.4				
Length Wtd. (ft)	89.01	Wetted Per. (ft)	61.99	29.91
13.47				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.45	0.98
0.24				
Alpha	1.68	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.51	2.70
0.64				
C & E Loss (ft)	0.02	Cum SA (acres)	0.36	0.65
0.43				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	854.29	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.73	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	158.27	147.26
22.41				
E.G. Slope (ft/ft)	0.003237	Area (sq ft)	158.27	147.26
22.41				
Q Total (cfs)	1512.00	Flow (cfs)	440.51	1029.46
42.03				
Top Width (ft)	110.15	Top Width (ft)	64.75	29.00
16.40				
Vel Total (ft/s)	4.61	Avg. Vel. (ft/s)	2.78	6.99
1.88				
Max Chl Dpth (ft)	5.73	Hydr. Depth (ft)	2.44	5.08
1.37				
Conv. Total (cfs)	26577.3	Conv. (cfs)	7743.1	18095.4
738.8				
Length Wtd. (ft)	89.17	Wetted Per. (ft)	64.95	29.91
16.63				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.49	0.99
0.27				
Alpha	1.68	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.66	2.92
0.78				
C & E Loss (ft)	0.00	Cum SA (acres)	0.41	0.66
0.46				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.84	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.29	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	195.19	163.41

32.29				
E.G. Slope (ft/ft)	0.002890	Area (sq ft)	195.19	163.41
32.29				
Q Total (cfs)	1796.00	Flow (cfs)	571.83	1156.93
67.24				
Top Width (ft)	115.35	Top Width (ft)	67.88	29.00
18.47				
Vel Total (ft/s)	4.59	Avg. Vel. (ft/s)	2.93	7.08
2.08				
Max Chl Dpth (ft)	6.29	Hydr. Depth (ft)	2.88	5.63
1.75				
Conv. Total (cfs)	33409.1	Conv. (cfs)	10637.2	21521.1
1250.7				
Length Wtd. (ft)	89.32	Wetted Per. (ft)	68.13	29.91
18.80				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.52	0.99
0.31				
Alpha	1.67	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	0.82	3.13
0.91				
C & E Loss (ft)	0.01	Cum SA (acres)	0.45	0.66
0.48				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1200

INPUT
Description: X-1200
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	27	856	58	854	79	852	94	851
102	848	115	847	125	848	134	848	137	850
149	855	190	876						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	94	.035	137	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
94	137	35	44	47	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.28	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.16	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.13	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.12	130.90
1.52				
E.G. Slope (ft/ft)	0.001332	Area (sq ft)	0.12	130.90
1.52				
Q Total (cfs)	419.00	Flow (cfs)	0.02	418.01
0.97				
Top Width (ft)	47.58	Top Width (ft)	1.88	43.00

2.70				
Vel Total (ft/s)	3.16	Avg. Vel. (ft/s)	0.16	3.19
0.64				
Max Chl Dpth (ft)	4.13	Hydr. Depth (ft)	0.06	3.04
0.56				
Conv. Total (cfs)	11481.0	Conv. (cfs)	0.5	11454.0
26.5				
Length Wtd. (ft)	43.97	Wetted Per. (ft)	1.89	44.24
2.93				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.01	0.25
0.04				
Alpha	1.02	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.05	1.34
0.15				
C & E Loss (ft)	0.02	Cum SA (acres)	0.07	0.54
0.14				

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.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.75	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.36	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.39	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	14.15	185.27
6.85				
E.G. Slope (ft/ft)	0.001963	Area (sq ft)	14.15	185.27
6.85				
Q Total (cfs)	928.00	Flow (cfs)	13.84	905.40
8.76				
Top Width (ft)	67.83	Top Width (ft)	19.10	43.00
5.74				
Vel Total (ft/s)	4.50	Avg. Vel. (ft/s)	0.98	4.89
1.28				
Max Chl Dpth (ft)	5.39	Hydr. Depth (ft)	0.74	4.31
1.20				
Conv. Total (cfs)	20947.3	Conv. (cfs)	312.5	20437.1
197.7				
Length Wtd. (ft)	43.80	Wetted Per. (ft)	19.15	44.24
6.21				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.09	0.51
0.14				
Alpha	1.15	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	0.22	2.05
0.41				
C & E Loss (ft)	0.04	Cum SA (acres)	0.20	0.58
0.31				

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.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.49	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.47	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.03	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	28.39	212.58
10.98				
E.G. Slope (ft/ft)	0.002158	Area (sq ft)	28.39	212.58
10.98				
Q Total (cfs)	1249.00	Flow (cfs)	37.94	1193.84
17.22				
Top Width (ft)	76.02	Top Width (ft)	25.76	43.00
7.26				
Vel Total (ft/s)	4.96	Avg. Vel. (ft/s)	1.34	5.62
1.57				
Max Chl Dpth (ft)	6.03	Hydr. Depth (ft)	1.10	4.94
1.51				
Conv. Total (cfs)	26887.8	Conv. (cfs)	816.8	25700.4
370.6				
Length Wtd. (ft)	43.67	Wetted Per. (ft)	25.85	44.24
7.87				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.15	0.65
0.19				
Alpha	1.23	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.34	2.35
0.61				
C & E Loss (ft)	0.06	Cum SA (acres)	0.26	0.58
0.41				

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.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	854.05	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.54	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.50	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	41.85	233.05
14.71				
E.G. Slope (ft/ft)	0.002248	Area (sq ft)	41.85	233.05
14.71				
Q Total (cfs)	1512.00	Flow (cfs)	65.67	1420.38
25.95				
Top Width (ft)	82.17	Top Width (ft)	30.76	43.00
8.40				
Vel Total (ft/s)	5.22	Avg. Vel. (ft/s)	1.57	6.09
1.76				
Max Chl Dpth (ft)	6.50	Hydr. Depth (ft)	1.36	5.42

1.75				
Conv. Total (cfs)	31888.6	Conv. (cfs)	1385.0	29956.3
547.3				
Length Wtd. (ft)	43.57	Wetted Per. (ft)	30.87	44.24
9.10				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.19	0.74
0.23				
Alpha	1.29	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.44	2.54
0.74				
C & E Loss (ft)	0.07	Cum SA (acres)	0.30	0.58
0.43				

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.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.60	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.61	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.99	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	58.07	253.98
19.08				
E.G. Slope (ft/ft)	0.002293	Area (sq ft)	58.07	253.98
19.08				
Q Total (cfs)	1796.00	Flow (cfs)	103.32	1655.60
37.08				
Top Width (ft)	88.44	Top Width (ft)	35.87	43.00
9.57				
Vel Total (ft/s)	5.42	Avg. Vel. (ft/s)	1.78	6.52
1.94				
Max Chl Dpth (ft)	6.99	Hydr. Depth (ft)	1.62	5.91
1.99				
Conv. Total (cfs)	37504.4	Conv. (cfs)	2157.5	34572.6
774.4				
Length Wtd. (ft)	43.47	Wetted Per. (ft)	36.00	44.24
10.37				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.23	0.82
0.26				
Alpha	1.34	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.17	Cum Volume (acre-ft)	0.54	2.71
0.86				
C & E Loss (ft)	0.09	Cum SA (acres)	0.34	0.58
0.45				

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.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1100

INPUT
Description: X-1100
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	53	856	67	854	92	852	113	850
118	847	127	848	140	848	142	849	148	850
158	856	171	869						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	113	.035	148	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
113	148	80	58	55	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.18	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.31	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.87	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)		Flow Area (sq ft)	4.00	92.54
0.63				
E.G. Slope (ft/ft)	0.003193	Area (sq ft)	4.00	92.54
0.63				
Q Total (cfs)	419.00	Flow (cfs)	3.50	415.00
0.50				
Top Width (ft)	45.61	Top Width (ft)	9.16	35.00
1.45				
Vel Total (ft/s)	4.31	Avg. Vel. (ft/s)	0.88	4.48
0.79				
Max Chl Dpth (ft)	3.87	Hydr. Depth (ft)	0.44	2.64
0.44				
Conv. Total (cfs)	7414.7	Conv. (cfs)	61.9	7343.9
8.9				
Length Wtd. (ft)	58.09	Wetted Per. (ft)	9.20	36.21
1.70				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.09	0.51
0.07				
Alpha	1.07	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	0.05	1.22
0.15				
C & E Loss (ft)	0.04	Cum SA (acres)	0.07	0.50
0.14				

