

## Baseline Assessment – Stream Attributes

### Reach S-EF65 (Pipeline ROW) Intermittent Spread G Montgomery County, Virginia

Data	Included
Photos	✓
SWVM Form	✓
FCI Calculator and HGM Form	✓
RBP Physical Characteristics Form	✓
Water Quality Data	N/A – No water present
RBP Habitat Form	✓
RBP Benthic Form	N/A – No water present
Benthic Identification Sheet	N/A – No water present
Wolman Pebble Count	✓
RiverMorph Data Sheet	✓
USM Form (Virginia Only)	✓
Longitudinal Profile and Cross Sections	✓



Photo Type: RB DS VIEW

Location, Orientation, Photographer Initials: Standing on RB looking downstream along the ROW looking E, TC



Photo Type: LB DS VIEW

Location, Orientation, Photographer Initials: Standing on LB looking downstream along the ROW looking SE, TC





Photo Type: RB US VIEW

Location, Orientation, Photographer Initials: Standing on RB looking upstream along the ROW looking NW, TC



Photo Type: LB US VIEW

Location, Orientation, Photographer Initials: Standing on LB looking upstream along the ROW looking SW, TC





Photo Type: RB CL

Location, Orientation, Photographer Initials: Standing on RB looking at LB along pipe centerline looking NE, TC



Photo Type: LB CL

Location, Orientation, Photographer Initials: Standing on LB looking at RB along pipe centerline looking S, TC





Photo Type: DS COND

Location, Orientation, Photographer Initials: Downstream conditions outside of ROW looking E, TC

*L:\22000s\22800\22865.06\Admin\05-ENVR\Field Data\Spread G\Field Forms\S-EF65\S-EF65\_Photo Doc.docx*

USACE FILE NO./ Project Name: <small>(V2.1, Sept 2015)</small>		Mountain Valley Pipeline		IMPACT COORDINATES: (in Decimal Degrees)		Lat.	37.295743	Lon.	-80.375921	WEATHER:		Sunny		DATE:		August 3, 2021			
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: <small>(watershed size (acres), unaltered or impairment)</small>				S-EF65				MITIGATION STREAM CLASS/SITE ID AND SITE DESCRIPTION: <small>(watershed size (acres), unaltered or impairment)</small>				Comments:							
STREAM IMPACT LENGTH:		152		FORM OF MITIGATION:		RESTORATION (Levels I-III)		MIT COORDINATES: (in Decimal Degrees)		Lat.		Lon.		PRECIPITATION PAST 48 HRS:		0.05"		Mitigation Length:	

Column No. 1- Impact Existing Condition (Debit)				Column No. 2- Mitigation Existing Condition - Baseline (Credit)				Column No. 3- Mitigation Projected at Five Years Post Completion (Credit)				Column No. 4- Mitigation Projected at Ten Years Post Completion (Credit)				Column No. 5- Mitigation Projected at Maturity (Credit)			
Stream Classification:				Stream Classification:				Stream Classification:				Stream Classification:				Stream Classification:			
Intermittent								0				0				0			
Percent Stream Channel Slope				Percent Stream Channel Slope				Percent Stream Channel Slope				Percent Stream Channel Slope				Percent Stream Channel Slope			
5.08								0				0				0			
HGM Score (attach data forms):				HGM Score (attach data forms):				HGM Score (attach data forms):				HGM Score (attach data forms):				HGM Score (attach data forms):			
Average				Average				Average				Average				Average			
Hydrology				Hydrology				Hydrology				Hydrology				Hydrology			
Biogeochemical Cycling				Biogeochemical Cycling				Biogeochemical Cycling				Biogeochemical Cycling				Biogeochemical Cycling			
0.58				0				0				0				0			
Habitat				Habitat				Habitat				Habitat				Habitat			
0.55				0				0				0				0			
0.22																			
PART I - Physical, Chemical and Biological Indicators				PART I - Physical, Chemical and Biological Indicators				PART I - Physical, Chemical and Biological Indicators				PART I - Physical, Chemical and Biological Indicators				PART I - Physical, Chemical and Biological Indicators			
Points Score Range Site Score				Points Score Range Site Score				Points Score Range Site Score				Points Score Range Site Score				Points Score Range Site Score			
PHYSICAL INDICATOR (Applies to all streams classifications)				PHYSICAL INDICATOR (Applies to all streams classifications)				PHYSICAL INDICATOR (Applies to all streams classifications)				PHYSICAL INDICATOR (Applies to all streams classifications)				PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)				USEPA RBP (Low Gradient Data Sheet)				USEPA RBP (High Gradient Data Sheet)				USEPA RBP (High Gradient Data Sheet)				USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover 0-20 0				1. Epifaunal Substrate/Available Cover 0-20 0				1. Epifaunal Substrate/Available Cover 0-20 0				1. Epifaunal Substrate/Available Cover 0-20 0				1. Epifaunal Substrate/Available Cover 0-20 0			
2. Embeddedness 0-20 15				2. Embeddedness 0-20 0				2. Embeddedness 0-20 0				2. Embeddedness 0-20 0				2. Embeddedness 0-20 0			
3. Velocity/ Depth Regime 0-20 0				3. Velocity/ Depth Regime 0-20 0				3. Velocity/ Depth Regime 0-20 0				3. Velocity/ Depth Regime 0-20 0				3. Velocity/ Depth Regime 0-20 0			
4. Sediment Deposition 0-20 11				4. Sediment Deposition 0-20 0				4. Sediment Deposition 0-20 0				4. Sediment Deposition 0-20 0				4. Sediment Deposition 0-20 0			
5. Channel Flow Status 0-20 0				5. Channel Flow Status 0-20 0				5. Channel Flow Status 0-20 0				5. Channel Flow Status 0-20 0				5. Channel Flow Status 0-20 0			
6. Channel Alteration 0-20 14				6. Channel Alteration 0-20 0				6. Channel Alteration 0-20 0				6. Channel Alteration 0-20 0				6. Channel Alteration 0-20 0			
7. Frequency of Riffles (or bends) 0-20 0				7. Frequency of Riffles (or bends) 0-20 0				7. Frequency of Riffles (or bends) 0-20 0				7. Frequency of Riffles (or bends) 0-20 0				7. Frequency of Riffles (or bends) 0-20 0			
8. Bank Stability (LB & RB) 0-20 17				8. Bank Stability (LB & RB) 0-20 0				8. Bank Stability (LB & RB) 0-20 0				8. Bank Stability (LB & RB) 0-20 0				8. Bank Stability (LB & RB) 0-20 0			
9. Vegetative Protection (LB & RB) 0-20 14				9. Vegetative Protection (LB & RB) 0-20 0				9. Vegetative Protection (LB & RB) 0-20 0				9. Vegetative Protection (LB & RB) 0-20 0				9. Vegetative Protection (LB & RB) 0-20 0			
10. Riparian Vegetative Zone Width (LB & RB) 0-20 12				10. Riparian Vegetative Zone Width (LB & RB) 0-20 0				10. Riparian Vegetative Zone Width (LB & RB) 0-20 0				10. Riparian Vegetative Zone Width (LB & RB) 0-20 0				10. Riparian Vegetative Zone Width (LB & RB) 0-20 0			
Total RBP Score Marginal 83				Total RBP Score Poor 0				Total RBP Score Poor 0				Total RBP Score Poor 0				Total RBP Score Poor 0			
Sub-Total 0.415				Sub-Total 0				Sub-Total 0				Sub-Total 0				Sub-Total 0			
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)				CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)				CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)				CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)				CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)				WVDEP Water Quality Indicators (General)				WVDEP Water Quality Indicators (General)				WVDEP Water Quality Indicators (General)				WVDEP Water Quality Indicators (General)			
Specific Conductivity				Specific Conductivity				Specific Conductivity				Specific Conductivity				Specific Conductivity			
100-199 = 85 points 0-80 0				100-199 = 85 points 0-80 0				100-199 = 85 points 0-80 0				100-199 = 85 points 0-80 0				100-199 = 85 points 0-80 0			
pH				pH				pH				pH				pH			
5.6-5.9 = 45 points 0-80 0				5.6-5.9 = 45 points 0-80 0				5.6-5.9 = 45 points 0-80 0				5.6-5.9 = 45 points 0-80 0				5.6-5.9 = 45 points 0-80 0			
DO				DO				DO				DO				DO			
10-30 0				10-30 0				10-30 0				10-30 0				10-30 0			
Sub-Total 0				Sub-Total 0				Sub-Total 0				Sub-Total 0				Sub-Total 0			
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)				BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)				BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)				BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)				BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)				WV Stream Condition Index (WVSCI)				WV Stream Condition Index (WVSCI)				WV Stream Condition Index (WVSCI)				WV Stream Condition Index (WVSCI)			
0 0-100 0-1 0				0 0-100 0-1 0				0 0-100 0-1 0				0 0-100 0-1 0				0 0-100 0-1 0			
Sub-Total 0				Sub-Total 0				Sub-Total 0				Sub-Total 0				Sub-Total 0			
PART II - Index and Unit Score				PART II - Index and Unit Score				PART II - Index and Unit Score				PART II - Index and Unit Score				PART II - Index and Unit Score			
Index Linear Feet Unit Score				Index Linear Feet Unit Score				Index Linear Feet Unit Score				Index Linear Feet Unit Score				Index Linear Feet Unit Score			
0.529 152 80.37				0 0 0				0 0 0				0 0 0				0 0 0			

