S-I23A

Stream Photograph Page

Stream ID S-I23A Date: 04/17/2015

Photograph Direction NW

Comments:

STREAM ID S-I23A	**STREAM NAME** UNT to Boggs Creek
LAT 37.917457 **LONG** -80.738603	**DATE** 04/17/2015
CLIENT MVP	**CLIENT** MVP
INVESTIGATORS R Sparhawk, A Hatfield, M Brice	
FLOW REGIME Perennial ___ Intermittent ✔ Ephemeral ___	**WATER TYPE** TNW ___ RPW ✔ NRPW ___

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 4.0 ft
Top of Bank Height:
LB 3.0 in RB 3.0 in
Water Depth: 2.00 in
Water Width: 2.0 ft
High Water Mark: 4.0 ft
Flow Direction: NW

Stream Erosion
___None ✔ Moderate ___Heavy

Artificial, Modified or Channelized
✔ Yes ___ No

Dam Present ___Yes ✔ No

Sinuosity ___ Low ✔ Medium ___ High

Gradient
___ Flat (0.5/100 ft) ✔ Moderate (2 ft/100 ft) ___Severe (10 ft/100 ft)

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
___ Stream bed moist
___ Standing water
✔ Flowing water

Velocity
✔ Fast ___ Moderate
___ Slow

Proportion of Reach Represented by Stream Morphology Types
Riffle 25 % Run 65 %
Pool 10 %

Turbidity
___ Clear ✔ Slightly turbid ___Turbid
___ Opaque ___Stained
___Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	
Cobble	64-256 mm (2.5"-10")	30
Gravel	2-64 mm (0.1"-2.5")	45
Sand	0.06-2mm (gritty)	10
Silt	0.004-0.06 mm	10
Clay	< 0.004 mm (slick)	5

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	5
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
✔ Forest ___ Commercial
___ Field/Pasture ___Industrial
___ Agricultural ___ Residential
___ Other:

Canopy Cover
___Partly open ✔ Partly shaded
___Shaded ___ Open

Indicate the dominant type (Check one)
✔ Trees ___ Shrubs
___ Grasses ___Herbaceous

Floodplain Width
___ Wide > 30ft ___ Moderate 15-30ft
✔ Narrow <16ft

Wetland Present ___Yes ✔ No
Wetland ID

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
___Rooted emergent ___Rooted submergent ___Rooted floating ___Free floating
___Floating algae ___Attached algae

MACROINVERTEBRATES OR OTHER WILDLIFE OBSERVED/OTHER OBSERVATIONS AND NOTES

Intermittent stream on two-track road

West Virginia Stream and Wetland Valuation Metric (SWVM)
Version 2.1, September 2015

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	**Mountain Valley Pipeline Project SWVM v2.1**	**IMPACT COORDINATES: (in Decimal Degrees)**	**Lat.**	**37.917347**	**Lon.**	**-80.738534**	**WEATHER:**	**Cloudy, 80°**	**DATE:**	**September 21, 2016**
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)	**S-I23a; UNT to Boggs Creek; 10.61ac** **Form of Mitigation: Mitigation Bank**	**MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION:** (watershed size (acreage), unaltered or impairments)							**Comments:**	**No/low water flow at time of survey. Unable to sample water quality or WVSCI**
STREAM IMPACT LENGTH: **33** **FORM OF MITIGATION:**	**RESTORATION (Levels I-III)**	**MIT COORDINATES: (in Decimal Degrees)**	**Lat.**		**Lon.**		**PRECIPITATION PAST 48 HRS:**	**0.30"**	**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:	**Intermittent**			**Stream Classification:**	**Intermittent**			**Stream Classification:**	**Intermittent**			**Stream Classification:**	**Intermittent**			**Stream Classification:**	**Intermittent**		
Percent Stream Channel Slope	**15**			**Percent Stream Channel Slope**				**Percent Stream Channel Slope**	**0**			**Percent Stream Channel Slope**	**0**			**Percent Stream Channel Slope**	**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	**0.52**			**Hydrology**				**Hydrology**				**Hydrology**				**Hydrology**			
Biogeochemical Cycling	**0.58**	**0.49**		**Biogeochemical Cycling**		**0**		**Biogeochemical Cycling**		**0**		**Biogeochemical Cycling**		**0**		**Biogeochemical Cycling**		**0**	
Habitat	**0.37**			Habitat				Habitat				Habitat				Habitat			
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 Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	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 (High 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	**11**	1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		**12**	2. Embeddedness	0-20			2. Embeddedness	0-20			2. Embeddedness	0-20			2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		**0**	3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		**6**	4. Sediment Deposition	0-20			4. Sediment Deposition	0-20			4. Sediment Deposition	0-20			4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		**0**	5. Channel Flow Status	0-20			5. Channel Flow Status	0-20			5. Channel Flow Status	0-20			5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		**11**	6. Channel Alteration	0-20			6. Channel Alteration	0-20			6. Channel Alteration	0-20			6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		**0**	7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		**14**	8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		**10**	9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		**10**	10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Marginal		**74**	Total RBP Score	Poor		**0**	Total RBP Score	Poor		**0**	Total RBP Score	Poor		**0**	Total RBP Score	Poor		**0**
Sub-Total			**0.37**	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	0-90	0-1			0-90	0-1			0-90	0-1			0-90	0-1			0-90	0-1	
pH				**pH**				**pH**				**pH**				**pH**			
5.6-5.9 = 45 points	0-80				5-90				5-90		5.6		5-90				5-90		
DO				**DO**				**DO**				**DO**				**DO**			
	10-30				10-30				10-30				10-30				10-30		
Sub-Total				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			0-100	0-1	**0**		0-100	0-1			0-100	0-1			0-100	0-1	
Sub-Total			**0**	Sub-Total			**0**	Sub-Total			**0**	Sub-Total			**0**	Sub-Total			**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0.538	**33**	**17.7375**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

West Virginia Stream and Wetland Valuation Metric (SWVM)
Version 2.1, September 2015

PART III - Impact Factors
(See instruction page to insert default values for MITIGATION BANKING and ILF)

Temporal Loss-Construction

**Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).*

Years	0
Sub-Total	0

Temporal Loss-Maturity

**Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).*

% Add. Mitigation	Temporal Loss-Maturity (Years)
0%	0
Sub-Total	0

Long-term Protection

% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
0 + 5/10 Year Monitoring	101
Sub-Total	0

PART IV - Index to Unit Score Conversion

Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
0.5375	33	17.7375	$14,190.00

PART V- Comparison of Unit Scores and Projected Balance

Final Unit Score (Debit) [No Net Loss Value]	17.7375	Mitigation Existing Condition - Baseline (Credit)		Mitigation Projected at Five Years Post Completion (Credit)		Mitigation Projected at Ten Years Post Completion (Credit)		Mitigation Projected At Maturity (Credit)	
FINAL PROJECTED NET BALANCE					0		0		0

Part VI - Mitigation Considerations (Incentives)

Extent of Stream Restoration

**Note1: Reference the Instructional handout to determine the correct Restoration Levels (below) for your project*
**Note2: Place an "X" in the appropriate category (only select one).*

☐ Restoration Level 1	
☐ Restoration Level 2	
☐ Restoration Level 3	

Compensatory Mitigation Plan incorporates HUC 12-based watershed approach? (Yes or No)
*Note: HUC 12-based watershed approach required to obtain Stream Restoration incentive

No

Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)
S-I23A	17.7375	#DIV/0!

Extended Upland Buffer Zone

**Note[1]: Reference Instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below)*
**Note[2]: Enter the buffer width for each channel side (Left Bank and Right Bank)*
**Note[3]: Select the appropriate mitigation type*

Buffer Width	Left Bank	
	0-50	None
	51-150	None
Buffer Width	**Right Bank**	
	0-50	None
	51-150	None
Average Buffer Width/Side	0	

Straight Preservation Ratio (v2.1, Sept 2015)

Final Mitigation Unit Yield
#DIV/0!

Ver. 1-25-11

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the UPPERMOST STRATUM of the plant community is determined based on the calculated value for $V_{CCANOPY}$ (≥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 Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: MVP
Location: S-I23A
Sampling Date: 09/21/2016

Project Site Before Project

Subclass for this SAR:
Intermittent Stream

Uppermost stratum present at this SAR:
Tree/Sapling Strata

SAR number:

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.52
Biogeochemical Cycling	0.58
Habitat	0.37

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canpoy over channel.	42.50	0.40
V_{EMBED}	Average embeddedness of channel.	2.30	0.57
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.75	0.38
V_{BERO}	Total percent of eroded stream channel bank.	40.00	0.86
V_{LWD}	Number of down woody stems per 100 feet of stream.	0.00	0.00
V_{TDBH}	Average dbh of trees.	7.70	0.81
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.80	0.38
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	10.42	0.13
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.81	0.85

Version 1-25-11

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia
Field Data Sheet and Calculator

Team:	C. Vileno, J. Bittner	Latitude/UTM Northing:	37.917347
Project Name:	MVP	Longitude/UTM Easting:	-80.738534
Location:	S-I23A	Sampling Date:	09/21/2016

SAR Number: | Reach Length (ft): 100 | Stream Type: Intermittent Stream

Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)

Site and Timing: Project Site | Before Project

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ 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.)

42.5 %

List the percent cover measurements at each point below:

20	30	20	30	0	0	0	0	0	0
60	70	80	60	80	80	80	80	80	80

2 V_{EMBED} 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.

2.3

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

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:

3	2	2	2	2	2	3	3	2	2
2	2	3	2	2	3	2	3	2	2
2	2	2	3	3	3	2	2	2	2

3 $V_{SUBSTRATE}$ 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_{EMBED}.

0.75 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):

6.00	3.00	2.00	2.00	0.50	0.50	1.00	1.00	1.00	1.00
1.00	2.00	0.75	0.75	0.75	0.75	0.75	0.75	1.00	1.00
0.75	0.50	1.00	0.50	0.50	1.00	0.50	0.50	0.50	0.50

4 V_{BERO} 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%.

40 %

Left Bank: 10 ft Right Bank: 30 ft

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

5 V_{LWD} 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. **0.0**

Number of downed woody stems: 0

6 V_{TDBH} Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. **7.7**

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

Left Side					Right Side				
5	10	8	10	6	8	10			
5	7	8							

7 V_{SNAG} 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_{SSD} 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. **Not Used**

Left Side: Right Side:

9 V_{SRICH} 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. **0.80**

Group 1 = 1.0		Group 2 (-1.0)	
☐ *Acer rubrum*	☐ *Magnolia tripetala*	☐ *Ailanthus altissima*	☐ *Lonicera japonica*
☐ *Acer saccharum*	☐ *Nyssa sylvatica*	☐ *Albizia julibrissin*	☐ *Lonicera tatarica*
☐ *Aesculus flava*	☐ *Oxydendrum arboreum*	☐ *Alliaria petiolata*	☐ *Lotus corniculatus*
☐ *Asimina triloba*	☐ *Prunus serotina*	☐ *Alternanthera philoxeroides*	☐ *Lythrum salicaria*
☐ *Betula alleghaniensis*	☑ *Quercus alba*		☑ *Microstegium vimineum*
☐ *Betula lenta*	☐ *Quercus coccinea*	☐ *Aster tataricus*	☐ *Paulownia tomentosa*
☐ *Carya alba*	☐ *Quercus imbricaria*	☐ *Cerastium fontanum*	☐ *Polygonum cuspidatum*
☐ *Carya glabra*	☐ *Quercus prinus*	☐ *Coronilla varia*	☐ *Pueraria montana*
☐ *Carya ovalis*	☑ *Quercus rubra*	☐ *Elaeagnus umbellata*	☑ *Rosa multiflora*
☑ *Carya ovata*	☐ *Quercus velutina*	☐ *Lespedeza bicolor*	☐ *Sorghum halepense*
☐ *Cornus florida*	☐ *Sassafras albidum*	☐ *Lespedeza cuneata*	☐ *Verbena brasiliensis*
☐ *Fagus grandifolia*	☐ *Tilia americana*	☐ *Ligustrum obtusifolium*	
☐ *Fraxinus americana*	☐ *Tsuga canadensis*	☐ *Ligustrum sinense*	
☐ *Liriodendron tulipifera*	☐ *Ulmus americana*		
☐ *Magnolia acuminata*			
3 Species in Group 1		2 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 $V_{DETRITUS}$ 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.