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.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.74	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.84	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)		Flow Area (sq ft)	17.76	126.38
2.82				
E.G. Slope (ft/ft)	0.005204	Area (sq ft)	17.76	126.38
2.82				
Q Total (cfs)	928.00	Flow (cfs)	32.64	890.67
4.69				
Top Width (ft)	57.38	Top Width (ft)	19.31	35.00
3.07				
Vel Total (ft/s)	6.31	Avg. Vel. (ft/s)	1.84	7.05
1.66				
Max Chl Dpth (ft)	4.84	Hydr. Depth (ft)	0.92	3.61
0.92				
Conv. Total (cfs)	12863.6	Conv. (cfs)	452.5	12346.1
65.0				
Length Wtd. (ft)	58.40	Wetted Per. (ft)	19.40	36.21
3.58				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.30	1.13
0.26				
Alpha	1.20	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	0.21	1.89
0.40				
C & E Loss (ft)	0.07	Cum SA (acres)	0.19	0.54
0.30				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.29	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.02	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.27	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)	851.70	Flow Area (sq ft)	27.12	141.44
4.29				
E.G. Slope (ft/ft)	0.006255	Area (sq ft)	27.12	141.44
4.29				
Q Total (cfs)	1249.00	Flow (cfs)	62.03	1177.96
9.01				
Top Width (ft)	63.15	Top Width (ft)	24.37	35.00
3.78				
Vel Total (ft/s)	7.23	Avg. Vel. (ft/s)	2.29	8.33
2.10				
Max Chl Dpth (ft)	5.27	Hydr. Depth (ft)	1.11	4.04
1.13				
Conv. Total (cfs)	15792.3	Conv. (cfs)	784.4	14894.0
113.9				
Length Wtd. (ft)	58.60	Wetted Per. (ft)	24.48	36.21
4.41				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.43	1.53
0.38				
Alpha	1.26	Stream Power (lb/ft s)	171.00	0.00

0.00				
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	0.32	2.17
0.61				
C & E Loss (ft)	0.07	Cum SA (acres)	0.24	0.54
0.40				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.81	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.25	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.56	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)	852.17	Flow Area (sq ft)	34.76	151.66
5.47				
E.G. Slope (ft/ft)	0.007080	Area (sq ft)	34.76	151.66
5.47				
Q Total (cfs)	1512.00	Flow (cfs)	91.00	1407.77
13.23				
Top Width (ft)	67.29	Top Width (ft)	28.02	35.00
4.27				
Vel Total (ft/s)	7.88	Avg. Vel. (ft/s)	2.62	9.28
2.42				
Max Chl Dpth (ft)	5.56	Hydr. Depth (ft)	1.24	4.33
1.28				
Conv. Total (cfs)	17969.2	Conv. (cfs)	1081.4	16730.5
157.3				
Length Wtd. (ft)	58.75	Wetted Per. (ft)	28.14	36.21
4.98				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.55	1.85
0.49				
Alpha	1.30	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	0.41	2.34
0.73				
C & E Loss (ft)	0.07	Cum SA (acres)	0.28	0.54
0.42				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.34	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.52	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.83	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)	852.61	Flow Area (sq ft)	42.62	160.92
6.66				
E.G. Slope (ft/ft)	0.007999	Area (sq ft)	42.62	160.92
6.66				
Q Total (cfs)	1796.00	Flow (cfs)	126.07	1651.65
18.28				
Top Width (ft)	71.04	Top Width (ft)	31.33	35.00
4.71				
Vel Total (ft/s)	8.54	Avg. Vel. (ft/s)	2.96	10.26
2.75				

Max Chl Dpth (ft)	5.83	Hydr. Depth (ft)	1.36	4.60
1.41				
Conv. Total (cfs)	20081.7	Conv. (cfs)	1409.7	18467.7
204.4				
Length Wtd. (ft)	58.89	Wetted Per. (ft)	31.46	36.21
5.49				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.68	2.22
0.61				
Alpha	1.34	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.40	Cum Volume (acre-ft)	0.50	2.50
0.85				
C & E Loss (ft)	0.06	Cum SA (acres)	0.31	0.54
0.44				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1000

INPUT
Description: X-1000
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	9	856	17	855	35	853	60	851
62	847	91	847	95	850	111	853	125	863

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	60	.035	95	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
60	95	25	69	95	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.03	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.17	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.86	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)		124.97
1.95				
E.G. Slope (ft/ft)	0.001283	Area (sq ft)		124.97
1.95				
Q Total (cfs)	419.00	Flow (cfs)		417.94
1.06				
Top Width (ft)	39.49	Top Width (ft)		34.93
4.57				
Vel Total (ft/s)	3.30	Avg. Vel. (ft/s)		3.34
0.54				
Max Chl Dpth (ft)	3.86	Hydr. Depth (ft)		3.58
0.43				
Conv. Total (cfs)	11698.8	Conv. (cfs)		11669.2
29.6				
Length Wtd. (ft)	68.07	Wetted Per. (ft)		38.31
4.65				
Min Ch El (ft)	847.00	Shear (lb/sq ft)		0.26

0.03				
Alpha	1.02	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.04	1.08
0.15				
C & E Loss (ft)	0.00	Cum SA (acres)	0.06	0.46
0.13				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.29	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.52	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.78	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	3.76	157.14
8.41				
E.G. Slope (ft/ft)	0.002875	Area (sq ft)	3.76	157.14
8.41				
Q Total (cfs)	928.00	Flow (cfs)	2.89	913.99
11.12				
Top Width (ft)	54.16	Top Width (ft)	9.69	35.00
9.47				
Vel Total (ft/s)	5.48	Avg. Vel. (ft/s)	0.77	5.82
1.32				
Max Chl Dpth (ft)	4.78	Hydr. Depth (ft)	0.39	4.49
0.89				
Conv. Total (cfs)	17307.7	Conv. (cfs)	53.9	17046.5
207.3				
Length Wtd. (ft)	67.65	Wetted Per. (ft)	9.72	38.47
9.63				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.07	0.73
0.16				
Alpha	1.11	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	0.19	1.70
0.39				
C & E Loss (ft)	0.01	Cum SA (acres)	0.16	0.49
0.30				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	852.93	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.77	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.16	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	8.38	170.54
12.42				
E.G. Slope (ft/ft)	0.003883	Area (sq ft)	8.38	170.54
12.42				
Q Total (cfs)	1249.00	Flow (cfs)	9.78	1217.47
21.75				
Top Width (ft)	60.99	Top Width (ft)	14.48	35.00
11.51				

Vel Total (ft/s)	6.53	Avg. Vel. (ft/s)	1.17	7.14 1.75
Max Chl Dpth (ft)	5.16	Hydr. Depth (ft)	0.58	4.87 1.08
Conv. Total (cfs)	20042.7	Conv. (cfs)	157.0	19536.7 349.0
Length Wtd. (ft)	67.48	Wetted Per. (ft)	14.52	38.47 11.71
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.14	1.07 0.26
Alpha	1.17	Stream Power (lb/ft s)	125.00	0.00 0.00
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	0.29	1.96 0.59
C & E Loss (ft)	0.02	Cum SA (acres)	0.21	0.49 0.39

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.40	Element	Left OB	Channel Right OB
Vel Head (ft)	1.01	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	852.40	Reach Len. (ft)	25.00	69.00 95.00
Crit W.S. (ft)		Flow Area (sq ft)	12.18	178.86 15.31
E.G. Slope (ft/ft)	0.004780	Area (sq ft)	12.18	178.86 15.31
Q Total (cfs)	1512.00	Flow (cfs)	17.86	1462.26 31.88
Top Width (ft)	65.23	Top Width (ft)	17.45	35.00 12.78
Vel Total (ft/s)	7.33	Avg. Vel. (ft/s)	1.47	8.18 2.08
Max Chl Dpth (ft)	5.40	Hydr. Depth (ft)	0.70	5.11 1.20
Conv. Total (cfs)	21870.6	Conv. (cfs)	258.3	21151.1 461.1
Length Wtd. (ft)	67.37	Wetted Per. (ft)	17.50	38.47 13.00
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.21	1.39 0.35
Alpha	1.21	Stream Power (lb/ft s)	125.00	0.00 0.00
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)	0.37	2.12 0.72
C & E Loss (ft)	0.03	Cum SA (acres)	0.24	0.50 0.41

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	853.87	Element	Left OB	Channel Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	852.57	Reach Len. (ft)	25.00	69.00

95.00					
Crit W.S. (ft)	851.76	Flow Area (sq ft)	15.43	184.99	
17.63					
E.G. Slope (ft/ft)	0.005949	Area (sq ft)	15.43	184.99	
17.63					
Q Total (cfs)	1796.00	Flow (cfs)	27.31	1725.75	
42.94					
Top Width (ft)	68.35	Top Width (ft)	19.64	35.00	
13.71					
Vel Total (ft/s)	8.24	Avg. Vel. (ft/s)	1.77	9.33	
2.44					
Max Chl Dpth (ft)	5.57	Hydr. Depth (ft)	0.79	5.29	
1.29					
Conv. Total (cfs)	23285.0	Conv. (cfs)	354.1	22374.2	
556.7					
Length Wtd. (ft)	67.31	Wetted Per. (ft)	19.70	38.47	
13.95					
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.29	1.79	
0.47					
Alpha	1.24	Stream Power (lb/ft s)	125.00	0.00	
0.00					
Frctn Loss (ft)	0.42	Cum Volume (acre-ft)	0.45	2.27	
0.83					
C & E Loss (ft)	0.03	Cum SA (acres)	0.26	0.50	
0.43					