## FCI Calculator for the High-Gradient Headwater Streams in Appalachia

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for  $V_{\text{CCANOPY}}$  ( $\geq 20\%$  cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-Gradient Headwater Streams and Low-Gradient Perennial Streams in Appalachia (Environmental Laboratory U.S. Army Corps of Engineers 2017).

**Project Name:** S-EF65 Pre-crossing Assessment

**Location:** Spread G, Montgomery County

**Sampling Date:** 8/3/2021

Project Site      Before Project

**Subclass for this SAR:**

Intermittent Stream

**Uppermost stratum present at this SAR:**

Shrub/Herb Strata

**SAR number:** S-EF65

### Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.58
Biogeochemical Cycling	0.55
Habitat	0.22


### Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{\text{CCANOPY}}$	Percent canopy over channel.	Not Used, <20%	Not Used
$V_{\text{EMBED}}$	Average embeddedness of channel.	3.11	0.86
$V_{\text{SUBSTRATE}}$	Median stream channel substrate particle size.	0.60	0.30
$V_{\text{BERO}}$	Total percent of eroded stream channel bank.	41.67	0.85
$V_{\text{LWD}}$	Number of down woody stems per 100 feet of stream.	0.00	0.00
$V_{\text{TDBH}}$	Average dbh of trees.	Not Used	Not Used
$V_{\text{SNAG}}$	Number of snags per 100 feet of stream.	0.00	0.10
$V_{\text{SSD}}$	Number of saplings and shrubs per 100 feet of stream.	33.33	0.51
$V_{\text{SRICH}}$	Riparian vegetation species richness.	0.00	0.00
$V_{\text{DETRITUS}}$	Average percent cover of leaves, sticks, etc.	2.50	0.03
$V_{\text{HERB}}$	Average percent cover of herbaceous vegetation.	86.25	1.00
$V_{\text{WLUSE}}$	Weighted Average of Runoff Score for Catchment.	0.98	1.00

## High-Gradient Headwater Streams in Appalachia

Team: <u>K. Ball, E. Lapidus, A. Oehser</u>				Latitude/UTM Northing: <u>37.295743</u>	
Project Name: <u>S-EF65 Pre-crossing Assessment</u>				Longitude/UTM Easting: <u>-80.375921</u>	
Location: <u>Spread G, Montgomery County</u>				Sampling Date: <u>8/3/2021</u>	
SAR Number:	<u>S-EF65</u>	Reach Length (ft):	<u>60</u>	Stream Type:	<u>Intermittent Stream</u>

Top Strata: Shrub/Herb Strata (determined from percent calculated in  $V_{\text{CCANOPY}}$ )

Site and Timing: Project Site  Before Project

**Sample Variables 1-4 in stream channel**

1	V <sub>CCANOPY</sub>	Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.)
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Not Used,  
<20%

List the percent cover measurements at each point below:

[illegible]

2	V <sub>EMBED</sub>	Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5.
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### 3.1

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983 )

Measure  
at least  
30 points

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

1	1	3	3						
4	3	3	3						
2	3	1	4						
2	4	5							
4	5	5							

3	$V_{\text{SUBSTRATE}}$	Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in $V_{\text{EMBED}}$ .
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0.60 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

0.08	1.40	0.50	0.60						
0.20	6.00	1.00	1.00						
0.40	0.60	0.08	1.40						
0.60	1.40	5.00							
0.08	0.60	4.50							

4	V <sub>BERO</sub>	Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%.
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42 %

Left Bank: 10 ft      Right Bank: 15 ft

**Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).**

5	V <sub>LWD</sub>	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.
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0.0

Number of downed woody stems: 0

6	V <sub>TDBH</sub>	Average dbh of trees (measure only if V <sub>CCANOPY</sub> tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.
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Not Used

List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:

[illegible]

7	V <sub>SNAG</sub>	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.
---	-------------------	--

0.0

Left Side: 0                      Right Side: 0

8	V <sub>SSD</sub>	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.
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33.3