10.42 %

Left Side				Right Side			
10	15	10	0	10	0	0	0
20	20			20	20		

11 V_{HERB} 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.

Not Used

Left Side				Right Side			

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed:

0.81

Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
Forest and native range (>75% ground cover)	1	75	75
Open space (pasture, lawns, parks, etc.), grass cover >75%	0.3	15	90
Residential districts, 1/4 - 1/3 ac (38% to 30% cover)	0.1	10	100

Summary

Variable	Value	VSI
$V_{CCANOPY}$	43 %	0.40
V_{EMBED}	2.3	0.57
$V_{SUBSTRATE}$	0.75 in	0.38
V_{BERO}	40 %	0.86
V_{LWD}	0.0	0.00
V_{TDBH}	7.7	0.81
V_{SNAG}	0.0	0.10
V_{SSD}	Not Used	Not Used
V_{SRICH}	0.80	0.38
$V_{DETRITUS}$	10.4 %	0.13
V_{HERB}	Not Used	Not Used
V_{WLUSE}	0.81	0.85

Notes:

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S-I23A	LOCATION Greenbrier, WV	
STATION #_____ RIVERMILE_____	STREAM CLASS Intermittent	
LAT 37.917347 LONG -80.738534	RIVER BASIN Sewell Creek	
STORET #	AGENCY Tetra Tech	
INVESTIGATORS C. Vileno, J. Bittner		
FORM COMPLETED BY C.Vileno	DATE 09/21/2016 TIME 12:00	REASON FOR SURVEY SWVM

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	**1. Epifaunal Substrate/ Available Cover**	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 not new fall and not 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.
	SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	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.
	SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	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).
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	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.
	SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	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.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	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.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	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.
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	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.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	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 6 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	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 6 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

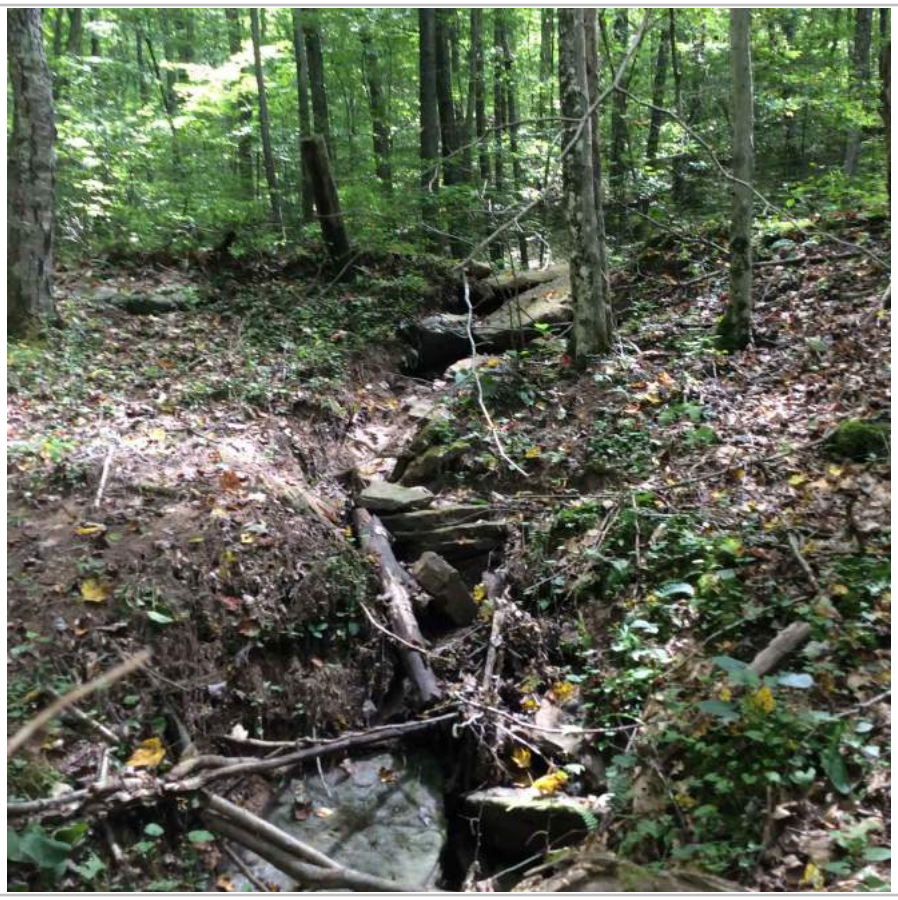
Total Score 74

No / low flow at time of survey. Unable to sample water quality or WVSCI.

S-IJ54

Stream Photograph Page

Stream ID S-IJ54 Date: 08/13/2016



Photograph Direction SE

Comments:

West Virginia Stream and Wetland Valuation Metric (SWVM)
Version 2.1, September 2015

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	**Mountain Valley Pipeline Project SWVM v2.1**		**IMPACT COORDINATES: (in Decimal Degrees)**	**Lat.**	**37.917137**	**Lon.**	**-80.742452**	**WEATHER:**	**Cloudy, 80°**	**DATE:**	**September 21, 2016**
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)	**S-IJ54; UNT to Boggs Creek; 1.23ac Form of Mitigation: Mitigation Bank**		**MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION:** (watershed size {acreage}, unaltered or impairments)							**Comments:**	**No/low water flow at time of survey. Unable to sample water quality or WVSCI**
STREAM IMPACT LENGTH:	**31**	**FORM OF MITIGATION:**	**RESTORATION (Levels I-III)**	**MIT COORDINATES: (in Decimal Degrees)**	**Lat.**		**Lon.**	**PRECIPITATION PAST 48 HRS:**	**0.30"**	**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:	**Ephemeral**			**Stream Classification:**	**Ephemeral**			**Stream Classification:**	**Ephemeral**			**Stream Classification:**	**Ephemeral**			**Stream Classification:**	**Ephemeral**		
Percent Stream Channel Slope	**8**			**Percent Stream Channel Slope**				**Percent Stream Channel Slope**	**0**			**Percent Stream Channel Slope**	**0**			**Percent Stream Channel Slope**	**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	**0.47**	**0.44**		**Hydrology**		**0**		**Hydrology**		**0**		**Hydrology**		**0**		**Hydrology**		**0**	
Biogeochemical Cycling	**0.5**			**Biogeochemical Cycling**				**Biogeochemical Cycling**				**Biogeochemical Cycling**				**Biogeochemical Cycling**			
Habitat	**0.35**			Habitat				Habitat				Habitat				Habitat			
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 Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	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 (High 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	**0**	1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		**6**	2. Embeddedness	0-20			2. Embeddedness	0-20			2. Embeddedness	0-20			2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		**0**	3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		**12**	4. Sediment Deposition	0-20			4. Sediment Deposition	0-20			4. Sediment Deposition	0-20			4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		**0**	5. Channel Flow Status	0-20			5. Channel Flow Status	0-20			5. Channel Flow Status	0-20			5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		**12**	6. Channel Alteration	0-20			6. Channel Alteration	0-20			6. Channel Alteration	0-20			6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		**0**	7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		**10**	8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		**8**	9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		**12**	10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Marginal		**60**	Total RBP Score	Poor		**0**	Total RBP Score	Poor		**0**	Total RBP Score	Poor		**0**	Total RBP Score	Poor		**0**
Sub-Total			**0.5**	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	0-90	0-1			0-90	0-1			0-90	0-1			0-90	0-1			0-90	0-1	
pH				**pH**				**pH**				**pH**				**pH**			
5.6-5.9 = 45 points	0-80				5-90				5-90		5.6		5-90				5-90		
DO				**DO**				**DO**				**DO**				**DO**			
	10-30				10-30				10-30				10-30				10-30		
Sub-Total				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			0-100	0-1			0-100	0-1			0-100	0-1			0-100	0-1	
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**
0.545	**31**	**16.895**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

PART III - Impact Factors
(See instruction page to insert default values for MITIGATION BANKING and ILF)

Temporal Loss-Construction

**Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).*

Years	0
Sub-Total	0

Temporal Loss-Maturity

**Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).*

% Add. Mitigation	Temporal Loss-Maturity (Years)
0%	0
Sub-Total	0

Long-term Protection

% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
0 + 5/10 Year Monitoring	101
Sub-Total	0

PART IV - Index to Unit Score Conversion

Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
0.545	31	16.895	$13,516.00

PART V- Comparison of Unit Scores and Projected Balance

Final Unit Score (Debit) [No Net Loss Value]	16.895	Mitigation Existing Condition - Baseline (Credit)		Mitigation Projected at Five Years Post Completion (Credit)		Mitigation Projected at Ten Years Post Completion (Credit)		Mitigation Projected At Maturity (Credit)	
FINAL PROJECTED NET BALANCE					0		0		0

Part VI - Mitigation Considerations (Incentives)

Extent of Stream Restoration

**Note1: Reference the Instructional handout to determine the correct Restoration Levels (below) for your project*
**Note2: Place an "X" in the appropriate category (only select one).*

☐ Restoration Level 1	
☐ Restoration Level 2	
☐ Restoration Level 3	

Compensatory Mitigation Plan incorporates HUC 12-based watershed approach? (Yes or No) *Note: HUC 12-based watershed approach required to obtain Stream Restoration incentive	No

Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)
S-IJ54	16.895	#DIV/0!

Extended Upland Buffer Zone

**Note[1]: Reference Instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below)*
**Note[2]: Enter the buffer width for each channel side (Left Bank and Right Bank)*
**Note[3]: Select the appropriate mitigation type*

Buffer Width	Left Bank	
	0-50	None
	51-150	None
Buffer Width	**Right Bank**	
	0-50	None
	51-150	None
Average Buffer Width/Side	0	

Straight Preservation Ratio (v2.1, Sept 2015)	
Final Mitigation Unit Yield	
#DIV/0!	

STREAM ID S-IJ54		**STREAM NAME** UNT to Boggs Creek	
CLIENT MVP		**PROJECT NAME** MVP	
LAT 37.917137	**LONG** -80.742452	**DATE** 08/13/2016	**COUNTY** Greenbrier
INVESTIGATORS E. Foster, S. Ryan, A. Carrano			
WATER TYPE TNW ☐ RPW ☐ NRPW ☑		**FLOW REGIME** Perennial ☐ Intermittent ☐ Ephemeral ☑	

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 5.0 ft
Top of Bank Height:
LB 2.0 ft RB 2.0 ft
Water Depth: 0.00 in
Water Width: 0.0 ft
Ordinary High Water Mark (Width): 2.0 ft
Ordinary High Water Mark (Height): 6.0 in
Flow Direction: Northwest

Sinuosity ☑ Low ☐ Medium ☐ High

Gradient ☐ Flat (0.5/100 ft) ☐ Moderate (2 ft/100 ft) ☑ Severe (10 ft/100 ft)

Stream Erosion
☐ None ☑ Moderate ☐ Heavy

Artificial, Modified or Channelized
☐ Yes ☑ No

Within Roadside Ditch
☐ Yes ☑ No

Culvert Present ☐ Yes ☑ No
Culvert Material: _____
Culvert Size: _____ in

FLOW CHARACTERISTICS

Water Present
☐ No water, stream bed dry
☑ Stream bed moist
☐ Standing water
☐ Flowing water

Velocity
☐ Fast ☐ Moderate
☐ Slow

Proportion of Reach Represented by Stream Morphology Types (Only enter if water present)
Riffle % Run %
Pool %

Turbidity
☐ Clear ☐ Slightly turbid ☐ Turbid
☐ Other _____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%) 100

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	60
Cobble	64-256 mm (2.5"-10")	20
Gravel	2-64 mm (0.1"-2.5")	
Sand	0.06-2mm (gritty)	10
Silt	0.004-0.06 mm	10
Clay	< 0.004 mm (slick)	

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	10
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Residential
☐ ROW ☐ Other:

Canopy Cover
☐ Open ☐ Partly shaded
☑ Shaded

Floodplain Width
☐ Wide > 30ft ☐ Moderate 15-30ft
☑ Narrow <15ft

MACROINVERTEBRATES/OTHER WILDLIFE OBSERVED OR OTHER NOTES AND OBSERVATIONS

No macros. Recent historic floods in area. Loses bed and bank and becoms sheet flow flowing into S-IJ53.