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 900

INPUT
Description: X-900
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	855	19	854	29	854	52	850	70	849
71	849	80	846.2	87	846.2	100	849	128	852
148	854	157	860						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	70	.035	100	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
70	100	20	34	75	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	850.93	Element	Left OB	Channel	
Right OB					
Vel Head (ft)	0.19	Wt. n-Val.	0.055	0.035	
0.055					
W.S. Elev (ft)	850.74	Reach Len. (ft)	2.00	2.00	
2.00					
Crit W.S. (ft)	849.14	Flow Area (sq ft)	23.85	102.55	
14.10					
E.G. Slope (ft/ft)	0.001521	Area (sq ft)	23.85	102.55	
14.10					
Q Total (cfs)	419.00	Flow (cfs)	26.26	379.26	

13.48				
Top Width (ft)	68.47	Top Width (ft)	22.24	30.00
16.22				
Vel Total (ft/s)	2.98	Avg. Vel. (ft/s)	1.10	3.70
0.96				
Max Chl Dpth (ft)	4.54	Hydr. Depth (ft)	1.07	3.42
0.87				
Conv. Total (cfs)	10742.3	Conv. (cfs)	673.4	9723.3
345.6				
Length Wtd. (ft)	2.00	Wetted Per. (ft)	22.34	30.72
16.32				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.10	0.32
0.08				
Alpha	1.40	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.03	0.90
0.13				
C & E Loss (ft)	0.04	Cum SA (acres)	0.05	0.41
0.11				

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.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.09	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.49	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.59	Reach Len. (ft)	2.00	2.00
2.00				
Crit W.S. (ft)	850.51	Flow Area (sq ft)	45.01	128.24
31.42				
E.G. Slope (ft/ft)	0.003046	Area (sq ft)	45.01	128.24
31.42				
Q Total (cfs)	928.00	Flow (cfs)	93.59	778.90
55.51				
Top Width (ft)	81.39	Top Width (ft)	27.17	30.00
24.22				
Vel Total (ft/s)	4.53	Avg. Vel. (ft/s)	2.08	6.07
1.77				
Max Chl Dpth (ft)	5.39	Hydr. Depth (ft)	1.66	4.27
1.30				
Conv. Total (cfs)	16815.3	Conv. (cfs)	1695.9	14113.7
1005.8				
Length Wtd. (ft)	2.00	Wetted Per. (ft)	27.33	30.72
24.35				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.31	0.79
0.25				
Alpha	1.54	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.17	1.48
0.35				
C & E Loss (ft)	0.04	Cum SA (acres)	0.15	0.44
0.26				

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.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	852.64	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.70	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.94	Reach Len. (ft)	2.00	2.00
2.00				
Crit W.S. (ft)	851.10	Flow Area (sq ft)	54.86	138.72
40.45				
E.G. Slope (ft/ft)	0.004001	Area (sq ft)	54.86	138.72
40.45				
Q Total (cfs)	1249.00	Flow (cfs)	142.18	1017.71
89.11				
Top Width (ft)	86.66	Top Width (ft)	29.18	30.00
27.48				
Vel Total (ft/s)	5.34	Avg. Vel. (ft/s)	2.59	7.34
2.20				
Max Chl Dpth (ft)	5.74	Hydr. Depth (ft)	1.88	4.62
1.47				
Conv. Total (cfs)	19744.8	Conv. (cfs)	2247.6	16088.5
1408.7				
Length Wtd. (ft)	2.00	Wetted Per. (ft)	29.37	30.72
27.63				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.47	1.13
0.37				
Alpha	1.58	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.27	1.72
0.54				
C & E Loss (ft)	0.03	Cum SA (acres)	0.20	0.44
0.35				

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.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.04	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.90	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.15	Reach Len. (ft)	2.00	2.00
2.00				
Crit W.S. (ft)	851.50	Flow Area (sq ft)	60.85	144.76
46.17				
E.G. Slope (ft/ft)	0.004922	Area (sq ft)	60.85	144.76
46.17				
Q Total (cfs)	1512.00	Flow (cfs)	182.57	1211.76
117.66				
Top Width (ft)	89.79	Top Width (ft)	30.34	30.00
29.45				
Vel Total (ft/s)	6.01	Avg. Vel. (ft/s)	3.00	8.37
2.55				
Max Chl Dpth (ft)	5.95	Hydr. Depth (ft)	2.01	4.83

1.57					
Conv. Total (cfs)	21552.2	Conv. (cfs)	2602.4	17272.6	1677.2
Length Wtd. (ft)	2.00	Wetted Per. (ft)	30.55	30.72	29.62
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.61	1.45	0.48
Alpha	1.60	Stream Power (lb/ft s)	157.00	0.00	0.00
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.35	1.87	0.65
C & E Loss (ft)	0.02	Cum SA (acres)	0.22	0.44	0.37

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.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	853.42	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.21	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	852.21	Reach Len. (ft)	2.00	2.00	2.00
Crit W.S. (ft)	851.88	Flow Area (sq ft)	62.94	146.82	48.22
E.G. Slope (ft/ft)	0.006552	Area (sq ft)	62.94	146.82	48.22
Q Total (cfs)	1796.00	Flow (cfs)	220.94	1431.36	143.69
Top Width (ft)	90.87	Top Width (ft)	30.73	30.00	30.14
Vel Total (ft/s)	6.96	Avg. Vel. (ft/s)	3.51	9.75	2.98
Max Chl Dpth (ft)	6.01	Hydr. Depth (ft)	2.05	4.89	1.60
Conv. Total (cfs)	22188.8	Conv. (cfs)	2729.7	17683.8	1775.3
Length Wtd. (ft)	2.00	Wetted Per. (ft)	30.95	30.72	30.31
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.83	1.95	0.65
Alpha	1.61	Stream Power (lb/ft s)	157.00	0.00	0.00
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.42	2.00	0.76
C & E Loss (ft)	0.00	Cum SA (acres)	0.25	0.45	0.38

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: Bluestone Creek
REACH: 1 RS: 810

INPUT
Description: New Crossing
Distance from Upstream XS = 2
Deck/Roadway Width = 13.5
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 8

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	852	0	60	849	0
75	849	847.25	110	849	847.25
200	850.5	0	216	852	0
233	854	0	245	856	

Upstream Bridge Cross Section Data
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	855	19	854	29	854	52	850	70	849
71	849	80	846.2	87	846.2	100	849	128	852
148	854	157	860						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	70	.035	100	.055

Bank Sta: Left	Right	Coeff Contr.	Expan.
70	100	.1	.3

Downstream Deck/Roadway Coordinates
num= 8

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	852	0	60	849	0
75	849	847.25	110	849	847.25
200	850.5	0	216	852	0
233	854	0	245	856	

Downstream Bridge Cross Section Data
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	854	19	852	39	850	63	848	80	847
89	846	97	846	107	848	163	850	188	851
216	856	233	858	245	859				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	63	.035	107	.055

Bank Sta: Left	Right	Coeff Contr.	Expan.
63	107	.1	.3

Upstream Embankment side slope = 4 horiz. to 1.0 vertical
Downstream Embankment side slope = 6 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins = 849
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 #2 Year

E.G. US. (ft)	850.93	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	850.74	E.G. Elev (ft)	850.88
850.23			
Q Total (cfs)	419.00	W.S. Elev (ft)	850.30
849.85			
Q Bridge (cfs)	40.30	Crit W.S. (ft)	850.30
849.85			
Q Weir (cfs)		Max Chl Dpth (ft)	4.10
3.85			
Weir Sta Lft (ft)		Vel Total (ft/s)	5.74
4.54			
Weir Sta Rgt (ft)		Flow Area (sq ft)	73.01
92.25			
Weir Submerg		Froude # Chl	0.54
0.45			
Weir Max Depth (ft)		Specif Force (cu ft)	154.65
155.09			
Min El Weir Flow (ft)	849.01	Hydr Depth (ft)	1.18
0.80			
Min El Prs (ft)	847.25	W.P. Total (ft)	92.70
170.91			
Delta EG (ft)	0.99	Conv. Total (cfs)	2379.8
2298.1			
Delta WS (ft)	0.91	Top Width (ft)	61.80
115.69			
BR Open Area (sq ft)	11.68	Frctn Loss (ft)	0.43
0.06			
BR Open Vel (ft/s)	3.45	C & E Loss (ft)	0.06
0.08			
Coef of Q		Shear Total (lb/sq ft)	1.52
1.12			
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #10 Year