Left Side:	3	Right Side:	17
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9	V <sub>SRICH</sub>	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	0.00
Group 1 = 1.0		Group 2 (-1.0)	
<input type="checkbox"/> <i>Acer rubrum</i>	<input type="checkbox"/> <i>Magnolia tripetala</i>	<input checked="" type="checkbox"/> <i>Ailanthus altissima</i>	<input checked="" type="checkbox"/> <i>Lonicera japonica</i>
<input type="checkbox"/> <i>Acer saccharum</i>	<input type="checkbox"/> <i>Nyssa sylvatica</i>	<input type="checkbox"/> <i>Albizia julibrissin</i>	<input type="checkbox"/> <i>Lonicera tatarica</i>
<input type="checkbox"/> <i>Aesculus flava</i>	<input type="checkbox"/> <i>Oxydendrum arboreum</i>	<input type="checkbox"/> <i>Alliaria petiolata</i>	<input type="checkbox"/> <i>Lotus corniculatus</i>
<input type="checkbox"/> <i>Asimina triloba</i>	<input type="checkbox"/> <i>Prunus serotina</i>	<input type="checkbox"/> <i>Alternanthera philoxeroides</i>	<input type="checkbox"/> <i>Lythrum salicaria</i>
<input type="checkbox"/> <i>Betula alleghaniensis</i>	<input type="checkbox"/> <i>Quercus alba</i>	<input type="checkbox"/> <i>Aster tataricus</i>	<input checked="" type="checkbox"/> <i>Microstegium vimineum</i>
<input type="checkbox"/> <i>Betula lenta</i>	<input type="checkbox"/> <i>Quercus coccinea</i>	<input type="checkbox"/> <i>Cerastium fontanum</i>	<input type="checkbox"/> <i>Paulownia tomentosa</i>
<input type="checkbox"/> <i>Carya alba</i>	<input type="checkbox"/> <i>Quercus imbricaria</i>	<input type="checkbox"/> <i>Coronilla varia</i>	<input type="checkbox"/> <i>Polygonum cuspidatum</i>
<input type="checkbox"/> <i>Carya glabra</i>	<input type="checkbox"/> <i>Quercus prinus</i>	<input type="checkbox"/> <i>Elaeagnus umbellata</i>	<input type="checkbox"/> <i>Pueraria montana</i>
<input type="checkbox"/> <i>Carya ovalis</i>	<input type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input type="checkbox"/> <i>Rosa multiflora</i>
<input type="checkbox"/> <i>Carya ovata</i>	<input type="checkbox"/> <i>Quercus velutina</i>	<input type="checkbox"/> <i>Lespedeza cuneata</i>	<input type="checkbox"/> <i>Sorghum halepense</i>
<input type="checkbox"/> <i>Cornus florida</i>	<input type="checkbox"/> <i>Sassafras albidum</i>	<input type="checkbox"/> <i>Ligustrum obtusifolium</i>	<input type="checkbox"/> <i>Verbena brasiliensis</i>
<input type="checkbox"/> <i>Fagus grandifolia</i>	<input type="checkbox"/> <i>Tilia americana</i>	<input type="checkbox"/> <i>Ligustrum sinense</i>	
<input type="checkbox"/> <i>Fraxinus americana</i>	<input type="checkbox"/> <i>Tsuga canadensis</i>		
<input type="checkbox"/> <i>Liriodendron tulipifera</i>	<input type="checkbox"/> <i>Ulmus americana</i>		
<input type="checkbox"/> <i>Magnolia acuminata</i>			
0 Species in Group 1		3 Species in Group 2	

**Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.**

10	V <sub>DETRITUS</sub>	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	2.50 %																								
<table border="1"> <thead> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td></td> <td></td> <td>0</td> <td>10</td> <td></td> <td></td> </tr> <tr> <td>0</td> <td>0</td> <td></td> <td></td> <td>0</td> <td>10</td> <td></td> <td></td> </tr> </tbody> </table>				Left Side				Right Side				0	0			0	10			0	0			0	10		
Left Side				Right Side																							
0	0			0	10																						
0	0			0	10																						
11	V <sub>HERB</sub>	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	86 %																								
<table border="1"> <thead> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> </thead> <tbody> <tr> <td>95</td> <td>95</td> <td></td> <td></td> <td>100</td> <td>90</td> <td></td> <td></td> </tr> <tr> <td>100</td> <td>85</td> <td></td> <td></td> <td>100</td> <td>25</td> <td></td> <td></td> </tr> </tbody> </table>				Left Side				Right Side				95	95			100	90			100	85			100	25		
Left Side				Right Side																							
95	95			100	90																						
100	85			100	25																						

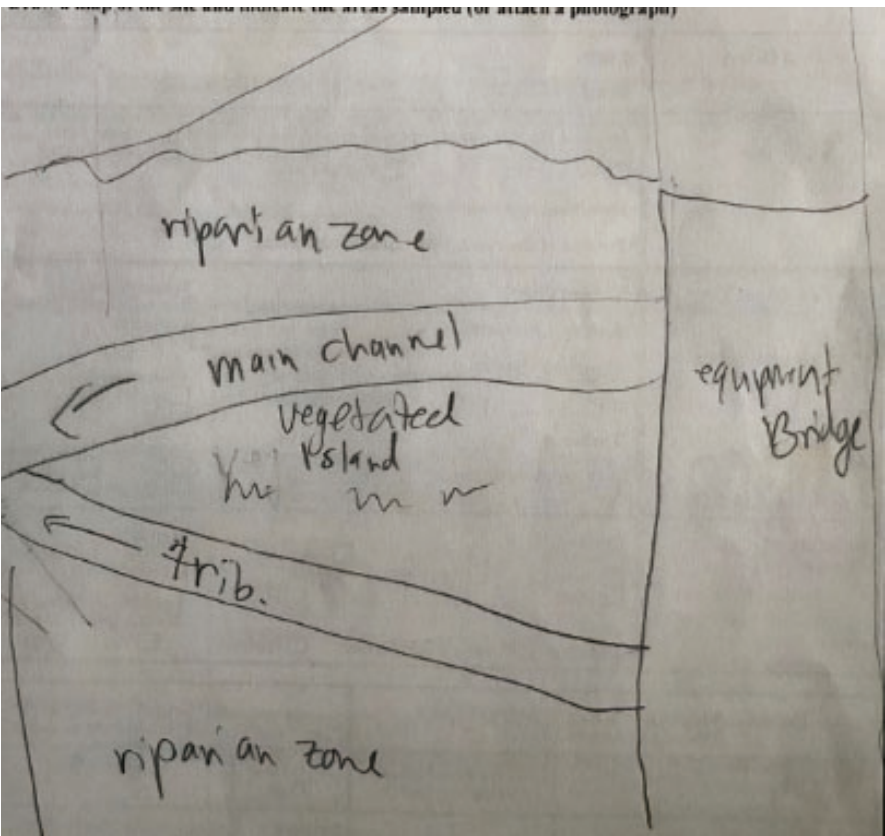
**Sample Variable 12 within the entire catchment of the stream.**

12	V <sub>WLUSE</sub>	Weighted Average of Runoff Score for watershed:	0.98																																								
<table border="1"> <thead> <tr> <th>Land Use (Choose From Drop List)</th> <th>Runoff Score</th> <th>% in Catchment</th> <th>Running Percent (not &gt;100)</th> </tr> </thead> <tbody> <tr> <td>Forest and native range (&lt;50% ground cover)</td> <td>0.5</td> <td>5</td> <td>5</td> </tr> <tr> <td>Forest and native range (&gt;75% ground cover)</td> <td>1</td> <td>95</td> <td>100</td> </tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> </tbody> </table>				Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (<50% ground cover)	0.5	5	5	Forest and native range (>75% ground cover)	1	95	100																												
Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)																																								
Forest and native range (<50% ground cover)	0.5	5	5																																								
Forest and native range (>75% ground cover)	1	95	100																																								