Ver. 1-25-11

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the UPPERMOST STRATUM of the plant community is determined based on the calculated value for $V_{CCANOPY}$ (≥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 Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: MVP
Location: S-IJ54
Sampling Date: 09/21/2016

Project Site Before Project

Subclass for this SAR:
Ephemeral Stream

Uppermost stratum present at this SAR:
Tree/Sapling Strata

SAR number:

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.47
Biogeochemical Cycling	0.50
Habitat	0.35

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canpoy over channel.	50.00	0.50
V_{EMBED}	Average embeddedness of channel.	1.73	0.36
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.08	0.04
V_{BERO}	Total percent of eroded stream channel bank.	20.00	0.97
V_{LWD}	Number of down woody stems per 100 feet of stream.	1.00	0.13
V_{TDBH}	Average dbh of trees.	10.00	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.90	0.43
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	31.25	0.38
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.81	0.85

Version 1-25-11

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia
Field Data Sheet and Calculator

Team:	C. Vileno, J. Bittner	Latitude/UTM Northing:	37.917125°
Project Name:	MVP	Longitude/UTM Easting:	-80.742425°
Location:	S-IJ54	Sampling Date:	09/21/2016

SAR Number: | Reach Length (ft): 100 | Stream Type: Ephemeral Stream

Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)

Site and Timing: Project Site | Before Project

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ 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.)

50.0 %

List the percent cover measurements at each point below:

60	50	60	60	40	40	30	50	50	60

2 V_{EMBED} 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.

1.7

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

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:

2	1	2	2	2	2	1	2	2	2
2	2	1	2	2	1	2	1	2	2
2	2	2	1	1	1	2	2	2	2

3 $V_{SUBSTRATE}$ 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_{EMBED}.

0.08 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	0.08	0.08	0.75	0.08	0.08	0.75	0.08	0.08	0.08
1.00	0.08	0.50	0.08	0.08	0.08	0.08	0.50	0.08	0.75
0.08	0.08	1.00	0.08	0.08	1.00	0.08	0.08	0.08	0.08

4 V_{BERO} 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%.

20 %

Left Bank: 10 ft Right Bank: 10 ft

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

5 V_{LWD} 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. **1.0**

Number of downed woody stems: 1

6 V_{TDBH} Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. **10.0**

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

Left Side					Right Side				
8	9	12	12	21	8	7	7	6	

7 V_{SNAG} 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_{SSD} 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. **Not Used**

Left Side: Right Side:

9 V_{SRICH} 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. **0.90**

Group 1 = 1.0		Group 2 (-1.0)	
☐ *Acer rubrum*	☐ *Magnolia tripetala*	☐ *Ailanthus altissima*	☐ *Lonicera japonica*
☐ *Acer saccharum*	☐ *Nyssa sylvatica*	☐ *Albizia julibrissin*	☐ *Lonicera tatarica*
☐ *Aesculus flava*	☐ *Oxydendrum arboreum*	☐ *Alliaria petiolata*	☐ *Lotus corniculatus*
☐ *Asimina triloba*	☐ *Prunus serotina*	☐ *Alternanthera philoxeroides*	☐ *Lythrum salicaria*
☐ *Betula alleghaniensis*	☐ *Quercus alba*		☑ *Microstegium vimineum*
☑ *Betula lenta*	☐ *Quercus coccinea*	☐ *Aster tataricus*	☐ *Paulownia tomentosa*
☐ *Carya alba*	☐ *Quercus imbricaria*	☐ *Cerastium fontanum*	☐ *Polygonum cuspidatum*
☐ *Carya glabra*	☐ *Quercus prinus*	☐ *Coronilla varia*	☐ *Pueraria montana*
☐ *Carya ovalis*	☑ *Quercus rubra*	☐ *Elaeagnus umbellata*	☐ *Rosa multiflora*
☐ *Carya ovata*	☐ *Quercus velutina*	☐ *Lespedeza bicolor*	☐ *Sorghum halepense*
☐ *Cornus florida*	☐ *Sassafras albidum*	☐ *Lespedeza cuneata*	☐ *Verbena brasiliensis*
☐ *Fagus grandifolia*	☐ *Tilia americana*	☐ *Ligustrum obtusifolium*	
☐ *Fraxinus americana*	☐ *Tsuga canadensis*	☐ *Ligustrum sinense*	
☐ *Liriodendron tulipifera*	☐ *Ulmus americana*		
☐ *Magnolia acuminata*			
2 Species in Group 1		1 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 $V_{DETRITUS}$ 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. **31.25 %**

Left Side				Right Side			
30	20	30	30	40	40	30	30

11 V_{HERB} 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. **Not Used**

Left Side				Right Side			

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed: **0.81**

Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
Forest and native range (>75% ground cover)	1	75	75
Open space (pasture, lawns, parks, etc.), grass cover >75%	0.3	15	90
Residential districts, 1/4 - 1/3 ac (38% to 30% cover)	0.1	10	100

Summary

Variable	Value	VSI
$V_{CCANOPY}$	50 %	0.50
V_{EMBED}	1.7	0.36
$V_{SUBSTRATE}$	0.08 in	0.04
V_{BERO}	20 %	0.97
V_{LWD}	1.0	0.13
V_{TDBH}	10.0	1.00
V_{SNAG}	0.0	0.10
V_{SSD}	Not Used	Not Used
V_{SRICH}	0.90	0.43
$V_{DETRITUS}$	31.3 %	0.38
V_{HERB}	Not Used	Not Used
V_{WLUSE}	0.81	0.85

Notes:

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S-IJ54	LOCATION Greenbrier, WV	
STATION #_____ RIVERMILE_____	STREAM CLASS Ephemeral	
LAT 37.917125° LONG -80.742425°	RIVER BASIN Sewell Creek	
STORET #	AGENCY Tetra Tech	
INVESTIGATORS C. Vileno, J. Bittner		
FORM COMPLETED BY C.Vileno	DATE 09/21/2016 TIME 09:45	REASON FOR SURVEY Proposed Pipeline

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	**1. Epifaunal Substrate/ Available Cover**	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 not new fall and not 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.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	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.
	SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	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).
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	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.
	SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	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.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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

	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
Parameters to be evaluated broader than sampling reach	**6. Channel Alteration**	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.
	SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	7. Frequency of Riffles (or bends)	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.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	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.
	SCORE 5 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 5 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	9. Vegetative Protection (score each bank)	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 4 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	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 6 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

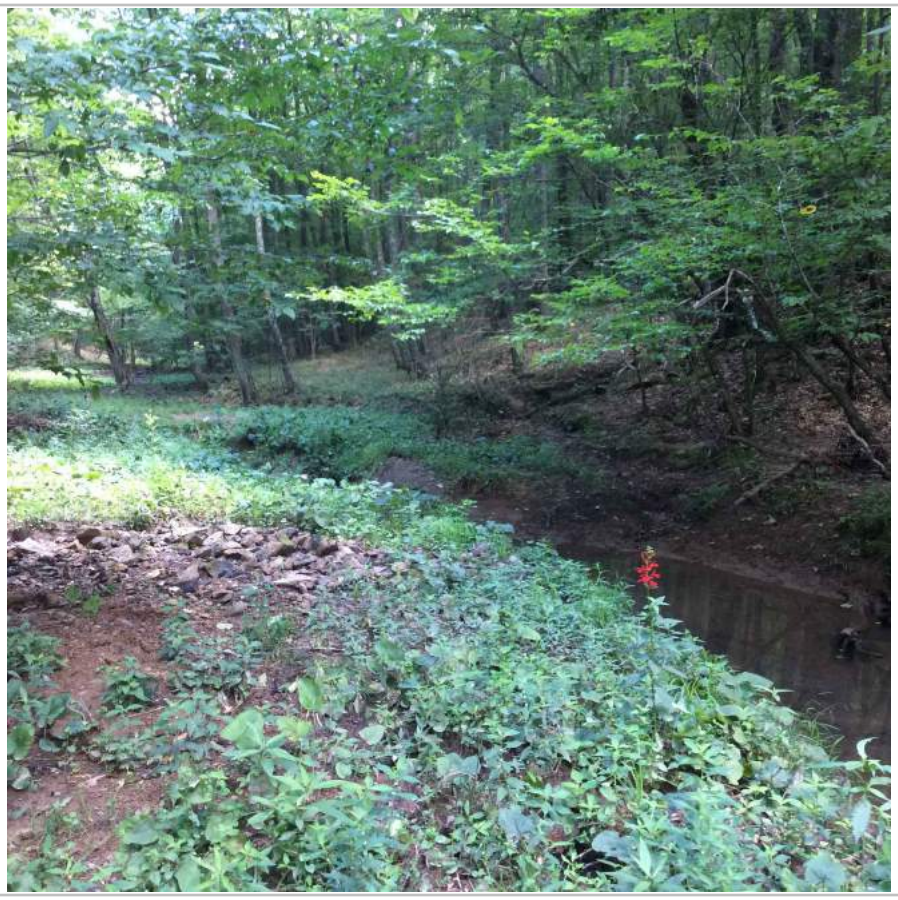
Total Score 60

No / low flow at time of survey. Unable to sample water quality or WVSCI.

S-IJ53

Stream Photograph Page

Stream ID S-IJ53 Date: 08/13/2016



Photograph Direction SE

Comments:

STREAM ID S-IJ53		**STREAM NAME** UNT to Boggs Creek	
CLIENT EQT		**PROJECT NAME** MVP	
LAT 37.916857	**LONG** -80.743251	**DATE** 08/13/2016	**COUNTY** Greenbrier
INVESTIGATORS E. Foster, S. Ryan, A. Carrano			
WATER TYPE TNW ☐ RPW ☑ NRPW ☐		**FLOW REGIME** Perennial ☑ Intermittent ☐ Ephemeral ☐	

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 12.0 ft
Top of Bank Height:
LB 2.0 ft RB 2.0 ft
Water Depth: 6.00 in
Water Width: 6.0 ft
Ordinary High Water Mark (Width): 9.0 ft
Ordinary High Water Mark (Height): 13.0 in
Flow Direction: West

Sinuosity ___ Low ✔ Medium ___ High

Gradient ✔ Flat (0.5/100 ft) ___ Moderate (2 ft/100 ft) ___ Severe (10 ft/100 ft)

Stream Erosion
___ None ✔ Moderate ___ Heavy

Artificial, Modified or Channelized
✔ Yes ___ No

Within Roadside Ditch
___ Yes ___ No

Culvert Present ✔ Yes ___ No
Culvert Material: Corrugated Metal
Culvert Size: 24 in

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
___ Stream bed moist
___ Standing water
✔ Flowing water

Velocity
___ Fast ___ Moderate
✔ Slow

Proportion of Reach Represented by Stream Morphology Types (Only enter if water present)
Riffle 30 % Run 50 %
Pool 20 %

Turbidity
___ Clear ✔ Slightly turbid ___ Turbid
___ Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%) 100

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	30
Cobble	64-256 mm (2.5"-10")	20
Gravel	2-64 mm (0.1"-2.5")	20
Sand	0.06-2mm (gritty)	20
Silt	0.004-0.06 mm	10
Clay	< 0.004 mm (slick)	

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	5
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
✔ Forest ___ Commercial
✔ Field/Pasture ___ Industrial
___ Agricultural ___ Residential
___ ROW ___ Other:

Canopy Cover
___ Open ___ Partly shaded
✔ Shaded

Floodplain Width
✔ Wide > 30ft ___ Moderate 15-30ft
___ Narrow <15ft

MACROINVERTEBRATES/OTHER WILDLIFE OBSERVED OR OTHER NOTES AND OBSERVATIONS

W-IJ47 PFO and PEM abut S-IJ53. Minnows and macros present. Recent historic flooding within past 2 months.