E.G. US. (ft)	852.09	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	851.59	E.G. Elev (ft)	852.03
851.53			
Q Total (cfs)	928.00	W.S. Elev (ft)	851.16
851.39			
Q Bridge (cfs)	36.67	Crit W.S. (ft)	851.16
850.41			
Q Weir (cfs)		Max Chl Dpth (ft)	4.96
5.39			
Weir Sta Lft (ft)		Vel Total (ft/s)	7.04
2.95			
Weir Sta Rgt (ft)		Flow Area (sq ft)	131.82
314.34			
Weir Submerg		Froude # Chl	0.59
0.23			
Weir Max Depth (ft)		Specif Force (cu ft)	375.97
481.94			
Min El Weir Flow (ft)	849.01	Hydr Depth (ft)	1.76
1.90			
Min El Prs (ft)	847.25	W.P. Total (ft)	105.81
220.36			
Delta EG (ft)	0.59	Conv. Total (cfs)	5510.8
13110.7			
Delta WS (ft)	0.23	Top Width (ft)	74.79
165.02			
BR Open Area (sq ft)	11.68	Frctn Loss (ft)	0.13
0.03			
BR Open Vel (ft/s)	3.14	C & E Loss (ft)	0.22
0.00			
Coef of Q		Shear Total (lb/sq ft)	2.21
0.45			
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a

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

BRIDGE OUTPUT Profile #25 Year

E.G. US. (ft)	852.64	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	851.94	E.G. Elev (ft)	852.60
852.09			
Q Total (cfs)	1249.00	W.S. Elev (ft)	851.58
851.94			
Q Bridge (cfs)	35.69	Crit W.S. (ft)	851.58
850.68			
Q Weir (cfs)		Max Chl Dpth (ft)	5.38
5.94			
Weir Sta Lft (ft)		Vel Total (ft/s)	7.58
3.07			
Weir Sta Rgt (ft)		Flow Area (sq ft)	164.68
407.43			
Weir Submerg		Froude # Chl	0.61
0.23			
Weir Max Depth (ft)		Specif Force (cu ft)	533.84
714.06			
Min El Weir Flow (ft)	849.01	Hydr Depth (ft)	2.03
2.35			
Min El Prs (ft)	847.25	W.P. Total (ft)	112.22
229.01			
Delta EG (ft)	0.59	Conv. Total (cfs)	7540.2
19401.4			
Delta WS (ft)	0.05	Top Width (ft)	81.15
173.59			
BR Open Area (sq ft)	11.68	Frctn Loss (ft)	0.12
0.03			
BR Open Vel (ft/s)	3.05	C & E Loss (ft)	0.26
0.00			
Coef of Q		Shear Total (lb/sq ft)	2.51
0.46			
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

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

BRIDGE OUTPUT Profile #50 Year

E.G. US. (ft)	853.04	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	852.15	E.G. Elev (ft)	853.00
852.51			
Q Total (cfs)	1512.00	W.S. Elev (ft)	851.88
852.35			
Q Bridge (cfs)	35.27	Crit W.S. (ft)	851.88
850.88			
Q Weir (cfs)		Max Chl Dpth (ft)	5.68
6.35			
Weir Sta Lft (ft)		Vel Total (ft/s)	7.97
3.15			
Weir Sta Rgt (ft)		Flow Area (sq ft)	189.68
480.60			
Weir Submerg		Froude # Chl	0.63
0.23			
Weir Max Depth (ft)		Specif Force (cu ft)	670.75
926.78			
Min El Weir Flow (ft)	849.01	Hydr Depth (ft)	2.21
2.67			
Min El Prs (ft)	847.25	W.P. Total (ft)	116.79
235.35			
Delta EG (ft)	0.56	Conv. Total (cfs)	9190.9
24896.6			
Delta WS (ft)	-0.15	Top Width (ft)	85.67
179.88			
BR Open Area (sq ft)	11.68	Frctn Loss (ft)	0.11
0.03			
BR Open Vel (ft/s)	3.02	C & E Loss (ft)	0.29
0.00			
Coef of Q		Shear Total (lb/sq ft)	2.74
0.47			
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

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.

BRIDGE OUTPUT Profile #100 Year

E.G. US. (ft)	853.42	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	852.21	E.G. Elev (ft)	853.40
852.92			
Q Total (cfs)	1796.00	W.S. Elev (ft)	852.20
852.75			
Q Bridge (cfs)	34.50	Crit W.S. (ft)	852.20
851.08			
Q Weir (cfs)		Max Chl Dpth (ft)	6.00
6.75			
Weir Sta Lft (ft)		Vel Total (ft/s)	8.25
3.24			
Weir Sta Rgt (ft)		Flow Area (sq ft)	217.61
554.46			
Weir Submerg		Froude # Chl	0.63
0.22			
Weir Max Depth (ft)		Specif Force (cu ft)	825.47
1168.86			
Min El Weir Flow (ft)	849.01	Hydr Depth (ft)	2.40
2.98			
Min El Prs (ft)	847.25	W.P. Total (ft)	121.74
241.51			
Delta EG (ft)	0.54	Conv. Total (cfs)	11125.4
30869.8			
Delta WS (ft)	-0.47	Top Width (ft)	90.58
185.97			
BR Open Area (sq ft)	11.68	Frctn Loss (ft)	0.10
0.03			
BR Open Vel (ft/s)	2.95	C & E Loss (ft)	0.31
0.00			
Coef of Q		Shear Total (lb/sq ft)	2.91
0.49			
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
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: Bluestone Creek
REACH: 1 RS: 800

INPUT
Description: X-800
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	854	19	852	39	850	63	848	80	847
89	846	97	846	107	848	163	850	188	851
216	856	233	858	245	859				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	63	.035	107	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
63	107	90	48	15	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.94	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	849.83	Reach Len. (ft)	90.00	48.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	20.13	128.59
46.96				
E.G. Slope (ft/ft)	0.001068	Area (sq ft)	20.13	128.59
46.96				
Q Total (cfs)	419.00	Flow (cfs)	16.72	363.19
39.09				
Top Width (ft)	117.26	Top Width (ft)	21.98	44.00
51.28				
Vel Total (ft/s)	2.14	Avg. Vel. (ft/s)	0.83	2.82
0.83				
Max Chl Dpth (ft)	3.83	Hydr. Depth (ft)	0.92	2.92
0.92				
Conv. Total (cfs)	12818.5	Conv. (cfs)	511.6	11111.1
1195.9				
Length Wtd. (ft)	47.30	Wetted Per. (ft)	22.05	44.28
51.31				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.06	0.19
0.06				
Alpha	1.53	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.02	0.84
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.03	0.37
0.08				

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.

CROSS SECTION OUTPUT Profile #10 Year

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	851.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	851.36	Reach Len. (ft)	90.00	48.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)	65.93	195.89	154.12
E.G. Slope (ft/ft)	0.000880	Area (sq ft)	65.93	195.89	154.12
Q Total (cfs)	928.00	Flow (cfs)	76.63	664.91	186.46
Top Width (ft)	164.63	Top Width (ft)	37.61	44.00	83.02
Vel Total (ft/s)	2.23	Avg. Vel. (ft/s)	1.16	3.39	1.21
Max Chl Dpth (ft)	5.36	Hydr. Depth (ft)	1.75	4.45	1.86
Conv. Total (cfs)	31278.3	Conv. (cfs)	2582.7	22410.9	6284.7
Length Wtd. (ft)	45.41	Wetted Per. (ft)	37.76	44.28	83.11
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.10	0.24	0.10
Alpha	1.74	Stream Power (lb/ft s)	245.00	0.00	0.00
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	0.13	1.37	0.26
C & E Loss (ft)	0.03	Cum SA (acres)	0.12	0.41	0.21

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.

CROSS SECTION OUTPUT Profile #25 Year

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	852.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	851.89	Reach Len. (ft)	90.00	48.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)	87.38	219.32	199.12
E.G. Slope (ft/ft)	0.000963	Area (sq ft)	87.38	219.32	199.12
Q Total (cfs)	1249.00	Flow (cfs)	117.34	839.73	291.93
Top Width (ft)	172.94	Top Width (ft)	42.94	44.00	86.00
Vel Total (ft/s)	2.47	Avg. Vel. (ft/s)	1.34	3.83	1.47
Max Chl Dpth (ft)	5.89	Hydr. Depth (ft)	2.04	4.98	2.32

Conv. Total (cfs)	40240.4	Conv. (cfs)	3780.6	27054.5 9405.3
Length Wtd. (ft)	44.58	Wetted Per. (ft)	43.11	44.28 86.14
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.12	0.30 0.14
Alpha	1.73	Stream Power (lb/ft s)	245.00	0.00 0.00
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.21	1.60 0.42
C & E Loss (ft)	0.04	Cum SA (acres)	0.16	0.41 0.30