S-EF65			Notes:
Variable	Value	VSI	Land Cover Analysis was completed using the 2019 National Land Cover Database (NLCD), from Landsat satellite imagery and other supplementary datasets. Watershed boundaries are based off of field delineated stream impacts. *Percentages in catchment values have been rounded to the nearest full number.
V <sub>CCANOPY</sub>	Not Used, <20%	Not Used	
V <sub>EMBED</sub>	3.1	0.86	
V <sub>SUBSTRATE</sub>	0.60 in	0.30	
V <sub>BERO</sub>	42 %	0.85	
V <sub>LWD</sub>	0.0	0.00	
V <sub>TDBH</sub>	Not Used	Not Used	
V <sub>SNAG</sub>	0.0	0.10	
V <sub>SSD</sub>	33.3	0.51	
V <sub>SRICH</sub>	0.00	0.00	
V <sub>DETRITUS</sub>	2.5 %	0.03	
V <sub>HERB</sub>	86 %	1.00	
V <sub>WLUSE</sub>	0.98	1.00	

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME S-EF65		LOCATION Montgomery County
STATION # 11740+24	RIVERMILE	STREAM CLASS Intermittent
LAT 37.295743	LONG -80.375921	RIVER BASIN Upper Roanoke
STORET #	AGENCY VADEQ	
INVESTIGATORS K. Ball, E. Lapidus, A. Oehser		
FORM COMPLETED BY KB	DATE 8/3/2021 TIME 2 PM	REASON FOR SURVEY Baseline Assessment

<b>WEATHER CONDITIONS</b>	<div style="display: flex; justify-content: space-between;"> <div> <p><b>Now</b></p> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> </div> <div> <p>60 %</p> <p>storm (heavy rain) rain (steady rain) showers (intermittent) %cloud cover clear/sunny</p> </div> </div> </div> <div> <p><b>Past 24 hours</b></p> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> </div> <div> <p>%</p> </div> </div> </div> <div> <p><b>Has there been a heavy rain in the last 7 days?</b></p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p><b>Air Temperature</b> 23 °C</p> <p><b>Other</b> _____</p> </div> </div>
<b>SITE LOCATION/MAP</b>	<p><b>Draw a map of the site and indicate the areas sampled (or attach a photograph)</b></p> 
<b>STREAM CHARACTERIZATION</b>	<div style="display: flex; justify-content: space-between;"> <div> <p><b>Stream Subsystem</b></p> <p><input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p><b>Stream Origin</b></p> <p><input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed  <input type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins  <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____</p> </div> <div> <p><b>Stream Type</b></p> <p><input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater</p> <p><b>Catchment Area</b> 0.48 km<sup>2</sup></p> </div> </div>

Note: No water present within stream bed.



# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	<b>Local Watershed NPS Pollution</b> <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources <b>Local Watershed Erosion</b> <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	<b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous Dominant species present _____	
<b>INSTREAM FEATURES</b>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <b>Estimated Reach Length</b> <u>18.3</u> m  <b>Estimated Stream Width</b> <u>1.5</u> m  <b>Sampling Reach Area</b> _____ m<sup>2</sup>  <b>Area in km<sup>2</sup> (m<sup>2</sup>x1000)</b> _____ km<sup>2</sup>  <b>Estimated Stream Depth</b> <u>N/A</u> m  <b>Surface Velocity (at thalweg)</b> <u>N/A</u> m/sec           </div> <div style="width: 45%;"> <b>Canopy Cover</b>  <input checked="" type="checkbox"/> Partly open      <input type="checkbox"/> Partly shaded      <input type="checkbox"/> Shaded  <b>High Water Mark</b> <u>1.07</u> m  <b>Proportion of Reach Represented by Stream Morphology Types</b>              Riffle _____ %      Run _____ %              Pool _____ %  <b>Channelized</b>      <input type="checkbox"/> Yes      <input checked="" type="checkbox"/> No  <b>Dam Present</b>      <input type="checkbox"/> Yes      <input checked="" type="checkbox"/> No           </div> </div>	
<b>LARGE WOODY DEBRIS</b>	<b>LWD</b> <u>0</u> m <sup>2</sup> <b>Density of LWD</b> _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)	
<b>AQUATIC VEGETATION</b>	<b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae Dominant species present <u>N/A</u> Portion of the reach with aquatic vegetation <u>N/A</u> %	
<b>WATER QUALITY</b>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <b>Temperature</b> <u>N/A</u> °C  <b>Specific Conductance</b> <u>N/A</u>  <b>Dissolved Oxygen</b> <u>N/A</u>  <b>pH</b> <u>NA</u>  <b>Turbidity</b> <u>N/A</u>  <b>WQ Instrument Used</b> <u>N/A</u> </div> <div style="width: 45%;"> <b>Water Odors</b>  <input type="checkbox"/> Normal/None      <input type="checkbox"/> Sewage  <input type="checkbox"/> Petroleum      <input type="checkbox"/> Chemical  <input type="checkbox"/> Fishy      <input type="checkbox"/> Other _____  <b>Water Surface Oils</b>  <input type="checkbox"/> Slick      <input type="checkbox"/> Sheen      <input type="checkbox"/> Globs      <input type="checkbox"/> Flecks  <input type="checkbox"/> None      <input type="checkbox"/> Other _____  <b>Turbidity (if not measured)</b>  <input type="checkbox"/> Clear      <input type="checkbox"/> Slightly turbid      <input type="checkbox"/> Turbid  <input type="checkbox"/> Opaque      <input type="checkbox"/> Stained      <input type="checkbox"/> Other _____           </div> </div>	
<b>SEDIMENT/SUBSTRATE</b>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <b>Odors</b>  <input type="checkbox"/> Normal      <input type="checkbox"/> Sewage      <input type="checkbox"/> Petroleum  <input type="checkbox"/> Chemical      <input type="checkbox"/> Anaerobic      <input type="checkbox"/> None  <input type="checkbox"/> Other _____  <b>Oils</b>  <input type="checkbox"/> Absent      <input type="checkbox"/> Slight      <input type="checkbox"/> Moderate      <input type="checkbox"/> Profuse           </div> <div style="width: 45%;"> <b>Deposits</b>  <input type="checkbox"/> Sludge      <input type="checkbox"/> Sawdust      <input type="checkbox"/> Paper fiber      <input type="checkbox"/> Sand  <input type="checkbox"/> Relict shells      <input type="checkbox"/> Other _____  <b>Looking at stones which are not deeply embedded, are the undersides black in color?</b>  <input type="checkbox"/> Yes      <input type="checkbox"/> No           </div> </div>	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		0	Detritus	sticks, wood, coarse plant materials (CPOM)	10
Boulder	> 256 mm (10")	0			
Cobble	64-256 mm (2.5"-10")	20	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	74			
Sand	0.06-2mm (gritty)	5	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	1			
Clay	< 0.004 mm (slick)	0			

Note: No water present within stream bed - WQ parameters not measured.