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	**Mountain Valley Pipeline Project SWVM v2.1**		**IMPACT COORDINATES: (in Decimal Degrees)**	**Lat.**	**37.916240°**	**Lon.**	**-80.744158°**	**WEATHER:**		**DATE:**	**8/10/2015**
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)	**S-IJ53; UNT to Boggs Creek; 219.74ac**				**MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION:** (watershed size {acreage}, unaltered or impairments)					**Comments:**	**In active cow pasture**
STREAM IMPACT LENGTH:	**20**	**FORM OF MITIGATION:**	**RESTORATION (Levels I-III)**	**MIT COORDINATES: (in Decimal Degrees)**	**Lat.**		**Lon.**	**PRECIPITATION PAST 48 HRS:**		**Mitigation Length:**	

Column No. 1- Impact Existing Condition (Debit)			
Stream Classification:	**Perennial**		
Percent Stream Channel Slope	**3**		
HGM Score (attach data forms):			
			Average
Hydrology			**0**
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	**10**
2. Embeddedness	0-20		**13**
3. Velocity/ Depth Regime	0-20		**4**
4. Sediment Deposition	0-20		**10**
5. Channel Flow Status	0-20		**5**
6. Channel Alteration	0-20		**18**
7. Frequency of Riffles (or bends)	0-20		**9**
8. Bank Stability (LB & RB)	0-20		**14**
9. Vegetative Protection (LB & RB)	0-20		**6**
10. Riparian Vegetative Zone Width (LB & RB)	0-20		**14**
Total RBP Score	Marginal		**103**
Sub-Total			**0.515**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
100-199 - 85 points	0-90	0-1	
pH			
5.6-5.9 = 45 points	0-80		
DO			
	10-30		
Sub-Total			
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
Fair	0-100	0-1	**52**
Sub-Total			**0.42**

Column No. 2- Mitigation Existing Condition - Baseline (Credit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope			
HGM Score (attach data forms):			
			Average
Hydrology	**1**		**0**
Biogeochemical Cycling	**1**		
Habitat	**1**		
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	**0**
2. Embeddedness	0-20		**0**
3. Velocity/ Depth Regime	0-20		**0**
4. Sediment Deposition	0-20		**0**
5. Channel Flow Status	0-20		**0**
6. Channel Alteration	0-20		**0**
7. Frequency of Riffles (or bends)	0-20		**0**
8. Bank Stability (LB & RB)	0-20		**0**
9. Vegetative Protection (LB & RB)	0-20		**0**
10. Riparian Vegetative Zone Width (LB & RB)	0-20		**0**
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	**0**
pH			
	5-90		**0**
DO			
	10-30		**0**
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	**0**
Sub-Total			**0**

Column No. 3- Mitigation Projected at Five Years Post Completion (Credit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope	**0**		
HGM Score (attach data forms):			
			Average
Hydrology	**1**		**0**
Biogeochemical Cycling	**1**		
Habitat	**1**		
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	**0**
2. Embeddedness	0-20		**0**
3. Velocity/ Depth Regime	0-20		**0**
4. Sediment Deposition	0-20		**0**
5. Channel Flow Status	0-20		**0**
6. Channel Alteration	0-20		**0**
7. Frequency of Riffles (or bends)	0-20		**0**
8. Bank Stability (LB & RB)	0-20		**0**
9. Vegetative Protection (LB & RB)	0-20		**0**
10. Riparian Vegetative Zone Width (LB & RB)	0-20		**0**
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	**0**
pH			
	5-90		**0**
DO			
	10-30		**0**
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	**0**
Sub-Total			**0**

Column No. 4- Mitigation Projected at Ten Years Post Completion (Credit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope	**0**		
HGM Score (attach data forms):			
			Average
Hydrology	**1**		**0**
Biogeochemical Cycling	**1**		
Habitat	**1**		
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	**0**
2. Embeddedness	0-20		**0**
3. Velocity/ Depth Regime	0-20		**0**
4. Sediment Deposition	0-20		**0**
5. Channel Flow Status	0-20		**0**
6. Channel Alteration	0-20		**0**
7. Frequency of Riffles (or bends)	0-20		**0**
8. Bank Stability (LB & RB)	0-20		**0**
9. Vegetative Protection (LB & RB)	0-20		**0**
10. Riparian Vegetative Zone Width (LB & RB)	0-20		**0**
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	**0**
pH			
	5-90		**0**
DO			
	10-30		**0**
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	**0**
Sub-Total			**0**

Column No. 5- Mitigation Projected at Maturity (Credit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope	**0**		
HGM Score (attach data forms):			
			Average
Hydrology	**1**		**0**
Biogeochemical Cycling	**1**		
Habitat	**1**		
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0.578	**20**	**11.5666667**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART III - Impact Factors
(See instruction page to insert default values for MITIGATION BANKING and ILF)

Temporal Loss-Construction

**Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).*

Years	0
Sub-Total	0

Temporal Loss-Maturity

**Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).*

% Add. Mitigation	Temporal Loss-Maturity (Years)
0%	0
Sub-Total	0

Long-term Protection

% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
0 + 5/10 Year Monitoring	101
Sub-Total	0

PART IV - Index to Unit Score Conversion

Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
0.578333333	20	11.56666667	$9,253.33

PART V- Comparison of Unit Scores and Projected Balance

Final Unit Score (Debit) [No Net Loss Value]	11.56666667	Mitigation Existing Condition - Baseline (Credit)		Mitigation Projected at Five Years Post Completion (Credit)		Mitigation Projected at Ten Years Post Completion (Credit)		Mitigation Projected At Maturity (Credit)	
FINAL PROJECTED NET BALANCE					0		0		0

Part VI - Mitigation Considerations (Incentives)

Extent of Stream Restoration

**Note1: Reference the Instructional handout to determine the correct Restoration Levels (below) for your project*
**Note2: Place an "X" in the appropriate category (only select one).*

☐ Restoration Level 1	
☐ Restoration Level 2	
☐ Restoration Level 3	

Compensatory Mitigation Plan incorporates HUC 12-based watershed approach? (Yes or No) *Note: HUC 12-based watershed approach required to obtain Stream Restoration incentive	No

Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)
S-IJ53	11.56666667	#DIV/0!

Extended Upland Buffer Zone

**Note[1]: Reference Instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below)*
**Note[2]: Enter the buffer width for each channel side (Left Bank and Right Bank)*
**Note[3]: Select the appropriate mitigation type*

Buffer Width	Left Bank	
	0-50	None
	51-150	None
Buffer Width	**Right Bank**	
	0-50	None
	51-150	None
Average Buffer Width/Side	0	

Straight Preservation Ratio (v2.1, Sept 2015)
Final Mitigation Unit Yield
#DIV/0!

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S-IJ53	LOCATION Greenbrier, WV	
STATION #_____ RIVERMILE_____	STREAM CLASS Perennial	
LAT 37.916240° LONG -80.744158°	RIVER BASIN Sewell Creek	
STORET #	AGENCY Tetra Tech	
INVESTIGATORS C. Vileno, J. Bittner		
FORM COMPLETED BY J. Bittner	DATE 09/21/2016 TIME 10:15	REASON FOR SURVEY Proposed Pipeline

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	**1. Epifaunal Substrate/ Available Cover**	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 not new fall and not 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.
	SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	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.
	SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	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).
	SCORE 4	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	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.
	SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	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.
	SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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

	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
Parameters to be evaluated broader than sampling reach	**6. Channel Alteration**	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.
	SCORE 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	7. Frequency of Riffles (or bends)	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.
	SCORE 9	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	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.
	SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	9. Vegetative Protection (score each bank)	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 3 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	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 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 103

Insects	Count	Tolerance	TV
Ephemeroptera			7
Ameletidae		2	0
Baetidae		4	0
Beatiscidae		4	0
Caenidae		5	0
Ephemerellidae		3	0
Ephemeridae		5	0
Heptageniidae	7	3	21
Isonychiidae		3	0
Leptophlebiidae		4	0
Potamanthidae		5	0
Siphlonuridae		3	0
Tricorythidae		5	0
Plecoptera			0
Capniidae		2	0
Chloroperlidae		2	0
Leuctridae		2	0
Nemouridae		2	0
Peltoperlidae		1	0
Perlidae		1	0
Perlodidae		1	0
Pteronarcyidae		1	0
Taeniopterygidae		2	0
Trichoptera			0
Brachycentridae		2	0
Glossosomatidae		2	0
Helicopsychidae		3	0
Hydropsychidae		5	0
Hydroptilidae		3	0
Lepidostomatidae		3	0
Leptoceridae		3	0
Limnephilidae		4	0
Molannidae		3	0
Philopotamidae		4	0
Phryganeidae		4	0
Polycentropodidae		5	0
Psychomiidae		3	0
Rhyacophilidae		3	0
Uenoidae		2	0
Total Tolerance Value			21

Insects	Count	Tolerance	TV
Odonata			0
Aeshnidae		3	0
Calopterygidae		6	0
Coenagrionidae		7	0
Cordulegastridae		3	0
Gomphidae		5	0
Lestidae		7	0
Libellulidae		7	0
Coleoptera			0
Chrysomelidae		7	0
Dryopidae		5	0
Dytiscidae		6	0
Elmidae		4	0
Gyrinidae		5	0
Haliplidae		7	0
Hydrophilidae		7	0
Psephenidae		3	0
Ptilodactylidae		5	0
Hemiptera			0
Belostomatidae		8	0
Corixidae		8	0
Gerridae		10	0
Hydrometridae		8	0
Nepidae		8	0
Notonectidae		8	0
Megaloptera			0
Corydalidae		3	0
Sialidae		6	0
Diptera			0
Athericidae		3	0
Blephariceridae		2	0
Ceratopogonidae		8	0
Chironomidae		9	0
Culicidae		10	0
Dixidae		6	0
Empididae		7	0
Psychodidae		8	0
Ptychopteridae		8	0
Simuliidae		6	0
Stratiomyidae		10	0
Syrphidae		10	0
Tabanidae		7	0
Tipulidae		5	0

Non-Insects	Count	Tolerance	TV
Crustacea			0
Asellidae		7	0
Cambaridae		5	0
Gammaridae		5	0
Palaemonidae		5	0
Annelida			0
Hirudinea		10	0
Nematoda		10	0
Nematomorpha		10	0
Oligochaeta		10	0
Turbellaria			0
Turbellaria		7	0
Bivalvia			0
Corbiculidae		6	0
Sphaeriidae		5	0
Unionidae		4	0
Gastropoda			0
Ancylidae		7	0
Hydrobiidae		4	0
Physidae		7	0
Planorbidae		5	0
Pleuroceridae		5	0
Viviparidae		5	0
Miscellaneous			0
Collembola		6	0
Lepidoptera		5	0
Neuroptera		5	0
Hydrachnidae		6	0
Totals	**Total number**		**7**
	Total families		**1**

Metric calculations			
Richness			**Additional metrics**
Total Taxa	1	4.5	Ephemeroptera Taxa 1
EPT Taxa	1	7.7	Plecoptera Taxa 0
Tolerance			Trichoptera Taxa 0
Biotic Index	3.00	100.0	Long-lived Taxa 0
% Tolerant	0.0	100.0	Odonata Taxa 0
Composition			Diptera Taxa 0
% EPT Abundance	100.0	100.0	COET Taxa 1
% Dominance	100.0	0.0	% Sensitive 100.0
% Net-spinners	0.0	NA	% Chironomidae 0.0
Stream Condition Index		**52.0**	% Clingers 100.0
Integrity Rating	**Marginal**		More diversity measures

West Virginia Save Our Streams
601 57th Street, SE, Charleston WV 25304
http://www.dep.wv.gov/sos

Note: There may be instances when families are collected that are not listed above. In those cases choose a similar family/tolerance value if known, to calculate the metrics. You should contact the WV Save Our Streams Coordinator to confirm your choice. Provide as much detail as possible so that family-level identification can be determined.