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.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.48	Element	Left OB	Channel Right OB
Vel Head (ft)	0.18	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	852.29	Reach Len. (ft)	90.00	48.00 15.00
Crit W.S. (ft)		Flow Area (sq ft)	105.36	236.95 234.04
E.G. Slope (ft/ft)	0.001003	Area (sq ft)	105.36	236.95 234.04
Q Total (cfs)	1512.00	Flow (cfs)	154.40	974.50 383.10
Top Width (ft)	179.05	Top Width (ft)	46.80	44.00 88.25
Vel Total (ft/s)	2.62	Avg. Vel. (ft/s)	1.47	4.11 1.64
Max Chl Dpth (ft)	6.29	Hydr. Depth (ft)	2.25	5.39 2.65
Conv. Total (cfs)	47750.5	Conv. (cfs)	4876.2	30775.5 12098.7
Length Wtd. (ft)	44.02	Wetted Per. (ft)	46.99	44.28 88.42
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.14	0.33 0.17
Alpha	1.71	Stream Power (lb/ft s)	245.00	0.00 0.00
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.28	1.73 0.52
C & E Loss (ft)	0.05	Cum SA (acres)	0.19	0.41 0.31

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.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.89	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.20	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.68	Reach Len. (ft)	90.00	48.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	124.36	254.13
268.92				
E.G. Slope (ft/ft)	0.001040	Area (sq ft)	124.36	254.13
268.92				
Q Total (cfs)	1796.00	Flow (cfs)	197.00	1115.25
483.76				
Top Width (ft)	184.94	Top Width (ft)	50.51	44.00
90.44				
Vel Total (ft/s)	2.77	Avg. Vel. (ft/s)	1.58	4.39
1.80				
Max Chl Dpth (ft)	6.68	Hydr. Depth (ft)	2.46	5.78
2.97				
Conv. Total (cfs)	55694.5	Conv. (cfs)	6108.9	34584.1
15001.5				
Length Wtd. (ft)	43.52	Wetted Per. (ft)	50.73	44.28
90.64				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.16	0.37
0.19				
Alpha	1.70	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.34	1.86
0.60				
C & E Loss (ft)	0.06	Cum SA (acres)	0.21	0.41
0.32				

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.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 700

INPUT
Description: X-700
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	853	15	857	20	857	33	850	35	849
39	847	53	846	66	846	72	850	85	850
110	850	160	852	183	856	195	860		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	33	.035	72	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33	72	95	67	8	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.24	Wt. n-Val.		0.035
W.S. Elev (ft)	849.62	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)		107.47
E.G. Slope (ft/ft)	0.002214	Area (sq ft)		107.47
Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	37.67	Top Width (ft)		37.67
Vel Total (ft/s)	3.90	Avg. Vel. (ft/s)		3.90
Max Chl Dpth (ft)	3.62	Hydr. Depth (ft)		2.85
Conv. Total (cfs)	8904.0	Conv. (cfs)		8904.0
Length Wtd. (ft)	66.98	Wetted Per. (ft)		39.42
Min Ch El (ft)	846.00	Shear (lb/sq ft)		0.38
Alpha	1.00	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	0.00	0.71
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.33
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.43	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.97	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.87	159.76
48.51				
E.G. Slope (ft/ft)	0.002679	Area (sq ft)	0.87	159.76
48.51				
Q Total (cfs)	928.00	Flow (cfs)	0.69	869.86
57.45				
Top Width (ft)	103.00	Top Width (ft)	1.80	39.00
62.21				
Vel Total (ft/s)	4.44	Avg. Vel. (ft/s)	0.79	5.44
1.18				
Max Chl Dpth (ft)	4.97	Hydr. Depth (ft)	0.48	4.10
0.78				
Conv. Total (cfs)	17930.9	Conv. (cfs)	13.3	16807.5
1110.1				
Length Wtd. (ft)	61.94	Wetted Per. (ft)	2.04	40.95
62.22				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.07	0.65
0.13				
Alpha	1.42	Stream Power (lb/ft s)	195.00	0.00
0.00				

Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.06	1.18
0.23				
C & E Loss (ft)	0.01	Cum SA (acres)	0.08	0.36
0.18				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.94	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.59	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.35	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	1.70	174.76
74.29				
E.G. Slope (ft/ft)	0.003342	Area (sq ft)	1.70	174.76
74.29				
Q Total (cfs)	1249.00	Flow (cfs)	1.88	1128.48
118.65				
Top Width (ft)	113.34	Top Width (ft)	2.51	39.00
71.82				
Vel Total (ft/s)	4.98	Avg. Vel. (ft/s)	1.11	6.46
1.60				
Max Chl Dpth (ft)	5.35	Hydr. Depth (ft)	0.68	4.48
1.03				
Conv. Total (cfs)	21604.5	Conv. (cfs)	32.5	19519.7
2052.3				
Length Wtd. (ft)	58.29	Wetted Per. (ft)	2.85	40.95
71.85				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.12	0.89
0.22				
Alpha	1.53	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.12	1.38
0.38				
C & E Loss (ft)	0.01	Cum SA (acres)	0.12	0.37
0.27				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.35	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.69	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.66	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	2.54	186.56
97.16				
E.G. Slope (ft/ft)	0.003710	Area (sq ft)	2.54	186.56
97.16				
Q Total (cfs)	1512.00	Flow (cfs)	3.39	1325.71
182.90				
Top Width (ft)	121.46	Top Width (ft)	3.07	39.00
79.39				
Vel Total (ft/s)	5.28	Avg. Vel. (ft/s)	1.33	7.11
1.88				
Max Chl Dpth (ft)	5.66	Hydr. Depth (ft)	0.83	4.78

1.22				
Conv. Total (cfs)	24823.8	Conv. (cfs)	55.7	21765.3
3002.8				
Length Wtd. (ft)	55.90	Wetted Per. (ft)	3.49	40.95
79.42				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.17	1.06
0.28				
Alpha	1.60	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.16	1.50
0.46				
C & E Loss (ft)	0.04	Cum SA (acres)	0.14	0.37
0.28				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.75	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.80	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.95	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	3.53	198.08
121.70				
E.G. Slope (ft/ft)	0.004040	Area (sq ft)	3.53	198.08
121.70				
Q Total (cfs)	1796.00	Flow (cfs)	5.48	1528.73
261.79				
Top Width (ft)	129.39	Top Width (ft)	3.62	39.00
86.77				
Vel Total (ft/s)	5.55	Avg. Vel. (ft/s)	1.55	7.72
2.15				
Max Chl Dpth (ft)	5.95	Hydr. Depth (ft)	0.98	5.08
1.40				
Conv. Total (cfs)	28255.6	Conv. (cfs)	86.3	24050.8
4118.6				
Length Wtd. (ft)	53.85	Wetted Per. (ft)	4.11	40.95
86.81				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.22	1.22
0.35				
Alpha	1.67	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.21	1.61
0.53				
C & E Loss (ft)	0.07	Cum SA (acres)	0.16	0.37
0.29				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 600

INPUT
Description: X-600
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	859	16	857	36	856	45	852	54	846

64	845	74	847	81	849	92	850	144	850
190	850	210	862						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	45	.035	81	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
45	81	63	43	1	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.67	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.34	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	849.32	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		88.96
0.57				
E.G. Slope (ft/ft)	0.003345	Area (sq ft)		88.96
0.57				
Q Total (cfs)	419.00	Flow (cfs)		418.74
0.26				
Top Width (ft)	35.52	Top Width (ft)		31.98
3.54				
Vel Total (ft/s)	4.68	Avg. Vel. (ft/s)		4.71
0.46				
Max Chl Dpth (ft)	4.32	Hydr. Depth (ft)		2.78
0.16				
Conv. Total (cfs)	7244.9	Conv. (cfs)		7240.4
4.5				
Length Wtd. (ft)	43.02	Wetted Per. (ft)		33.52
3.55				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.55
0.03				
Alpha	1.01	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.00	0.56
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.28
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.20	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.53	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.66	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)	849.57	Flow Area (sq ft)		133.18
78.03				
E.G. Slope (ft/ft)	0.003720	Area (sq ft)		133.18
78.03				
Q Total (cfs)	928.00	Flow (cfs)		825.93
102.07				
Top Width (ft)	144.10	Top Width (ft)		33.99
110.10				

Vel Total (ft/s)	4.39	Avg. Vel. (ft/s)		6.20
1.31				
Max Chl Dpth (ft)	5.66	Hydr. Depth (ft)		3.92
0.71				
Conv. Total (cfs)	15214.2	Conv. (cfs)		13540.9
1673.4				
Length Wtd. (ft)	39.78	Wetted Per. (ft)		35.93
110.33				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.86
0.16				
Alpha	1.78	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.06	0.95
0.22				
C & E Loss (ft)	0.00	Cum SA (acres)	0.08	0.31
0.17				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.73	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.56	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.17	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		150.69
134.34				
E.G. Slope (ft/ft)	0.003722	Area (sq ft)		150.69
134.34				
Q Total (cfs)	1249.00	Flow (cfs)		998.02
250.98				
Top Width (ft)	145.71	Top Width (ft)		34.76
110.95				
Vel Total (ft/s)	4.38	Avg. Vel. (ft/s)		6.62
1.87				
Max Chl Dpth (ft)	6.17	Hydr. Depth (ft)		4.34
1.21				
Conv. Total (cfs)	20473.7	Conv. (cfs)		16359.6
4114.1				
Length Wtd. (ft)	35.98	Wetted Per. (ft)		36.85
111.32				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.95
0.28				
Alpha	1.86	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	0.12	1.13
0.36				
C & E Loss (ft)	0.02	Cum SA (acres)	0.12	0.31
0.25				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.11	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.56	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.54	Reach Len. (ft)	63.00	43.00