# HABITAT ASSESSMENT FIELD DATA SHEET - HG - USE ON ALL STREAMS (FRONT)

STREAM NAME		LOCATION	
STATION # _____ RIVERMILE _____		STREAM CLASS	
LAT _____ LONG _____		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS			
FORM COMPLETED BY		DATE _____ TIME _____ AM <b>PM</b>	REASON FOR SURVEY

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <b>0</b>
	<b>2. Embeddedness</b>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	<b>SCORE</b>	20 19 18 17 16	<b>15</b> 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	<b>3. Velocity/Depth Regime</b>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <b>0</b>
	<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	<b>SCORE</b>	20 19 18 17 16	15 14 13 12 <b>11</b>	10 9 8 7 6	5 4 3 2 1 0
	<b>5. Channel Flow Status</b>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <b>0</b>



# HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
<b>SCORE</b>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>7. Frequency of Riffles (or bends)</b>	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
<b>SCORE</b>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
Note: determine left or right side by facing downstream.																					
SCORE ____ (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE ____ (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
SCORE ____ (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE ____ (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
SCORE ____ (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE ____ (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					

Total Score \_\_\_\_\_

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME _____	LOCATION _____	
STATION # _____ RIVERMILE _____	STREAM CLASS _____	
LAT _____ LONG _____	RIVER BASIN _____	
STORET # _____	AGENCY _____	
INVESTIGATORS _____		LOT NUMBER _____
FORM COMPLETED BY _____	DATE _____ TIME _____	REASON FOR SURVEY _____

<b>HABITAT TYPES</b>	<b>Indicate the percentage of each habitat type present</b> Cobble _____% Snags _____% Vegetated Banks _____% Sand _____% Submerged Macrophytes _____% Other ( _____ ) _____%
<b>SAMPLE COLLECTION</b>	<b>Gear used</b> D-frame    kick-net    Other _____  <b>How were the samples collected?</b> wading    from bank    from boat  <b>Indicate the number of jabs/kicks taken in each habitat type.</b> Cobble _____ Snags _____ Vegetated Banks _____ Sand _____ Submerged Macrophytes _____ Other ( _____ ) _____
<b>GENERAL COMMENTS</b>	

### QUALITATIVE LISTING OF AQUATIC BIOTA

**Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant**

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

### FIELD OBSERVATIONS OF MACROBENTHOS

**Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)**

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						



# WOLMAN PEBBLE COUNT FORM

County: Montgomery County  
Stream Name: Mill Creek  
HUC Code: 05050002  
Survey Date: 8/3/2021  
Surveyors: KB, AO, EL  
Type: Representative

Stream ID: S-EF65

Basin: Upper Roanoke

PEBBLE COUNT							
Inches	PARTICLE	Millimeters		Particle Count	Total #	Item %	% Cum
	Silt/Clay	< .062	S/C	<div><div></div><div></div><div></div></div>	2	2.00	2.00
	Very Fine	.062-.125	S A N D	<div><div></div><div></div><div></div></div>	0	0.00	2.00
	Fine	.125-.25		<div><div></div><div></div><div></div></div>	0	0.00	2.00
	Medium	.25-.5		<div><div></div><div></div><div></div></div>	0	0.00	2.00
	Coarse	.50-1.0		<div><div></div><div></div><div></div></div>	0	0.00	2.00
.04-.08	Very Coarse	1.0-2		<div><div></div><div></div><div></div></div>	1	1.00	3.00
.08 -.16	Very Fine	2 -4		G R A V E L	<div><div></div><div></div><div></div></div>	3	3.00
.16 - .22	Fine	4 -5.7	<div><div></div><div></div><div></div></div>		2	2.00	8.00
.22 - .31	Fine	5.7 - 8	<div><div></div><div></div><div></div></div>		10	10.00	18.00
.31 - .44	Medium	8 -11.3	<div><div></div><div></div><div></div></div>		9	9.00	27.00
.44 - .63	Medium	11.3 - 16	<div><div></div><div></div><div></div></div>		21	21.00	48.00
.63 - .89	Coarse	16 -22.6	<div><div></div><div></div><div></div></div>		8	8.00	56.00
.89 - 1.26	Coarse	22.6 - 32	<div><div></div><div></div><div></div></div>		11	11.00	67.00
1.26 - 1.77	Vry Coarse	32 - 45	<div><div></div><div></div><div></div></div>		11	11.00	78.00
1.77 -2.5	Vry Coarse	45 - 64	<div><div></div><div></div><div></div></div>		7	7.00	85.00
2.5 - 3.5	Small	64 - 90	C O B B L E	<div><div></div><div></div><div></div></div>	7	7.00	92.00
3.5 - 5.0	Small	90 - 128		<div><div></div><div></div><div></div></div>	5	5.00	97.00
5.0 - 7.1	Large	128 - 180		<div><div></div><div></div><div></div></div>	3	3.00	100.00
7.1 - 10.1	Large	180 - 256		<div><div></div><div></div><div></div></div>	0	0.00	100.00
10.1 - 14.3	Small	256 - 362	B O U L D E R	<div><div></div><div></div><div></div></div>	0	0.00	100.00
14.3 - 20	Small	362 - 512		<div><div></div><div></div><div></div></div>	0	0.00	100.00
20 - 40	Medium	512 - 1024		<div><div></div><div></div><div></div></div>	0	0.00	100.00
40 - 80	Large	1024 -2048		<div><div></div><div></div><div></div></div>	0	0.00	100.00
80 - 160	Vry Large	2048 -4096		<div><div></div><div></div><div></div></div>	0	0.00	100.00
	Bedrock		BDRK	<div><div></div><div></div><div></div></div>	0	0.00	100.00
				Totals:	100		
	Total Tally:						

# RIVERMORPH PARTICLE SUMMARY

River Name: Mill Creek  
 Reach Name: S-EF65  
 Sample Name: Representative  
 Survey Date: 08/03/2021

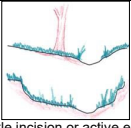
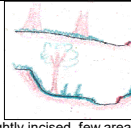
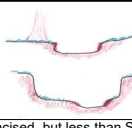
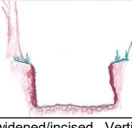
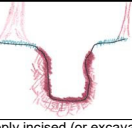
Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	2	2.00	2.00
0.062 - 0.125	0	0.00	2.00
0.125 - 0.25	0	0.00	2.00
0.25 - 0.50	0	0.00	2.00
0.50 - 1.0	0	0.00	2.00
1.0 - 2.0	1	1.00	3.00
2.0 - 4.0	3	3.00	6.00
4.0 - 5.7	2	2.00	8.00
5.7 - 8.0	10	10.00	18.00
8.0 - 11.3	9	9.00	27.00
11.3 - 16.0	21	21.00	48.00
16.0 - 22.6	8	8.00	56.00
22.6 - 32.0	11	11.00	67.00
32 - 45	11	11.00	78.00
45 - 64	7	7.00	85.00
64 - 90	7	7.00	92.00
90 - 128	5	5.00	97.00
128 - 180	3	3.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00
D16 (mm)	7.54		
D35 (mm)	13.09		
D50 (mm)	17.65		
D84 (mm)	61.29		
D95 (mm)	112.8		
D100 (mm)	180		
Silt/Clay (%)	2		
Sand (%)	1		
Gravel (%)	82		
Cobble (%)	15		
Boulder (%)	0		
Bedrock (%)	0		

Total Particles = 100.