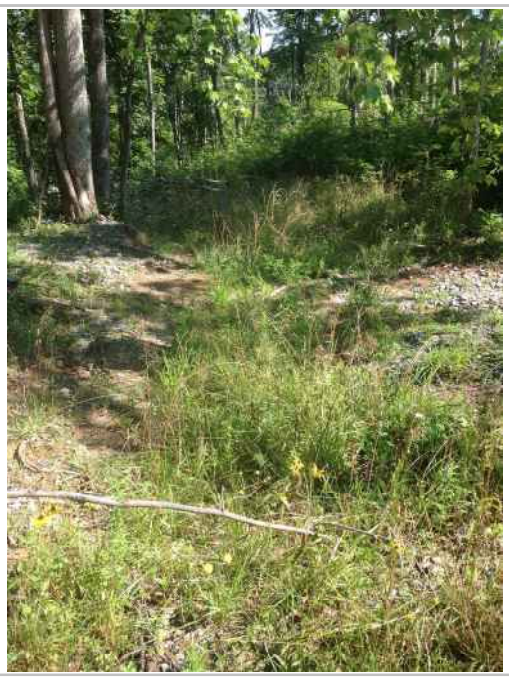
No FCI form included. Not a high-gradient ephemeral or intermittent headwater stream.

No / low flow at time of survey. Unable to sample water quality.

S-FF1

Stream Photograph Page

Stream ID S-FF1



Photograph Direction South

Date: 07/23/2015

Comments: 2015 stream identification.

Photograph Direction North

Date: 10/22/2019

Comments: 2019 stream identification confirmation.

West Virginia Stream and Wetland Valuation Metric (SWVM)
Version 2.1, September 2015

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	Mountain Valley Pipeline Project SWVM v2.1	IMPACT COORDINATES: (in Decimal Degrees)	Lat.	37.837628	Lon.	-80.751984	WEATHER:		DATE:	8/10/2015
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)	S-FF1 UNT to Meadow River Form of Mitigation: Mitigation Bank	MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)							Comments:	No survey access. Values have been assumed and represent a good quality stream.
STREAM IMPACT LENGTH: 31	FORM OF MITIGATION: RESTORATION (Levels I-III)	MIT COORDINATES: (in Decimal Degrees)	Lat.		Lon.		PRECIPITATION PAST 48 HRS:		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:	Ephemeral			Stream Classification:	Ephemeral			Stream Classification:	Ephemeral			Stream Classification:	Ephemeral			Stream Classification:	Ephemeral		
Percent Stream Channel Slope	5			Percent Stream Channel Slope				Percent Stream Channel Slope	0			Percent Stream Channel Slope	0			Percent Stream Channel Slope	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	1			Hydrology				Hydrology				Hydrology				Hydrology			
Biogeochemical Cycling	1	1		Biogeochemical Cycling		0		Biogeochemical Cycling		0		Biogeochemical Cycling		0		Biogeochemical Cycling		0	
Habitat	1			Habitat				Habitat				Habitat				Habitat			
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 Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	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 (High 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	20	1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		20	2. Embeddedness	0-20			2. Embeddedness	0-20			2. Embeddedness	0-20			2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		20	3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		20	4. Sediment Deposition	0-20			4. Sediment Deposition	0-20			4. Sediment Deposition	0-20			4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		20	5. Channel Flow Status	0-20			5. Channel Flow Status	0-20			5. Channel Flow Status	0-20			5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		20	6. Channel Alteration	0-20			6. Channel Alteration	0-20			6. Channel Alteration	0-20			6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		20	7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		20	8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		20	9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		20	10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Optimal		120	Total RBP Score	Poor		0	Total RBP Score	Poor		0	Total RBP Score	Poor		0	Total RBP Score	Poor		0
Sub-Total			1	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			
<=99 - 90 points	0-90	0-1	50		0-90	0-1			0-90	0-1			0-90	0-1			0-90	0-1	
pH				pH				pH				pH				pH			
6.0-8.0 = 80 points	0-80		6		5-90				5-90		5.6		5-90				5-90		
DO				DO				DO				DO				DO			
>5.0 = 30 points	10-30		30		10-30				10-30				10-30				10-30		
Sub-Total			1	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)			
Very Good	0-100	0-1	100		0-100	0-1			0-100	0-1			0-100	0-1			0-100	0-1	
Sub-Total			1	Sub-Total			0	Sub-Total			0	Sub-Total			0	Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
1.000	31	31

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

PART III - Impact Factors
(See instruction page to insert default values for MITIGATION BANKING and ILF)

Temporal Loss-Construction

**Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).*

Years	0
Sub-Total	0

Temporal Loss-Maturity

**Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).*

% Add. Mitigation	Temporal Loss-Maturity (Years)
0%	0
Sub-Total	0

Long-term Protection

% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
0 + 5/10 Year Monitoring	101
Sub-Total	0

PART IV - Index to Unit Score Conversion

Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
1	31	31	$24,800.00

PART V- Comparison of Unit Scores and Projected Balance

Final Unit Score (Debit) [No Net Loss Value]	31	Mitigation Existing Condition - Baseline (Credit)		Mitigation Projected at Five Years Post Completion (Credit)		Mitigation Projected at Ten Years Post Completion (Credit)		Mitigation Projected At Maturity (Credit)	
FINAL PROJECTED NET BALANCE					0		0		0

Part VI - Mitigation Considerations (Incentives)

Extent of Stream Restoration

**Note1: Reference the Instructional handout to determine the correct Restoration Levels (below) for your project*
**Note2: Place an "X" in the appropriate category (only select one).*

Restoration Level 1	
Restoration Level 2	
Restoration Level 3	

Compensatory Mitigation Plan incorporates HUC 12-based watershed approach? (Yes or No) *Note: HUC 12-based watershed approach required to obtain Stream Restoration incentive	No

Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)
S-FF1	31	#DIV/0!

Extended Upland Buffer Zone

**Note[1]: Reference Instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below)*
**Note[2]: Enter the buffer width for each channel side (Left Bank and Right Bank)*
**Note[3]: Select the appropriate mitigation type*

Buffer Width	Left Bank	
	0-50	None
	51-150	None
Buffer Width	**Right Bank**	
	0-50	None
	51-150	None
Average Buffer Width/Side	0	

Straight Preservation Ratio (v2.1, Sept 2015)	
Final Mitigation Unit Yield	
#DIV/0!	

STREAM ID S-FF1	**STREAM NAME** UNT to Meadow River
LAT 37.837628 **LONG** -80.751984	**DATE** 07/23/2015
CLIENT MVP	**PROJECT NAME** MVP
INVESTIGATORS C. Vileno, B. Schrotenboer, C. Sorden	
FLOW REGIME Perennial ___ Intermittent ___ Ephemeral ✓	**WATER TYPE** TNW ___ RPW ___ NRPW ✓

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 3.0 ft
Top of Bank Height:
LB 1.0 ft RB 1.0 ft
Water Depth: 0.00 in
Water Width: 0.0 in
High Water Mark: 2.0 ft
Flow Direction: North

Stream Erosion
___ None ✓ Moderate ___ Heavy

Artificial, Modified or Channelized
___ Yes ✓ No

Dam Present ___ Yes ✓ No

Sinuosity ___ Low ✓ Medium ___ High

Gradient
___ Flat (0.5/100 ft) ✓ Moderate (2 ft/100 ft) ___ Severe (10 ft/100 ft)

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
✓ Stream bed moist
___ Standing water
___ Flowing water

Velocity
___ Fast ___ Moderate
___ Slow

Proportion of Reach Represented by Stream Morphology Types
Riffle % Run %
Pool %

Turbidity
___ Clear ___ Slightly turbid ___ Turbid
___ Opaque ___ Stained
___ Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	0
Cobble	64-256 mm (2.5"-10")	10
Gravel	2-64 mm (0.1"-2.5")	20
Sand	0.06-2mm (gritty)	30
Silt	0.004-0.06 mm	25
Clay	< 0.004 mm (slick)	15

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	30
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
✓ Forest ___ Commercial
___ Field/Pasture ___ Industrial
___ Agricultural ___ Residential
___ Other:

Canopy Cover
✓ Partly open ___ Partly shaded
___ Shaded ___ Open

Indicate the dominant type (Check one)
✓ Trees ___ Shrubs
___ Grasses ___ Herbaceous

Floodplain Width
___ Wide > 30ft ___ Moderate 15-30ft
✓ Narrow <16ft

Wetland Present ___ Yes ✓ No
Wetland ID

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
___ Rooted emergent ___ Rooted submergent ___ Rooted floating ___ Free floating
___ Floating algae ___ Attached algae

MACROINVERTEBRATES OR OTHER WILDLIFE OBSERVED/OTHER OBSERVATIONS AND NOTES

Information listed on this form represents the data collected in 2015. The stream was revisited on 10/22/2019. The presence of a stream channel and OHWM was confirmed.

Assessment not completed in the field. HGM, RBP, WVDEP Water Quality, and WVSCI scores used on SWVM forms represent a high quality stream.

S-I12

Stream Photograph Page

Stream ID S-I12 Date: 04/16/2015

Photograph Direction West

Comments:

STREAM ID S-I12	**STREAM NAME** Lick Creek
LAT 37.775867 **LONG** -80.710972	**DATE** 04/16/2015
CLIENT MVP	**CLIENT** MVP
INVESTIGATORS RS, AH, MB	
FLOW REGIME Perennial ___ Intermittent ✔ Ephemeral ___	**WATER TYPE** TNW ___ RPW ✔ NRPW ___

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 4.0 ft
Top of Bank Height:
LB 10.0 ft RB 10.0 ft
Water Depth: 3.00 in
Water Width: 2.5 ft
High Water Mark: 4.0 ft
Flow Direction: W

Stream Erosion
___None ✔ Moderate ___Heavy

Artificial, Modified or Channelized
✔ Yes ___ No

Dam Present ___Yes ✔ No

Sinuosity ✔ Low ___ Medium ___ High

Gradient
___ Flat (0.5/100 ft) ___Moderate (2 ft/100 ft) ✔ Severe (10 ft/100 ft)

FLOW CHARACTERISTICS

Water Present
___No water, stream bed dry
___Stream bed moist
___Standing water
✔ Flowing water

Velocity
✔ Fast ___ Moderate
___ Slow

Proportion of Reach Represented by Stream Morphology Types
Riffle 15 % Run 75 %
Pool 10 %

Turbidity
___ Clear ✔ Slightly turbid ___Turbid
___ Opaque ___Stained
___Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	5
Cobble	64-256 mm (2.5"-10")	30
Gravel	2-64 mm (0.1"-2.5")	30
Sand	0.06-2mm (gritty)	15
Silt	0.004-0.06 mm	10
Clay	< 0.004 mm (slick)	10

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	5
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
✔ Forest ___ Commercial
___ Field/Pasture ___Industrial
___ Agricultural ___ Residential
___ Other:

Canopy Cover
___Partly open ✔ Partly shaded
___Shaded ___ Open

Indicate the dominant type (Check one)
✔ Trees ___ Shrubs
___ Grasses ___Herbaceous

Floodplain Width
___ Wide > 30ft ___ Moderate 15-30ft
✔ Narrow <16ft

Wetland Present ___Yes ✔ No
Wetland ID

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
✔ Rooted emergent ___Rooted submergent ___Rooted floating ___Free floating
___ Floating algae ___Attached algae

MACROINVERTEBRATES OR OTHER WILDLIFE OBSERVED/OTHER OBSERVATIONS AND NOTES

West Virginia Stream and Wetland Valuation Metric (SWVM)
Version 2.1, September 2015

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	**Mountain Valley Pipeline Project SWVM v2.1**	**IMPACT COORDINATES: (in Decimal Degrees)**	**Lat.**	**37.775891**	**Lon.**	**-80.710797**	**WEATHER:**		**DATE:**	**8/10/2015**
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)	**S-I12; Lick Creek; 32.87ac watershed** **Form of Mitigation: Mitigation Bank**			**MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION:** (watershed size {acreage}, unaltered or impairments)					**Comments:**	
STREAM IMPACT LENGTH:	**38**	**FORM OF MITIGATION:**	**RESTORATION (Levels I-III)**	**MIT COORDINATES: (in Decimal Degrees)**	**Lat.**		**Lon.**		**PRECIPITATION PAST 48 HRS:**		**Mitigation Length:**	

Column No. 1- Impact Existing Condition (Debit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope	**3**		
HGM Score (attach data forms):			
			Average
Hydrology	**0.72**		
Biogeochemical Cycling	**0.48**		**0**
Habitat	**0.28**		
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	**12**
2. Embeddedness	0-20		**14**
3. Velocity/ Depth Regime	0-20		**8**
4. Sediment Deposition	0-20		**6**
5. Channel Flow Status	0-20		**15**
6. Channel Alteration	0-20		**13**
7. Frequency of Riffles (or bends)	0-20		**16**
8. Bank Stability (LB & RB)	0-20		**8**
9. Vegetative Protection (LB & RB)	0-20		**4**
10. Riparian Vegetative Zone Width (LB & RB)	0-20		**8**
Total RBP Score	Marginal		**104**
Sub-Total			**0.52**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
<=99 - 90 points	0-90	0-1	**50**
pH			
6.0-8.0 = 80 points	0-80	0-1	**6**
DO			
>5.0 = 30 points	10-30		**30**
Sub-Total			**1**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
Poor	0-100	0-1	**29.1**
Sub-Total			**0.191**

Column No. 2- Mitigation Existing Condition - Baseline (Credit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope			
HGM Score (attach data forms):			
			Average
Hydrology			
Biogeochemical Cycling			**0**
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

Column No. 3- Mitigation Projected at Five Years Post Completion (Credit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope	**0**		
HGM Score (attach data forms):			
			Average
Hydrology			
Biogeochemical Cycling			**0**
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

Column No. 4- Mitigation Projected at Ten Years Post Completion (Credit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope	**0**		
HGM Score (attach data forms):			
			Average
Hydrology			
Biogeochemical Cycling			**0**
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

Column No. 5- Mitigation Projected at Maturity (Credit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope	**0**		
HGM Score (attach data forms):			
			Average
Hydrology			
Biogeochemical Cycling			**0**
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0.570	**38**	**21.67266667**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART III - Impact Factors
(See instruction page to insert default values for MITIGATION BANKING and ILF)

Temporal Loss-Construction

**Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).*

Years	0
Sub-Total	0

Temporal Loss-Maturity

**Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).*

% Add. Mitigation	Temporal Loss-Maturity (Years)
0%	0
Sub-Total	0

Long-term Protection

% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
0 + 5/10 Year Monitoring	101
Sub-Total	0

PART IV - Index to Unit Score Conversion

Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
0.570333333	38	21.67266667	$17,338.13

PART V- Comparison of Unit Scores and Projected Balance

Final Unit Score (Debit) [No Net Loss Value]	21.67266667	Mitigation Existing Condition - Baseline (Credit)		Mitigation Projected at Five Years Post Completion (Credit)		Mitigation Projected at Ten Years Post Completion (Credit)		Mitigation Projected At Maturity (Credit)	
FINAL PROJECTED NET BALANCE					0		0		0

Part VI - Mitigation Considerations (Incentives)

Extent of Stream Restoration

***Note1: Reference the Instructional handout to determine the correct Restoration Levels (below) for your project**
***Note2: Place an "X" in the appropriate category (only select one).**

☐ Restoration Level 1	
☐ Restoration Level 2	
☐ Restoration Level 3	

Compensatory Mitigation Plan incorporates HUC 12-based watershed approach? (Yes or No) *Note: HUC 12-based watershed approach required to obtain Stream Restoration incentive	No

Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)
S-I12	21.67266667	#DIV/0!

Extended Upland Buffer Zone

***Note[1]: Reference Instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below)**
***Note[2]: Enter the buffer width for each channel side (Left Bank and Right Bank)**
***Note[3]: Select the appropriate mitigation type**

Buffer Width	Left Bank	
	0-50	None
	51-150	None
Buffer Width	**Right Bank**	
	0-50	None
	51-150	None
Average Buffer Width/Side	0	

	Straight Preservation Ratio (v2.1, Sept 2015)
Final Mitigation Unit Yield	
#DIV/0!	

Ver. 1-25-11

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the UPPERMOST STRATUM of the plant community is determined based on the calculated value for $V_{CCANOPY}$ (≥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 Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: MVP
Location: S-I12 (Summers County, WV)
Sampling Date: 5/26/2016

Project Site Before Project

Subclass for this SAR:
Intermittent Stream

Uppermost stratum present at this SAR:
Shrub/Herb Strata

SAR number:

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.72
Biogeochemical Cycling	0.48
Habitat	0.28

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canpoy over channel.	Not Used, <20%	Not Used
V_{EMBED}	Average embeddedness of channel.	2.80	0.75
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.50	0.25
V_{BERO}	Total percent of eroded stream channel bank.	60.00	0.75
V_{LWD}	Number of down woody stems per 100 feet of stream.	5.00	0.63
V_{TDBH}	Average dbh of trees.	Not Used	Not Used
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	1.00	0.02
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	5.00	0.06
V_{HERB}	Average percent cover of herbaceous vegetation.	23.64	0.32
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.98	1.00

Version 1-25-11

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia
Field Data Sheet and Calculator

Team:	C. Vileno, J. McGuirk, A. Mengel	Latitude/UTM Northing:	37.775891
Project Name:	MVP	Longitude/UTM Easting:	-80.710797
Location:	S-I12 (Summers County, WV)	Sampling Date:	5/26/2016

SAR Number: | Reach Length (ft): 100 | Stream Type: Intermittent Stream

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

Site and Timing: Project Site | Before Project

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ 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.)

Not Used, <20%

List the percent cover measurements at each point below:

20	20	20	20	20	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

2 V_{EMBED} 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.

2.8

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

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

List the ratings at each point below:

4	4	4	4	4	4	4	4	4	4
3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2

3 $V_{SUBSTRATE}$ 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_{EMBED}.

0.50 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):

0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.50	0.50	0.50	0.50	0.50
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50

4 V_{BERO} 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%.

60 %

Left Bank: 30 ft Right Bank: 30 ft

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

5	V_{LWD}	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. Number of downed woody stems: 5	5.0
6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.	Not Used
7	V_{SNAG}	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. Left Side: 0 Right Side: 0	0.0
8	V_{SSD}	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. Left Side: 1 Right Side: 0	1.0
9	V_{SRICH}	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

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

Left Side					Right Side				
					2	3	4		

Group 1 = 1.0

☑	*Acer rubrum*	☐	*Magnolia tripetala*
☐	*Acer saccharum*	☐	*Nyssa sylvatica*
☐	*Aesculus flava*	☐	*Oxydendrum arboreum*
☐	*Asimina triloba*	☐	*Prunus serotina*
☐	*Betula alleghaniensis*	☐	*Quercus alba*
☐	*Betula lenta*	☐	*Quercus coccinea*
☐	*Carya alba*	☐	*Quercus imbricaria*
☐	*Carya glabra*	☐	*Quercus prinus*
☐	*Carya ovalis*	☐	*Quercus rubra*
☐	*Carya ovata*	☐	*Quercus velutina*
☐	*Cornus florida*	☐	*Sassafras albidum*
☐	*Fagus grandifolia*	☐	*Tilia americana*
☐	*Fraxinus americana*	☐	*Tsuga canadensis*
☐	*Liriodendron tulipifera*	☐	*Ulmus americana*
☐	*Magnolia acuminata*		

1 Species in Group 1

Group 2 (-1.0)

☐	*Ailanthus altissima*	☐	*Lonicera japonica*
☐	*Albizia julibrissin*	☐	*Lonicera tatarica*
☑	*Alliaria petiolata*	☑	*Lotus corniculatus*
☐	*Alternanthera philoxeroides*	☐	*Lythrum salicaria*
		☑	*Microstegium vimineum*
☐	*Aster tataricus*	☐	*Paulownia tomentosa*
☐	*Cerastium fontanum*	☐	*Polygonum cuspidatum*
☑	*Coronilla varia*	☐	*Pueraria montana*
☐	*Elaeagnus umbellata*	☑	*Rosa multiflora*
☐	*Lespedeza bicolor*	☐	*Sorghum halepense*
☐	*Lespedeza cuneata*	☐	*Verbena brasiliensis*
☐	*Ligustrum obtusifolium*		
☐	*Ligustrum sinense*		

5 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 $V_{DETRITUS}$ 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. **5.00 %**

Left Side				Right Side			
0	0	0	0	10	10	10	10

11 V_{HERB} 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. **24 %**

Left Side				Right Side			
0	0	0	0	20	30	0	0
80	80			50			

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed: **0.98**

Land Use (Choose From Drop List)	Runoff Score	% in Catch-ment	Running Percent (not >100)
Gravel	0	2	2
Forest and native range (>75% ground cover)	1	98	100

Summary		
Variable	Value	VSI
$V_{CCANOPY}$	Not Used, <20%	Not Used
V_{EMBED}	2.8	0.75
$V_{SUBSTRATE}$	0.50 in	0.25
V_{BERO}	60 %	0.75
V_{LWD}	5.0	0.63
V_{TDBH}	Not Used	Not Used
V_{SNAG}	0.0	0.10
V_{SSD}	1.0	0.02
V_{SRICH}	0.00	0.00
$V_{DETRITUS}$	5.0 %	0.06
V_{HERB}	24 %	0.32
V_{WLUSE}	0.98	1.00

Notes:

Evaluted section of stream almost entirely within roadway and/or roadway ROW.