1.00				
Crit W.S. (ft)		Flow Area (sq ft)		163.62
175.42				
E.G. Slope (ft/ft)	0.003677	Area (sq ft)		163.62
175.42				
Q Total (cfs)	1512.00	Flow (cfs)		1124.50
387.50				
Top Width (ft)	146.88	Top Width (ft)		35.31
111.57				
Vel Total (ft/s)	4.46	Avg. Vel. (ft/s)		6.87
2.21				
Max Chl Dpth (ft)	6.54	Hydr. Depth (ft)		4.63
1.57				
Conv. Total (cfs)	24933.3	Conv. (cfs)		18543.4
6390.0				
Length Wtd. (ft)	33.79	Wetted Per. (ft)		37.52
112.04				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		1.00
0.36				
Alpha	1.83	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	0.16	1.23
0.43				
C & E Loss (ft)	0.03	Cum SA (acres)	0.14	0.31
0.26				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.48	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.58	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.90	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		176.31
215.32				
E.G. Slope (ft/ft)	0.003652	Area (sq ft)		176.31
215.32				
Q Total (cfs)	1796.00	Flow (cfs)		1254.85
541.15				
Top Width (ft)	148.01	Top Width (ft)		35.85
112.16				
Vel Total (ft/s)	4.59	Avg. Vel. (ft/s)		7.12
2.51				
Max Chl Dpth (ft)	6.90	Hydr. Depth (ft)		4.92
1.92				
Conv. Total (cfs)	29720.1	Conv. (cfs)		20765.2
8954.9				
Length Wtd. (ft)	32.05	Wetted Per. (ft)		38.16
112.73				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		1.05
0.44				
Alpha	1.77	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.21	1.32
0.50				
C & E Loss (ft)	0.03	Cum SA (acres)	0.15	0.31
0.27				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 500

INPUT
Description: X-500
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	856	50	850	70	848.5	80	846.77	95	845.64
100	846.5	106	849.5	163	850	185	850.45	215	850
223	852	240	862						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	70	.035	106	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
70	106	85	68	5	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.47	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.46	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	849.01	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)		Flow Area (sq ft)	1.74	76.84
E.G. Slope (ft/ft)	0.005935	Area (sq ft)	1.74	76.84
Q Total (cfs)	419.00	Flow (cfs)	1.45	417.55
Top Width (ft)	41.83	Top Width (ft)	6.81	35.02
Vel Total (ft/s)	5.33	Avg. Vel. (ft/s)	0.84	5.43
Max Chl Dpth (ft)	3.37	Hydr. Depth (ft)	0.26	2.19
Conv. Total (cfs)	5438.9	Conv. (cfs)	18.8	5420.0
Length Wtd. (ft)	68.03	Wetted Per. (ft)	6.82	35.88
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.09	0.79
Alpha	1.03	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.47	Cum Volume (acre-ft)	0.00	0.48
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.24
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.04	Element	Left OB	Channel
Right OB				

Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.49	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)	849.78	Flow Area (sq ft)	25.79	129.85
56.40				
E.G. Slope (ft/ft)	0.004133	Area (sq ft)	25.79	129.85
56.40				
Q Total (cfs)	928.00	Flow (cfs)	46.78	818.85
62.37				
Top Width (ft)	171.04	Top Width (ft)	24.08	36.00
110.96				
Vel Total (ft/s)	4.38	Avg. Vel. (ft/s)	1.81	6.31
1.11				
Max Chl Dpth (ft)	4.85	Hydr. Depth (ft)	1.07	3.61
0.51				
Conv. Total (cfs)	14435.8	Conv. (cfs)	727.8	12737.8
970.2				
Length Wtd. (ft)	64.91	Wetted Per. (ft)	24.17	36.97
111.03				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.28	0.91
0.13				
Alpha	1.85	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)	0.04	0.82
0.22				
C & E Loss (ft)	0.05	Cum SA (acres)	0.06	0.27
0.16				

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.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.49	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.09	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)	850.64	Flow Area (sq ft)	41.74	151.45
123.68				
E.G. Slope (ft/ft)	0.003397	Area (sq ft)	41.74	151.45
123.68				
Q Total (cfs)	1249.00	Flow (cfs)	83.39	959.38
206.23				
Top Width (ft)	178.44	Top Width (ft)	29.08	36.00
113.36				
Vel Total (ft/s)	3.94	Avg. Vel. (ft/s)	2.00	6.33
1.67				
Max Chl Dpth (ft)	5.45	Hydr. Depth (ft)	1.44	4.21
1.09				
Conv. Total (cfs)	21429.9	Conv. (cfs)	1430.8	16460.6
3538.5				
Length Wtd. (ft)	59.76	Wetted Per. (ft)	29.20	36.97
113.50				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.30	0.87
0.23				
Alpha	2.03	Stream Power (lb/ft s)	240.00	0.00

0.00				
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)	0.09	0.98
0.35				
C & E Loss (ft)	0.06	Cum SA (acres)	0.09	0.27
0.25				

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.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	851.96	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.47	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.49	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)	850.91	Flow Area (sq ft)	54.09	165.90
169.53				
E.G. Slope (ft/ft)	0.003104	Area (sq ft)	54.09	165.90
169.53				
Q Total (cfs)	1512.00	Flow (cfs)	114.16	1067.61
330.22				
Top Width (ft)	183.39	Top Width (ft)	32.43	36.00
114.96				
Vel Total (ft/s)	3.88	Avg. Vel. (ft/s)	2.11	6.44
1.95				
Max Chl Dpth (ft)	5.85	Hydr. Depth (ft)	1.67	4.61
1.47				
Conv. Total (cfs)	27137.6	Conv. (cfs)	2049.0	19161.7
5926.9				
Length Wtd. (ft)	56.72	Wetted Per. (ft)	32.57	36.97
115.16				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.32	0.87
0.29				
Alpha	2.02	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	0.12	1.07
0.43				
C & E Loss (ft)	0.06	Cum SA (acres)	0.11	0.28
0.26				

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.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.34	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.47	Wt. n-Val.	0.055	0.035
0.055				

W.S. Elev (ft)	851.87	Reach Len. (ft)	85.00	68.00	5.00
Crit W.S. (ft)		Flow Area (sq ft)	66.98	179.55	213.39
E.G. Slope (ft/ft)	0.002921	Area (sq ft)	66.98	179.55	213.39
Q Total (cfs)	1796.00	Flow (cfs)	148.62	1181.49	465.89
Top Width (ft)	188.07	Top Width (ft)	35.58	36.00	116.48
Vel Total (ft/s)	3.91	Avg. Vel. (ft/s)	2.22	6.58	2.18
Max Chl Dpth (ft)	6.23	Hydr. Depth (ft)	1.88	4.99	1.83
Conv. Total (cfs)	33229.9	Conv. (cfs)	2749.8	21860.2	8619.9
Length Wtd. (ft)	54.36	Wetted Per. (ft)	35.75	36.97	116.72
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.34	0.89	0.33
Alpha	1.98	Stream Power (lb/ft s)	240.00	0.00	0.00
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)	0.16	1.15	0.50
C & E Loss (ft)	0.07	Cum SA (acres)	0.13	0.28	0.27

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.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 400

INPUT
Description: X-400
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	875	7	859	22	851	36	851	42	847
48	846	55	845.52	67	846	72	849	83	849
108	849	141	851	168	849	170	850	175	852
190	860								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	36	.035	72	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
36	72	125	105	45	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	848.99	Element	Left OB	Channel
Vel Head (ft)	0.60	Wt. n-Val.		0.035

W.S. Elev (ft)	848.39	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)		Flow Area (sq ft)		67.38
E.G. Slope (ft/ft)	0.008031	Area (sq ft)		67.38
Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	31.05	Top Width (ft)		31.05
Vel Total (ft/s)	6.22	Avg. Vel. (ft/s)		6.22
Max Chl Dpth (ft)	2.87	Hydr. Depth (ft)		2.17
Conv. Total (cfs)	4675.5	Conv. (cfs)		4675.5
Length Wtd. (ft)	105.00	Wetted Per. (ft)		32.24
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.05
Alpha	1.00	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	1.13	Cum Volume (acre-ft)		0.36
0.11				
C & E Loss (ft)	0.04	Cum SA (acres)		0.19
0.07				