# Stream Assessment Form (Form 1)

Unified Stream Methodology for use in Virginia

For use in wadeable channels classified as intermittent or perennial

Project #	Project Name (Applicant)	Locality	Cowardin Class.	HUC	Date	SAR #	Impact Length	Impact Factor
22865.06	Mountain Valley Pipeline (Mountain Valley Pipeline, LLC)	Montgomery County	R4	03010101	8/3/2021	S-EF65	152	1
Name(s) of Evaluator(s)		Stream Name and Information					SAR Length	
KB, EL, AO		Mill Creek					152	
<b>1. Channel Condition:</b> Assess the cross-section of the stream and prevailing condition (erosion, aggradation)								
Conditional Category								
Channel Condition	Optimal	Suboptimal	Marginal	Poor	Severe			
	 Very little incision or active erosion; 80-100% stable banks. Vegetative surface protection or natural rock, prominent (80-100%). AND/OR Stable bankfull benches are present. Access to their original floodplain or fully developed wide bankfull benches. Mid channel bars and transverse bars few. Transient sediment deposition covers less than 10% of bottom.	 Slightly incised, few areas of active erosion or unprotected banks. Majority of banks are stable (60-80%). Vegetative protection or natural rock prominent (60-80%) AND/OR Depositional features contribute to stability. The bankfull and low flow channels are well defined. Stream likely has access to bankfull benches, or newly developed portions of the reach. Transient sediment covers 10-40% of the stream bottom.	 Often incised, but less than Severe or Poor. Banks more stable than Severe or Poor due to lower bank slopes. Erosion may be present on 40-60% of both banks. Vegetative protection on 40-60% of banks. Streambanks may be vertical or undercut. AND/OR 40-60% Sediment may be temporary / transient, contribute instability. Deposition that contribute to stability, may be forming/present. AND/OR V-shaped channels have vegetative protection on > 40% of the banks and depositional features which contribute to stability.	 Overwidened/incised. Vertically / laterally unstable. Likely to widen further. Majority of both banks are near vertical. Erosion present on 60-banks. Vegetative protection present on 20-40% of banks, and is insufficient to prevent erosion. the stream is covered by sediment. Sediment is temporary / transient in nature, and contributing to instability. AND/OR V-shaped channels have vegetative protection is present on > 40% of the banks and stable sediment deposition is absent.	 Deeply incised (or excavated), vertical/lateral instability. Severe incision, flow contained within the banks. Streambed below average majority of banks vertical/undercut. Vegetative protection present on less than 20% of banks, is not preventing erosion. Obvious bank sloughing present. Erosion/raw banks on 80-100%. AND/OR Aggrading channel. More than 80% of stream bed is covered by deposition, contributing to instability. Multiple thread channels and/or subterranean flow.			
Scores	3	2.4	2	1.6	1	CI		
NOTES>>								
<b>2. RIPARIAN BUFFERS:</b> Assess both bank's 100 foot riparian areas along the entire SAR. (rough measurements of length & width may be acceptable)								
Conditional Category								
Riparian Buffers	Optimal	Suboptimal	Marginal	Poor	NOTES>>			
	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover. Wetlands located within the riparian areas.	High Suboptimal: Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	Low Suboptimal: Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and a maintained understory. Recent cutover (dense vegetation).	High Marginal: Non-maintained, dense herbaceous vegetation with either a shrub layer or a tree layer (dbh > 3 inches) present, with <30% tree canopy cover.	Low Marginal: Non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, hay production, ponds, open water. If present, tree stratum (dbh > 3 inches) present, with <30% tree canopy cover with maintained understory.	High Poor: Lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, recently seeded and stabilized, or other comparable condition.	Low Poor: Impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, trails, or other comparable conditions.	
Scores	1.5	1.2	1.1	0.85	0.75	0.6	0.5	
1. Delineate riparian areas along each stream bank into Condition Categories and Condition Scores using the descriptors. 2. Determine square footage for each by measuring or estimating length and width. Calculators are provided for you below. 3. Enter the % Riparian Area and Score for each riparian category in the blocks below.					Ensure the sums of % Riparian Blocks equal 100			
Right Bank	% Riparian Area>	55%	40%	5%			100%	
	Score >	0.75	1.5	0.6				
Left Bank	% Riparian Area>	60%	25%	15%			100%	
	Score >	0.6	1.5	0.75				
CI= (Sum % RA * Scores*0.01)/2								
Rt Bank CI >								1.04
Lt Bank CI >								0.85
CI								
<b>3. INSTREAM HABITAT:</b> Varied substrate sizes, water velocity and depths; woody and leafy debris; stable substrate; low embeddedness; shade; undercut banks; root mats; SAV; riffle/pool complexes, stable features.								
Conditional Category								
Instream Habitat/ Available Cover	Optimal	Suboptimal	Marginal	Poor	NOTES>>			
	Habitat elements are typically present in greater than 50% of the reach.	Stable habitat elements are typically present in 30-50% of the reach and are adequate for maintenance of populations.	Stable habitat elements are typically present in 10-30% of the reach and are adequate for maintenance of populations.	Habitat elements listed above are lacking or are unstable. Habitat elements are typically present in less than 10% of the reach.				
Scores	1.5	1.2	0.9	0.5	Stream Gradient			
					High			
					CI			
					1.20			



## Stream Impact Assessment Form Page 2

Project #	Project Name (Applicant)	Locality	Cowardin Class.	HUC	Date	SAR #	Impact Length	Impact Factor
22865.06	Mountain Valley Pipeline (Mountain Valley Pipeline, LLC)	Montgomery County	R4	03010101	8/3/2021	S-EF65	152	1

#### 4. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel, channelization, embankments, spoil piles, constrictions, livestock

Channel Alteration	Conditional Category						NOTES>>
	Negligible	Minor		Moderate		Severe	
	Channelization, dredging, alteration, or hardening absent. Stream has an unaltered pattern or has naturalized.	Less than 20% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	20-40% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	40 - 60% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	60 - 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines AND/OR 80% of banks shored with gabion, riprap, or cement.	
<b>Scores</b>	<b>1.5</b>	<b>1.3</b>	<b>1.1</b>	<b>0.9</b>	<b>0.7</b>	<b>0.5</b>	

CI

1.50

#### REACH CONDITION INDEX and STREAM CONDITION UNITS FOR THIS REACH

NOTE: The CIs and RCI should be rounded to 2 decimal places. The CR should be rounded to a whole number.