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S-I12	LOCATION Summers County	
STATION #_____ RIVERMILE_____	STREAM CLASS Intermittent	
LAT 37.775891 LONG -80.710797	RIVER BASIN Lower New	
STORET #	AGENCY Tetra Tech	
INVESTIGATORS C. Vileno, J. McGuirk, A. Mengel		
FORM COMPLETED BY A. Mengel	DATE 05/26/2016 TIME 11:15	REASON FOR SURVEY SWVM

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	**1. Epifaunal Substrate/ Available Cover**	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 not new fall and not 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.
	SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	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.
	SCORE 14	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	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).
	SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	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.
	SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	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.
	SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	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.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	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.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	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.
SCORE 4 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	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 2 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	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 4 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 104

Insects	Count	Tolerance	TV
Ephemeroptera			3
Ameletidae		2	0
Baetidae		4	0
Beatiscidae		4	0
Caenidae		5	0
Ephemerellidae		3	0
Ephemeridae		5	0
Heptageniidae		3	0
Isonychiidae		3	0
Leptophlebiidae	3	4	12
Potamanthidae		5	0
Siphlonuridae		3	0
Tricorythidae		5	0
Plecoptera			4
Capniidae		2	0
Chloroperlidae		2	0
Leuctridae		2	0
Nemouridae	2	2	4
Peltoperlidae		1	0
Perlidae		1	0
Perlodidae		1	0
Pteronarcyidae		1	0
Taeniopterygidae	2	2	4
Trichoptera			0
Brachycentridae		2	0
Glossosomatidae		2	0
Helicopsychidae		3	0
Hydropsychidae		5	0
Hydroptilidae		3	0
Lepidostomatidae		3	0
Leptoceridae		3	0
Limnephilidae		4	0
Molannidae		3	0
Philopotamidae		4	0
Phryganeidae		4	0
Polycentropodidae		5	0
Psychomiidae		3	0
Rhyacophilidae		3	0
Uenoidae		2	0
Total Tolerance Value			802

Insects	Count	Tolerance	TV
Odonata			4
Aeshnidae		3	0
Calopterygidae		6	0
Coenagrionidae	4	7	28
Cordulegastridae		3	0
Gomphidae		5	0
Lestidae		7	0
Libellulidae		7	0
Coleoptera			0
Chrysomelidae		7	0
Dryopidae		5	0
Dytiscidae		6	0
Elmidae		4	0
Gyrinidae		5	0
Haliplidae		7	0
Hydrophilidae		7	0
Psephenidae		3	0
Ptilodactylidae		5	0
Hemiptera			0
Belostomatidae		8	0
Corixidae		8	0
Gerridae		10	0
Hydrometridae		8	0
Nepidae		8	0
Notonectidae		8	0
Megaloptera			0
Corydalidae		3	0
Sialidae		6	0
Diptera			52
Athericidae		3	0
Blephariceridae		2	0
Ceratopogonidae		8	0
Chironomidae	50	9	450
Culicidae		10	0
Dixidae		6	0
Empididae		7	0
Psychodidae		8	0
Ptychopteridae		8	0
Simuliidae		6	0
Stratiomyidae		10	0
Syrphidae		10	0
Tabanidae		7	0
Tipulidae	2	5	10

Non-Insects	Count	Tolerance	TV
Crustacea			17
Asellidae	17	7	119
Cambaridae		5	0
Gammaridae		5	0
Palaemonidae		5	0
Annelida			0
Hirudinea		10	0
Nematoda		10	0
Nematomorpha		10	0
Oligochaeta		10	0
Turbellaria			25
Turbellaria	25	7	175
Bivalvia			0
Corbiculidae		6	0
Sphaeriidae		5	0
Unionidae		4	0
Gastropoda			0
Ancylidae		7	0
Hydrobiidae		4	0
Physidae		7	0
Planorbidae		5	0
Pleuroceridae		5	0
Viviparidae		5	0
Miscellaneous			0
Collembola		6	0
Lepidoptera		5	0
Neuroptera		5	0
Hydrachnidae		6	0
Totals	**Total number**		**105**
	Total families		**8**

Metric calculations			
Richness			**Additional metrics**
Total Taxa	8	36.4	Ephemeroptera Taxa 1
EPT Taxa	3	23.1	Plecoptera Taxa 2
Tolerance			Trichoptera Taxa 0
Biotic Index	7.64	33.7	Long-lived Taxa 3
% Tolerant	91.4	8.7	Odonata Taxa 1
Composition			Diptera Taxa 2
% EPT Abundance	6.7	7.4	COET Taxa 2
% Dominance	47.6	65.5	% Sensitive 3.8
% Net-spinners	0.0	NA	% Chironomidae 47.6
Stream Condition Index		**29.1**	% Clingers 6.7
Integrity Rating	**Poor**		More diversity measures

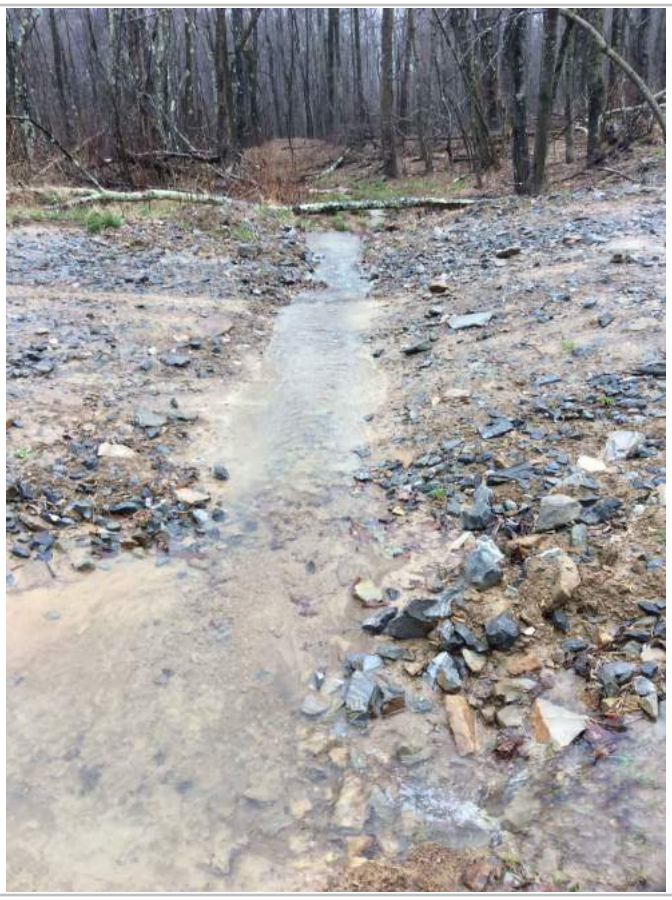
West Virginia Save Our Streams
601 57th Street, SE, Charleston WV 25304
http://www.dep.wv.gov/sos

Note: There may be instances when families are collected that are not listed above. In those cases choose a similar family/tolerance value if known, to calculate the metrics. You should contact the WV Save Our Streams Coordinator to confirm your choice. Provide as much detail as possible so that family-level identification can be determined.

S-I10

Stream Photograph Page

Stream ID S-I10 Date: 04/16/2015



Photograph Direction SW

Comments:

STREAM ID S-I10	**STREAM NAME** UNT to Lick Creek
LAT 37.772438 **LONG** -80.713785	**DATE** 04/16/2015
CLIENT MVP	**CLIENT** MVP
INVESTIGATORS RS, AH, MB	
FLOW REGIME Perennial ___ Intermittent ✔ Ephemeral ___	**WATER TYPE** TNW ___ RPW ✔ NRPW ___

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 3.0 ft
Top of Bank Height:
LB 10.0 in RB 10.0 in
Water Depth: 3.00 in
Water Width: 2.0 ft
High Water Mark: 3.0 ft
Flow Direction: SW

Stream Erosion
___None ✔ Moderate ___Heavy

Artificial, Modified or Channelized
✔ Yes ___ No

Dam Present ___Yes ✔ No

Sinuosity ✔ Low ___ Medium ___ High

Gradient
___ Flat (0.5/100 ft) ___Moderate (2 ft/100 ft) ✔ Severe (10 ft/100 ft)

FLOW CHARACTERISTICS

Water Present
___No water, stream bed dry
___Stream bed moist
___Standing water
✔ Flowing water

Velocity
✔ Fast ___ Moderate
___ Slow

Proportion of Reach Represented by Stream Morphology Types
Riffle 40 % Run 40 %
Pool 20 %

Turbidity
___ Clear ✔ Slightly turbid ___Turbid
___ Opaque ___Stained
___Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		5
Boulder	> 256 mm (10")	5
Cobble	64-256 mm (2.5"-10")	15
Gravel	2-64 mm (0.1"-2.5")	25
Sand	0.06-2mm (gritty)	20
Silt	0.004-0.06 mm	20
Clay	< 0.004 mm (slick)	10

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	10
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
✔ Forest ___ Commercial
___ Field/Pasture ___Industrial
___ Agricultural ___ Residential
___ Other:

Canopy Cover
___Partly open ✔ Partly shaded
___Shaded ___ Open

Indicate the dominant type (Check one)
✔ Trees ___ Shrubs
___ Grasses ___Herbaceous

Floodplain Width
___ Wide > 30ft ___ Moderate 15-30ft
✔ Narrow <16ft

Wetland Present ___Yes ✔ No
Wetland ID

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
___Rooted emergent ___Rooted submergent ___Rooted floating ___Free floating
___Floating algae ___Attached algae

MACROINVERTEBRATES OR OTHER WILDLIFE OBSERVED/OTHER OBSERVATIONS AND NOTES	

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	Mountain Valley Pipeline Project SWVM v2.1	IMPACT COORDINATES: (in Decimal Degrees)	Lat.	37.772437	Lon.	-80.713781	WEATHER:		DATE:	May 26, 2016
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)	S-I10; UNT to Lick Creek; 9.11ac watershed Form of Mitigation: Mitigation Bank	MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)							Comments:	No/low water flow at time of survey. Unable to sample water quality or WVSCI
STREAM IMPACT LENGTH:	26	FORM OF MITIGATION:	RESTORATION (Levels I-III)	MIT COORDINATES: (in Decimal Degrees)	Lat.		Lon.		PRECIPITATION PAST 48 HRS:		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:	Intermittent			Stream Classification:	Intermittent			Stream Classification:	Intermittent			Stream Classification:	Intermittent			Stream Classification:	Intermittent		
Percent Stream Channel Slope	3			Percent Stream Channel Slope				Percent Stream Channel Slope	0			Percent Stream Channel Slope	0			Percent Stream Channel Slope	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	0.69			Hydrology				Hydrology				Hydrology				Hydrology			
Biogeochemical Cycling	0.5	0		Biogeochemical Cycling		0		Biogeochemical Cycling		0		Biogeochemical Cycling		0		Biogeochemical Cycling		0	
Habitat	0.35			Habitat				Habitat				Habitat				Habitat			
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 Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	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 (High 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	9	1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		14	2. Embeddedness	0-20			2. Embeddedness	0-20			2. Embeddedness	0-20			2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		10	3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		16	4. Sediment Deposition	0-20			4. Sediment Deposition	0-20			4. Sediment Deposition	0-20			4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		9	5. Channel Flow Status	0-20			5. Channel Flow Status	0-20			5. Channel Flow Status	0-20			5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		16	6. Channel Alteration	0-20			6. Channel Alteration	0-20			6. Channel Alteration	0-20			6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		5	7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		16	8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		10	9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		10	10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Suboptimal		115	Total RBP Score	Poor		0	Total RBP Score	Poor		0	Total RBP Score	Poor		0	Total RBP Score	Poor		0
Sub-Total			0.575	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	0-90	0-1			0-90	0-1			0-90	0-1			0-90	0-1			0-90	0-1	
pH				pH				pH				pH				pH			
5.6-5.9 = 45 points	0-80				5-90				5-90		5		5-90				5-90		
DO				DO				DO				DO				DO			
	10-30				10-30				10-30				10-30				10-30		
Sub-Total				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			0-100	0-1			0-100	0-1			0-100	0-1			0-100	0-1	
Sub-Total			0	Sub-Total			0	Sub-Total			0	Sub-Total			0	Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0.688	26	17.875

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

PART III - Impact Factors
(See instruction page to insert default values for MITIGATION BANKING and ILF)

Temporal Loss-Construction

**Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).*

Years	0
Sub-Total	0

Temporal Loss-Maturity

**Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).*

% Add. Mitigation	Temporal Loss-Maturity (Years)
0%	0
Sub-Total	0

Long-term Protection

% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
0 + 5/10 Year Monitoring	101
Sub-Total	0

PART IV - Index to Unit Score Conversion

Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
0.6875	26	17.875	$14,300.00

PART V- Comparison of Unit Scores and Projected Balance

Final Unit Score (Debit) [No Net Loss Value]	17.875	Mitigation Existing Condition - Baseline (Credit)		Mitigation Projected at Five Years Post Completion (Credit)		Mitigation Projected at Ten Years Post Completion (Credit)		Mitigation Projected At Maturity (Credit)	
FINAL PROJECTED NET BALANCE					0		0		0

Part VI - Mitigation Considerations (Incentives)

Extent of Stream Restoration

***Note1: Reference the Instructional handout to determine the correct Restoration Levels (below) for your project**
***Note2: Place an "X" in the appropriate category (only select one).**

☐ Restoration Level 1	
☐ Restoration Level 2	
☐ Restoration Level 3	

Compensatory Mitigation Plan incorporates HUC 12-based watershed approach? (Yes or No) *Note: HUC 12-based watershed approach required to obtain Stream Restoration incentive	No

Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)
S-I10	17.875	#DIV/0!