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

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	850.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.03	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	849.58	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)	849.58	Flow Area (sq ft)		106.31
26.03				
E.G. Slope (ft/ft)	0.008968	Area (sq ft)		106.31
26.03				
Q Total (cfs)	928.00	Flow (cfs)		886.58
41.42				
Top Width (ft)	88.29	Top Width (ft)		33.86
54.42				
Vel Total (ft/s)	7.01	Avg. Vel. (ft/s)		8.34
1.59				
Max Chl Dpth (ft)	4.06	Hydr. Depth (ft)		3.14
0.48				
Conv. Total (cfs)	9799.5	Conv. (cfs)		9362.1
437.4				
Length Wtd. (ft)	102.85	Wetted Per. (ft)		35.58
54.60				
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.67
0.27				
Alpha	1.35	Stream Power (lb/ft s)	190.00	0.00
0.00				

Frctn Loss (ft)	0.91	Cum Volume (acre-ft)	0.02	0.64
0.21				
C & E Loss (ft)	0.01	Cum SA (acres)	0.04	0.22
0.15				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.22	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.06	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.16	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)	850.16	Flow Area (sq ft)		126.41
63.43				
E.G. Slope (ft/ft)	0.008144	Area (sq ft)		126.41
63.43				
Q Total (cfs)	1249.00	Flow (cfs)		1105.86
143.14				
Top Width (ft)	108.00	Top Width (ft)		34.74
73.26				
Vel Total (ft/s)	6.58	Avg. Vel. (ft/s)		8.75
2.26				
Max Chl Dpth (ft)	4.64	Hydr. Depth (ft)		3.64
0.87				
Conv. Total (cfs)	13840.2	Conv. (cfs)		12254.1
1586.1				
Length Wtd. (ft)	98.42	Wetted Per. (ft)		36.64
73.61				
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.75
0.44				
Alpha	1.58	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)	0.05	0.76
0.34				
C & E Loss (ft)	0.03	Cum SA (acres)	0.07	0.22
0.24				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	851.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.10	Wt. n-Val.		0.035	0.055
W.S. Elev (ft)	850.54	Reach Len. (ft)	125.00	105.00	45.00
Crit W.S. (ft)	850.54	Flow Area (sq ft)		139.58	93.27
E.G. Slope (ft/ft)	0.007912	Area (sq ft)		139.58	93.27
Q Total (cfs)	1512.00	Flow (cfs)		1270.14	241.86
Top Width (ft)	120.79	Top Width (ft)		35.31	85.48
Vel Total (ft/s)	6.49	Avg. Vel. (ft/s)		9.10	2.59
Max Chl Dpth (ft)	5.02	Hydr. Depth (ft)		3.95	1.09
Conv. Total (cfs)	16998.2	Conv. (cfs)		14279.1	2719.1
Length Wtd. (ft)	95.71	Wetted Per. (ft)		37.32	85.92
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.85	0.54
Alpha	1.68	Stream Power (lb/ft s)	190.00	0.00	0.00
Frctn Loss (ft)	0.67	Cum Volume (acre-ft)	0.07	0.83	0.41
C & E Loss (ft)	0.03	Cum SA (acres)	0.08	0.22	0.25

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.17	Wt. n-Val.		0.035	0.055
W.S. Elev (ft)	850.85	Reach Len. (ft)	125.00	105.00	45.00
Crit W.S. (ft)	850.85	Flow Area (sq ft)		150.61	121.36
E.G. Slope (ft/ft)	0.008098	Area (sq ft)		150.61	121.36
Q Total (cfs)	1796.00	Flow (cfs)		1444.17	351.83
Top Width (ft)	131.34	Top Width (ft)		35.77	95.56

Vel Total (ft/s)	6.60	Avg. Vel. (ft/s)			9.59
2.90					
Max Chl Dpth (ft)	5.33	Hydr. Depth (ft)			4.21
1.27					
Conv. Total (cfs)	19958.3	Conv. (cfs)			16048.5
3909.8					
Length Wtd. (ft)	93.76	Wetted Per. (ft)			37.88
96.09					
Min Ch El (ft)	845.52	Shear (lb/sq ft)			2.01
0.64					
Alpha	1.73	Stream Power (lb/ft s)		190.00	0.00
0.00					
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)		0.09	0.89
0.48					
C & E Loss (ft)	0.02	Cum SA (acres)		0.09	0.22
0.26					

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 300

INPUT
Description: X-300
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	885	7	878	9	849	21	850	26	848
33	848	37	845	49	844	57	845	64	848
84	848	88	849	112	848	126	849	152	849
162	853	180	860						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	33	.035	64	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33	64	125	98	20	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	847.81	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.00	Wt. n-Val.		0.035
W.S. Elev (ft)	846.81	Reach Len. (ft)	125.00	98.00
20.00				
Crit W.S. (ft)	846.81	Flow Area (sq ft)		52.28
E.G. Slope (ft/ft)	0.015301	Area (sq ft)		52.28

Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	26.65	Top Width (ft)		26.65
Vel Total (ft/s)	8.01	Avg. Vel. (ft/s)		8.01
Max Chl Dpth (ft)	2.81	Hydr. Depth (ft)		1.96
Conv. Total (cfs)	3387.3	Conv. (cfs)		3387.3
Length Wtd. (ft)	81.71	Wetted Per. (ft)		27.73
Min Ch El (ft)	844.00	Shear (lb/sq ft)		1.80
Alpha	1.00	Stream Power (lb/ft s)	180.00	0.00
0.00				
Frctn Loss (ft)	0.66	Cum Volume (acre-ft)		0.22
0.11				
C & E Loss (ft)	0.23	Cum SA (acres)		0.12
0.07				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	849.67	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.10	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	848.58	Reach Len. (ft)	125.00	98.00
20.00				
Crit W.S. (ft)	848.58	Flow Area (sq ft)	4.46	104.41
18.57				
E.G. Slope (ft/ft)	0.008644	Area (sq ft)	4.46	104.41
18.57				
Q Total (cfs)	928.00	Flow (cfs)	7.26	893.27
27.47				
Top Width (ft)	83.71	Top Width (ft)	8.44	31.00
44.27				
Vel Total (ft/s)	7.28	Avg. Vel. (ft/s)	1.63	8.56
1.48				
Max Chl Dpth (ft)	4.58	Hydr. Depth (ft)	0.53	3.37
0.42				
Conv. Total (cfs)	9981.4	Conv. (cfs)	78.1	9607.9

295.4				
Length Wtd. (ft)	81.24	Wetted Per. (ft)	8.56	32.72
44.37				
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.28	1.72
0.23				
Alpha	1.33	Stream Power (lb/ft s)	180.00	0.00
0.00				
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.01	0.38
0.19				
C & E Loss (ft)	0.20	Cum SA (acres)	0.03	0.14
0.10				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	850.32	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.95	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	849.38	Reach Len. (ft)	125.00	98.00
20.00				
Crit W.S. (ft)	849.38	Flow Area (sq ft)	12.85	129.15
74.25				
E.G. Slope (ft/ft)	0.006228	Area (sq ft)	12.85	129.15
74.25				
Q Total (cfs)	1249.00	Flow (cfs)	28.16	1080.74
140.10				
Top Width (ft)	134.92	Top Width (ft)	14.98	31.00
88.94				
Vel Total (ft/s)	5.78	Avg. Vel. (ft/s)	2.19	8.37
1.89				
Max Chl Dpth (ft)	5.38	Hydr. Depth (ft)	0.86	4.17
0.83				
Conv. Total (cfs)	15826.9	Conv. (cfs)	356.9	13694.8
1775.3				
Length Wtd. (ft)	78.24	Wetted Per. (ft)	15.61	32.72
89.19				
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.32	1.53
0.32				
Alpha	1.83	Stream Power (lb/ft s)	180.00	0.00
0.00				
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	0.03	0.46
0.27				
C & E Loss (ft)	0.10	Cum SA (acres)	0.04	0.14
0.15				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	850.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.00	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	849.70	Reach Len. (ft)	125.00	98.00	20.00
Crit W.S. (ft)	849.70	Flow Area (sq ft)	18.40	139.09	102.88
E.G. Slope (ft/ft)	0.006282	Area (sq ft)	18.40	139.09	102.88
Q Total (cfs)	1512.00	Flow (cfs)	43.16	1228.10	240.74
Top Width (ft)	140.38	Top Width (ft)	19.64	31.00	89.74
Vel Total (ft/s)	5.81	Avg. Vel. (ft/s)	2.35	8.83	2.34
Max Chl Dpth (ft)	5.70	Hydr. Depth (ft)	0.94	4.49	1.15
Conv. Total (cfs)	19076.9	Conv. (cfs)	544.5	15494.9	3037.5
Length Wtd. (ft)	76.59	Wetted Per. (ft)	20.65	32.72	90.05
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.35	1.67	0.45
Alpha	1.91	Stream Power (lb/ft s)	180.00	0.00	0.00
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.04	0.49	0.31
C & E Loss (ft)	0.07	Cum SA (acres)	0.05	0.14	0.16