THE REACH CONDITION INDEX (RCI) >>

1.13

RCI= (Sum of all CI's)/5, except if stream is ephemeral RCI = (Riparian CI/2)

COMPENSATION REQUIREMENT (CR) >>

172

CR = RCI X L<sub>r</sub> X IF

#### INSERT PHOTOS:

(WSSI Photo Location "L:\22000s\22800\22865.06\Admin\05-ENVR\Field Data\Spread G\Field Forms\S-EF65\Photos\S-EF65\_DS COND US.jpeg")

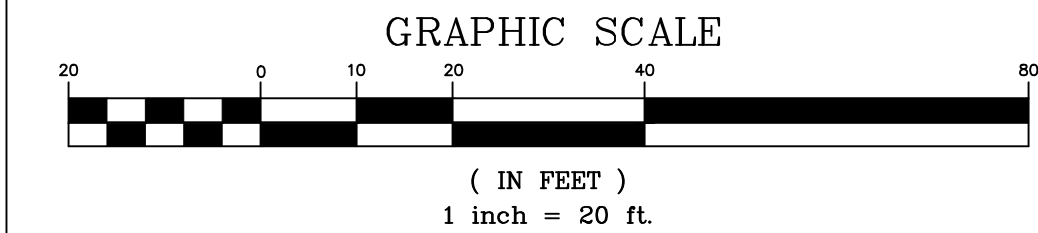


Reach S-EF65 looking upstream within ROW. Assessment is limited to areas within the temporary ROW.

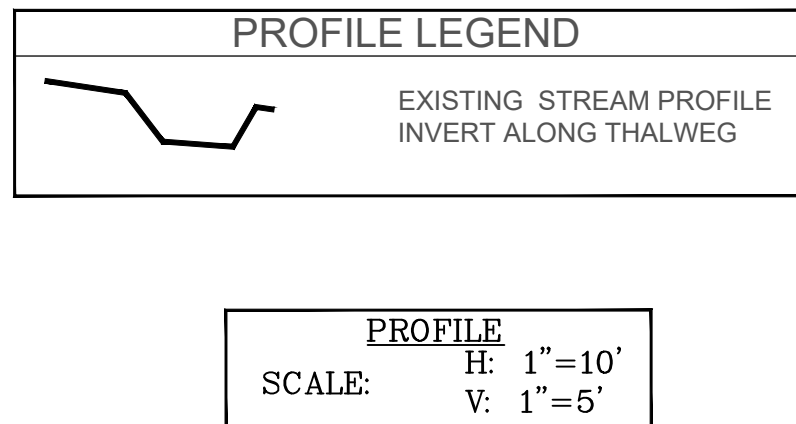
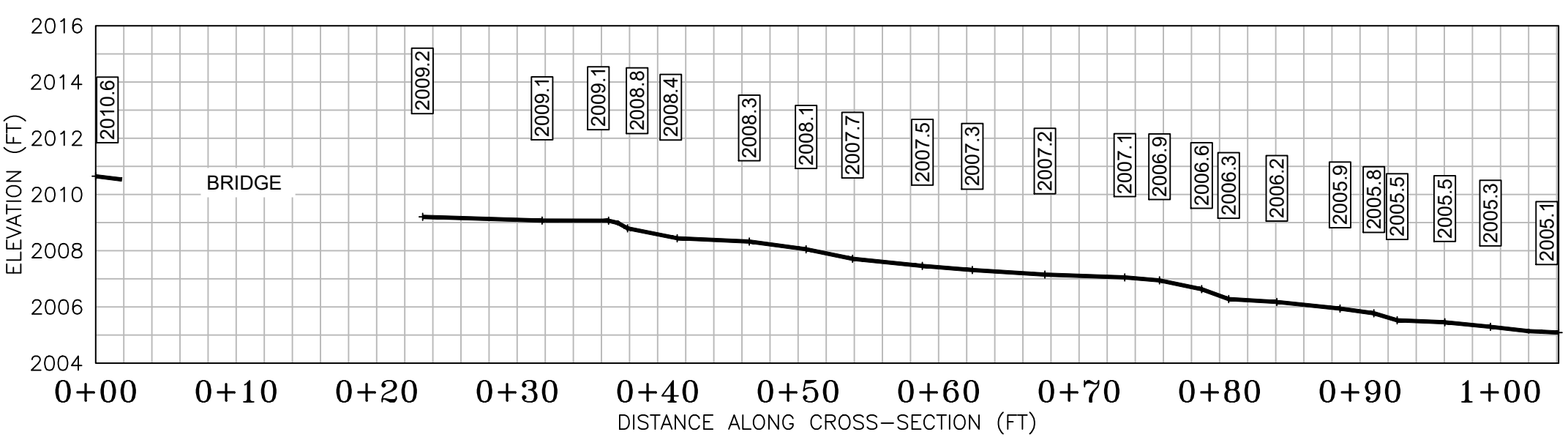
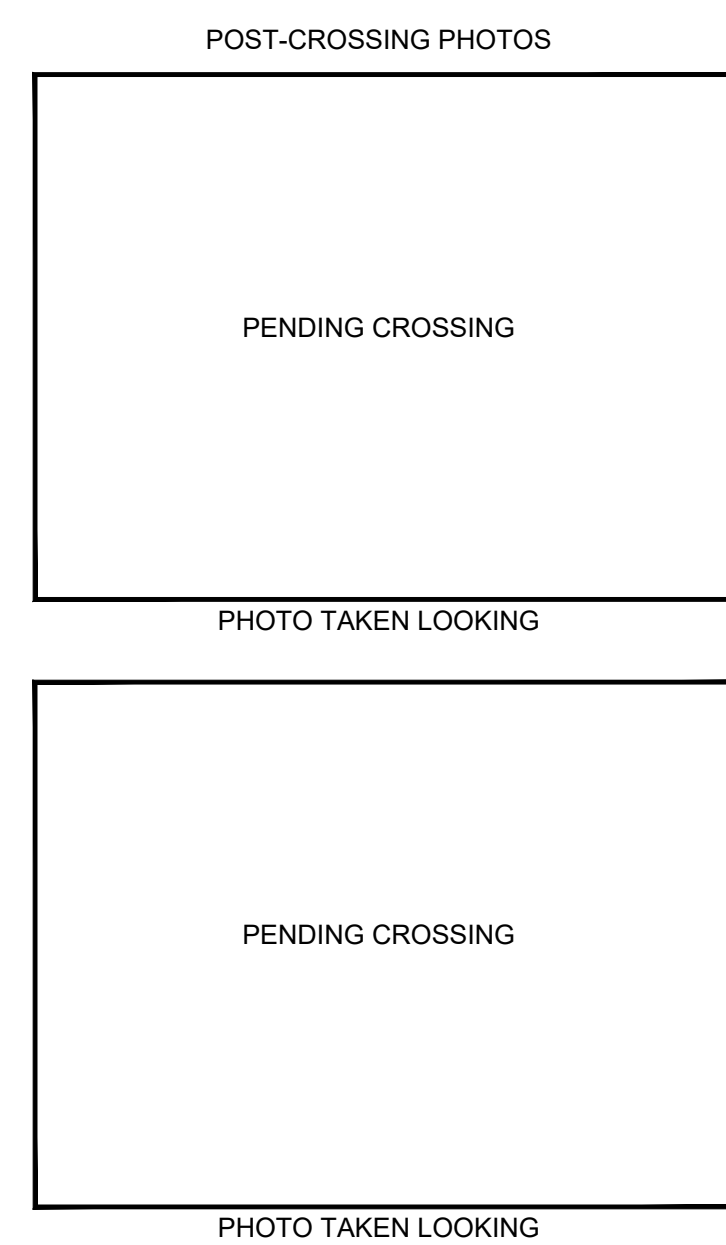
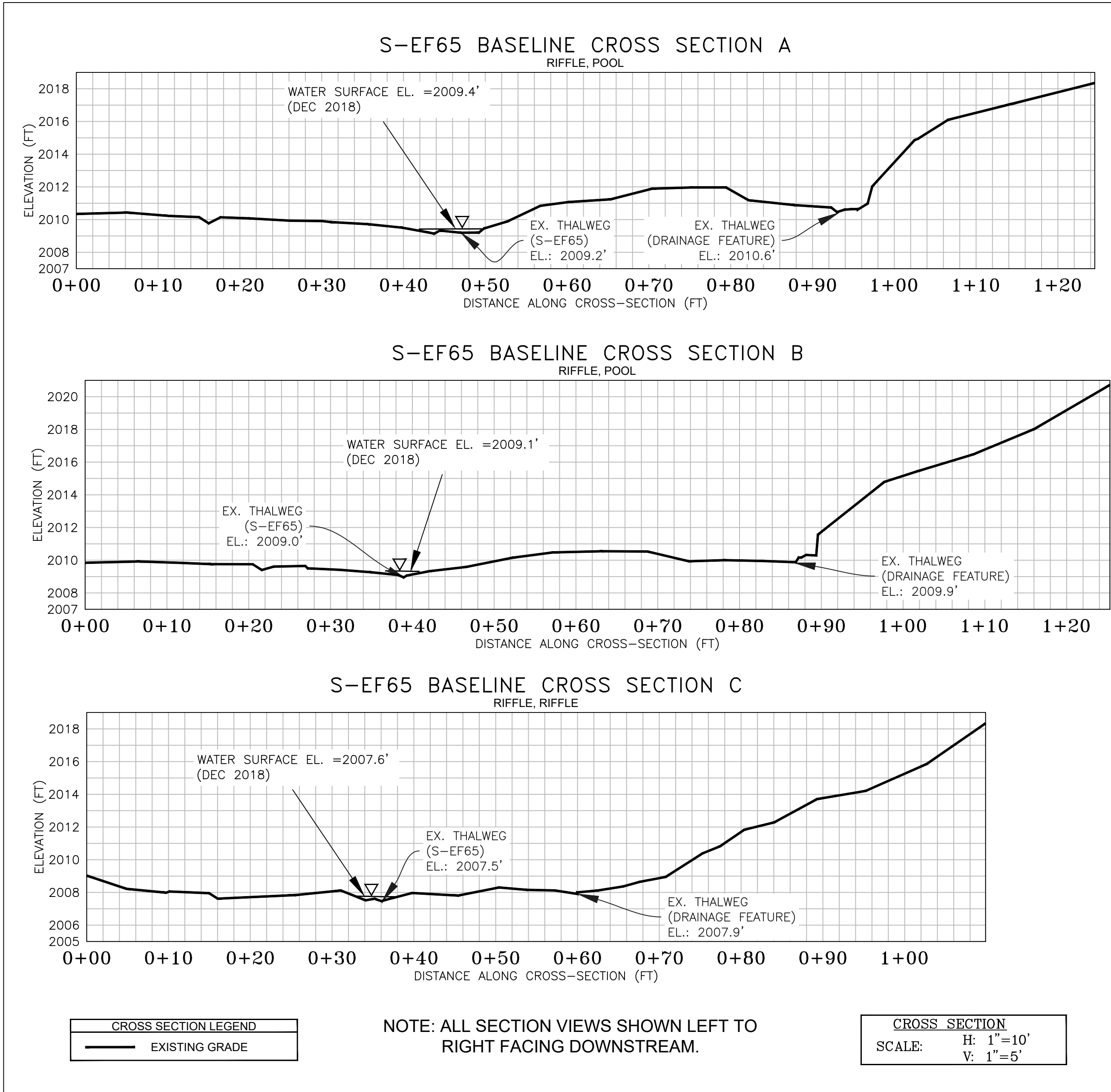
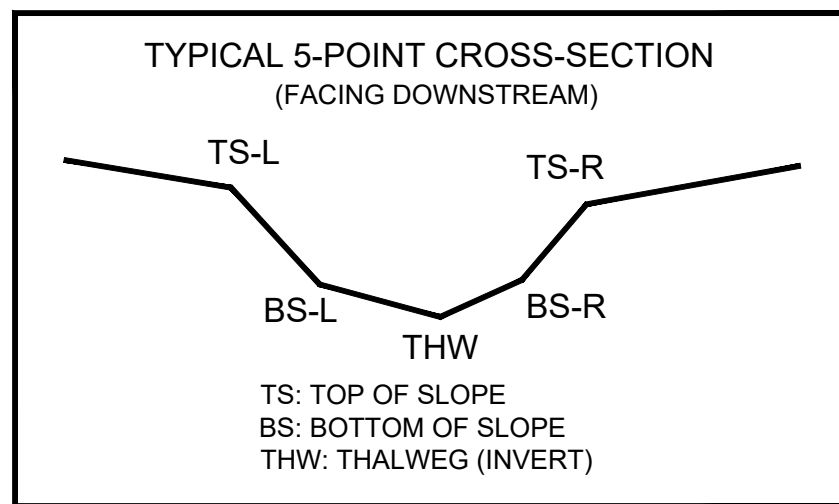
#### DESCRIBE PROPOSED IMPACT:

PROVIDED UNDER SEPARATE COVER





CL STAKEOUT POINTS: S-EF65 CROSS SECTION B (PIPE CL)					
PRE-CROSSING				POST-CROSSING	
PT. LOC.	NORTHING	EASTING	ELEV	VERT. DIFF.	HORIZ. DIFF.
TS-L	13542851.75	1821894.41	2009.65	----	----
BS-L	13542846.70	1821884.18	2009.04	----	----
THW	13542846.31	1821883.39	2008.99	----	----
BS-R	13542845.09	1821880.73	2009.33	----	----
TS-R	13542838.63	1821867.09	2010.48	----	----



1. This map has been oriented to NAD 1983 UTM ZONE 17N, and vertically to The North American Vertical Datum of 1988 (NAVD 88), using a Real Time Network (RTN) GPS. Field locations were completed on December 27, 2018.
2. Monumentation, including traverse stations and fly points, shown on this drawing should be used to orient any future boundary, topographic, or location survey.
3. Easement lines shown on plan view were provided by Mountain Valley Pipeline (MVP).
4. WSSI Contour Interval = 2.0'. Contours within the channel were interpolated using stream channel breaklines (i.e. top of slopes, toe of slopes, thalweg) and cross-sectional points. Contours outside the channel were interpolated using cross-sectional spot shots.
5. All section views shown are left to right facing downstream.
6. Cross-section B shot at location of pipe centerline (based on best professional judgement).