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	851.05	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.12	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	849.93	Reach Len. (ft)	125.00	98.00
20.00				
Crit W.S. (ft)	849.93	Flow Area (sq ft)	23.39	146.34
123.95				
E.G. Slope (ft/ft)	0.006844	Area (sq ft)	23.39	146.34
123.95				
Q Total (cfs)	1796.00	Flow (cfs)	59.62	1395.20
341.18				
Top Width (ft)	144.38	Top Width (ft)	23.05	31.00
90.33				
Vel Total (ft/s)	6.12	Avg. Vel. (ft/s)	2.55	9.53
2.75				
Max Chl Dpth (ft)	5.93	Hydr. Depth (ft)	1.01	4.72
1.37				
Conv. Total (cfs)	21710.1	Conv. (cfs)	720.7	16865.1
4124.2				
Length Wtd. (ft)	75.20	Wetted Per. (ft)	24.33	32.72
90.68				
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.41	1.91
0.58				
Alpha	1.93	Stream Power (lb/ft s)	180.00	0.00
0.00				
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	0.06	0.53
0.35				
C & E Loss (ft)	0.07	Cum SA (acres)	0.06	0.14
0.16				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 200

INPUT
Description: X-200
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	873	8	857	23	848	31	847	35	844
44	843	50	845	62	847	68	848	81	847
84	847	93	845	109	844	117	844	123	848

141	850	156	852	172	860

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	31	.035	62	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
31	62	115	105	75	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	846.77	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.24	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	846.53	Reach Len. (ft)	115.00	105.00
75.00				
Crit W.S. (ft)	845.76	Flow Area (sq ft)		53.69
62.72				
E.G. Slope (ft/ft)	0.005017	Area (sq ft)		53.69
62.72				
Q Total (cfs)	419.00	Flow (cfs)		244.03
174.97				
Top Width (ft)	62.21	Top Width (ft)		27.54
34.67				
Vel Total (ft/s)	3.60	Avg. Vel. (ft/s)		4.55
2.79				
Max Chl Dpth (ft)	3.53	Hydr. Depth (ft)		1.95
1.81				
Conv. Total (cfs)	5915.6	Conv. (cfs)		3445.3
2470.3				
Length Wtd. (ft)	91.70	Wetted Per. (ft)		28.89
35.63				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		0.58
0.55				
Alpha	1.18	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)	0.85	Cum Volume (acre-ft)		0.10
0.09				
C & E Loss (ft)	0.04	Cum SA (acres)		0.06
0.06				

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	848.14	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.41	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	847.72	Reach Len. (ft)	115.00	105.00
75.00				
Crit W.S. (ft)	846.73	Flow Area (sq ft)	2.08	89.86
114.30				
E.G. Slope (ft/ft)	0.005393	Area (sq ft)	2.08	89.86
114.30				

Q Total (cfs)	928.00	Flow (cfs)	2.08	551.42
374.50				
Top Width (ft)	92.06	Top Width (ft)	5.77	31.00
55.29				
Vel Total (ft/s)	4.50	Avg. Vel. (ft/s)	1.00	6.14
3.28				
Max Chl Dpth (ft)	4.72	Hydr. Depth (ft)	0.36	2.90
2.07				
Conv. Total (cfs)	12637.1	Conv. (cfs)	28.4	7509.0
5099.7				
Length Wtd. (ft)	91.64	Wetted Per. (ft)	5.82	32.55
56.75				
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.12	0.93
0.68				
Alpha	1.32	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)	0.00	0.16
0.16				
C & E Loss (ft)	0.07	Cum SA (acres)	0.01	0.07
0.08				

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	848.59	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.63	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	847.96	Reach Len. (ft)	115.00	105.00
75.00				
Crit W.S. (ft)	847.10	Flow Area (sq ft)	3.72	97.38
128.31				
E.G. Slope (ft/ft)	0.007417	Area (sq ft)	3.72	97.38
128.31				
Q Total (cfs)	1249.00	Flow (cfs)	5.29	739.33
504.39				
Top Width (ft)	98.97	Top Width (ft)	7.71	31.00
60.26				
Vel Total (ft/s)	5.44	Avg. Vel. (ft/s)	1.42	7.59
3.93				
Max Chl Dpth (ft)	4.96	Hydr. Depth (ft)	0.48	3.14
2.13				
Conv. Total (cfs)	14502.5	Conv. (cfs)	61.4	8584.5
5856.5				
Length Wtd. (ft)	91.76	Wetted Per. (ft)	7.77	32.55
61.83				
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.22	1.39
0.96				
Alpha	1.36	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	0.01	0.20

0.22				
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07
0.12				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	849.00	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.76	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	848.24	Reach Len. (ft)	115.00	105.00
75.00				
Crit W.S. (ft)	847.51	Flow Area (sq ft)	5.93	105.79
145.10				
E.G. Slope (ft/ft)	0.008200	Area (sq ft)	5.93	105.79
145.10				
Q Total (cfs)	1512.00	Flow (cfs)	11.39	892.49
608.12				
Top Width (ft)	102.51	Top Width (ft)	8.39	31.00
63.12				
Vel Total (ft/s)	5.89	Avg. Vel. (ft/s)	1.92	8.44
4.19				
Max Chl Dpth (ft)	5.24	Hydr. Depth (ft)	0.71	3.41
2.30				
Conv. Total (cfs)	16697.5	Conv. (cfs)	125.8	9856.0
6715.7				
Length Wtd. (ft)	91.54	Wetted Per. (ft)	8.52	32.55
64.71				
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.36	1.66
1.15				
Alpha	1.42	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)	0.98	Cum Volume (acre-ft)	0.01	0.22
0.26				
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07
0.12				

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

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	849.39	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.87	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	848.51	Reach Len. (ft)	115.00	105.00
75.00				
Crit W.S. (ft)	847.83	Flow Area (sq ft)	8.32	114.38
162.93				
E.G. Slope (ft/ft)	0.008588	Area (sq ft)	8.32	114.38
162.93				
Q Total (cfs)	1796.00	Flow (cfs)	19.67	1040.27
736.06				

Top Width (ft)	105.46	Top Width (ft)	8.85	31.00	65.61
Vel Total (ft/s)	6.29	Avg. Vel. (ft/s)	2.37	9.09	4.52
Max Chl Dpth (ft)	5.51	Hydr. Depth (ft)	0.94	3.69	2.48
Conv. Total (cfs)	19379.8	Conv. (cfs)	212.3	11225.0	7942.5
Length Wtd. (ft)	91.24	Wetted Per. (ft)	9.06	32.55	67.22
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.49	1.88	1.30
Alpha	1.42	Stream Power (lb/ft s)	172.00	0.00	0.00
Frctn Loss (ft)	1.02	Cum Volume (acre-ft)	0.01	0.24	0.29
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07	0.13

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

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 100

INPUT
Description: X-100
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	861	23	846	26	845	38	843	45	844
50	846	72	846	90	846	94	844	116	844
126	844	136	851	141	852	160	856	172	860

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	23	.035	50	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23	50	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	845.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-Val.		0.035	0.055
W.S. Elev (ft)	845.28	Reach Len. (ft)			
Crit W.S. (ft)	845.28	Flow Area (sq ft)		29.91	43.65
E.G. Slope (ft/ft)	0.022329	Area (sq ft)		29.91	43.65
Q Total (cfs)	419.00	Flow (cfs)		222.54	196.46
Top Width (ft)	59.40	Top Width (ft)		23.02	36.38

Vel Total (ft/s)	5.70	Avg. Vel. (ft/s)		7.44
4.50				
Max Chl Dpth (ft)	2.28	Hydr. Depth (ft)		1.30
1.20				
Conv. Total (cfs)	2804.0	Conv. (cfs)		1489.3
1314.7				
Length Wtd. (ft)		Wetted Per. (ft)		23.55
37.08				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		1.77
1.64				
Alpha	1.20	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	847.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.15	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	845.95	Reach Len. (ft)		
Crit W.S. (ft)	845.95	Flow Area (sq ft)		46.72
69.01				
E.G. Slope (ft/ft)	0.028303	Area (sq ft)		46.72
69.01				
Q Total (cfs)	928.00	Flow (cfs)		475.06
452.94				
Top Width (ft)	65.43	Top Width (ft)		26.74
38.69				
Vel Total (ft/s)	8.02	Avg. Vel. (ft/s)		10.17
6.56				
Max Chl Dpth (ft)	2.95	Hydr. Depth (ft)		1.75
1.78				
Conv. Total (cfs)	5516.1	Conv. (cfs)		2823.8
2692.3				
Length Wtd. (ft)		Wetted Per. (ft)		27.51
39.77				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		3.00
3.07				
Alpha	1.15	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	847.64	Element	Left OB	Channel