Extended Upland Buffer Zone

***Note[1]: Reference Instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below)**
***Note[2]: Enter the buffer width for each channel side (Left Bank and Right Bank)**
***Note[3]: Select the appropriate mitigation type**

Buffer Width	Left Bank	
	0-50	None
	51-150	None
Buffer Width	**Right Bank**	
	0-50	None
	51-150	None
Average Buffer Width/Side	0	

Straight Preservation Ratio (v2.1, Sept 2015)

Final Mitigation Unit Yield
#DIV/0!

Ver. 1-25-11

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the UPPERMOST STRATUM of the plant community is determined based on the calculated value for $V_{CCANOPY}$ (≥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 Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: MVP
Location: S-I10 (Summers County, WV)
Sampling Date: 05/26/2016

Project Site Before Project

Subclass for this SAR:
Intermittent Stream

Uppermost stratum present at this SAR:
Shrub/Herb Strata

SAR number:

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.69
Biogeochemical Cycling	0.50
Habitat	0.35

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canpoy over channel.	Not Used, <20%	Not Used
V_{EMBED}	Average embeddedness of channel.	2.94	0.80
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	1.00	0.50
V_{BERO}	Total percent of eroded stream channel bank.	40.00	0.86
V_{LWD}	Number of down woody stems per 100 feet of stream.	2.00	0.25
V_{TDBH}	Average dbh of trees.	Not Used	Not Used
V_{SNAG}	Number of snags per 100 feet of stream.	1.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	10.00	0.15
V_{SRICH}	Riparian vegetation species richness.	1.80	0.86
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	3.75	0.05
V_{HERB}	Average percent cover of herbaceous vegetation.	36.25	0.48
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.98	1.00

Version 1-25-11

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia
Field Data Sheet and Calculator

Team: C. Vileno, J. McGuirk, A. Mengel
Latitude/UTM Northing: 37.772437
Project Name: MVP
Longitude/UTM Easting: -80.713781
Location: S-I10 (Summers County, WV)
Sampling Date: 05/26/2016
SAR Number:
Reach Length (ft): 100
Stream Type: Intermittent Stream

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

Site and Timing: Project Site | Before Project

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ 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.)

Not Used, <20%

List the percent cover measurements at each point below:

0	0	0	0	0	0	0	0	20	20
20	20	20	30	30	30	30	30	30	30

2 V_{EMBED} 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.

2.9

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

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

List the ratings at each point below:

2	2	2	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3

3 $V_{SUBSTRATE}$ 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_{EMBED}.

1.00 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):

1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.25	0.25	0.25	0.25	0.25	0.08	0.08	0.08	0.08	0.08
0.08	0.08	0.08	0.08	0.25	0.25	0.25	0.25	0.25	0.25
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

4 V_{BERO} 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%.

40 %

Left Bank: 20 ft Right Bank: 20 ft

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

5	V_{LWD}	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. Number of downed woody stems: 2	2.0
6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.	Not Used

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

Left Side					Right Side				
5	6				7	7	2		

7	V_{SNAG}	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. Left Side: 1 Right Side: 0	1.0
8	V_{SSD}	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. Left Side: 7 Right Side: 3	10.0
9	V_{SRICH}	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.	1.80

Group 1 = 1.0

☑	*Acer rubrum*	☐	*Magnolia tripetala*
☑	*Acer saccharum*	☐	*Nyssa sylvatica*
☐	*Aesculus flava*	☐	*Oxydendrum arboreum*
☐	*Asimina triloba*	☐	*Prunus serotina*
☐	*Betula alleghaniensis*	☐	*Quercus alba*
☐	*Betula lenta*	☐	*Quercus coccinea*
☐	*Carya alba*	☐	*Quercus imbricaria*
☐	*Carya glabra*	☐	*Quercus prinus*
☐	*Carya ovalis*	☐	*Quercus rubra*
☑	*Carya ovata*	☐	*Quercus velutina*
☐	*Cornus florida*	☐	*Sassafras albidum*
☐	*Fagus grandifolia*	☐	*Tilia americana*
☐	*Fraxinus americana*	☐	*Tsuga canadensis*
☐	*Liriodendron tulipifera*	☐	*Ulmus americana*
☐	*Magnolia acuminata*		

3 Species in Group 1

Group 2 (-1.0)

☐	*Ailanthus altissima*	☐	*Lonicera japonica*
☐	*Albizia julibrissin*	☐	*Lonicera tatarica*
☐	*Alliaria petiolata*	☐	*Lotus corniculatus*
☐	*Alternanthera philoxeroides*	☐	*Lythrum salicaria*
		☐	*Microstegium vimineum*
☐	*Aster tataricus*	☐	*Paulownia tomentosa*
☐	*Cerastium fontanum*	☐	*Polygonum cuspidatum*
☐	*Coronilla varia*	☐	*Pueraria montana*
☐	*Elaeagnus umbellata*	☑	*Rosa multiflora*
☐	*Lespedeza bicolor*	☐	*Sorghum halepense*
☐	*Lespedeza cuneata*	☐	*Verbena brasiliensis*
☐	*Ligustrum obtusifolium*		
☐	*Ligustrum sinense*		

1 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 $V_{DETRITUS}$ 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. **3.75 %**

Left Side				Right Side			
0	0	0	10	0	0	0	20

11 V_{HERB} 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. **36 %**

Left Side				Right Side			
60	0	0	90	50	0	0	90

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed: **0.98**

Land Use (Choose From Drop List)	Runoff Score	% in Catch-ment	Running Percent (not >100)
Gravel	0	2	2
Forest and native range (>75% ground cover)	1	98	100

Summary		
Variable	Value	VSI
$V_{CCANOPY}$	Not Used, <20%	Not Used
V_{EMBED}	2.9	0.80
$V_{SUBSTRATE}$	1.00 in	0.50
V_{BERO}	40 %	0.86
V_{LWD}	2.0	0.25
V_{TDBH}	Not Used	Not Used
V_{SNAG}	1.0	1.00
V_{SSD}	10.0	0.15
V_{SRICH}	1.80	0.86
$V_{DETRITUS}$	3.8 %	0.05
V_{HERB}	36 %	0.48
V_{WLUSE}	0.98	1.00

Notes:

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S-I10	LOCATION Summers County	
STATION #_____ RIVERMILE_____	STREAM CLASS Intermittent	
LAT 37.772437 LONG -80.713781	RIVER BASIN Lower New	
STORET #	AGENCY Tetra Tech	
INVESTIGATORS C. Vileno, J. McGuirk, A. Mengel		
FORM COMPLETED BY C. Vileno	DATE 05/26/2016 TIME 9:30	REASON FOR SURVEY SWVM

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	**1. Epifaunal Substrate/ Available Cover**	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 not new fall and not 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.
	SCORE 9	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	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.
	SCORE 14	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	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).
	SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	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.
	SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	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.
	SCORE 9	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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

Parameters to be evaluated broader than sampling reach	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
	6. Channel Alteration	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.
	SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	7. Frequency of Riffles (or bends)	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.
	SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	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.
	SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	9. Vegetative Protection (score each bank)	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 5 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 5 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	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 5 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 5 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

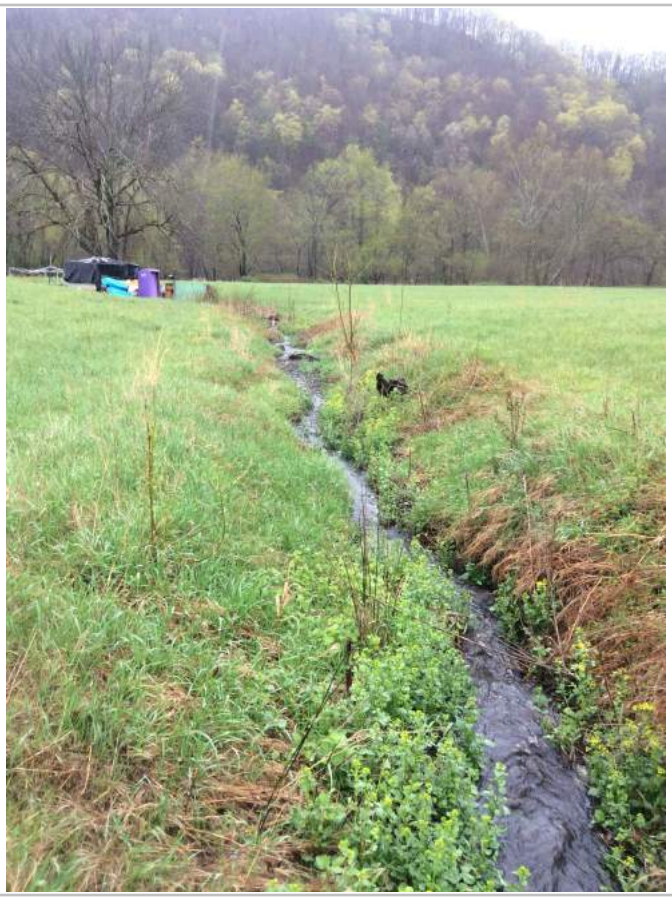
Total Score 115

No / low flow at time of survey. Unable to sample water quality or WVSCI.

S-K10

Stream Photograph Page

Stream ID S-K10 Date: 04/14/2015



Photograph Direction SW

Comments:

STREAM ID S-K10	**STREAM NAME** UNT to Greenbrier River
LAT 37.675066 **LONG** -80.734473	**DATE** 04/14/2015
CLIENT MVP	**PROJECT NAME** MVP
INVESTIGATORS J. Hart, B. Czeck, N. Katsiaficas	
FLOW REGIME Perennial ___ Intermittent ✔ Ephemeral ___	**WATER TYPE** TNW ___ RPW ✔ NRPW ___

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 6.0 ft
Top of Bank Height:
LB 3.0 ft RB 4.0 ft
Water Depth: 5.00 in
Water Width: 2.5 ft
High Water Mark: 2.5 ft
Flow Direction: NW

Stream Erosion
___ None ✔ Moderate ___ Heavy

Artificial, Modified or Channelized
✔ Yes ___ No

Dam Present ___ Yes ✔ No

Sinuosity ✔ Low ___ Medium ___ High

Gradient
___ Flat (0.5/100 ft) ✔ Moderate (2 ft/100 ft) ___ Severe (10 ft/100 ft)

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
___ Stream bed moist
___ Standing water
✔ Flowing water

Velocity
___ Fast ✔ Moderate
___ Slow

Proportion of Reach Represented by Stream Morphology Types
Riffle 30 % Run 60 %
Pool 10 %

Turbidity
___ Clear ___ Slightly turbid ___ Turbid
___ Opaque ✔ Stained
___ Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	
Cobble	64-256 mm (2.5"-10")	15
Gravel	2-64 mm (0.1"-2.5")	15
Sand	0.06-2mm (gritty)	10
Silt	0.004-0.06 mm	30
Clay	< 0.004 mm (slick)	30

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	20
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
___ Forest ___ Commercial
✔ Field/Pasture ___ Industrial
___ Agricultural ___ Residential
___ Other:

Canopy Cover
___ Partly open ✔ Partly shaded
___ Shaded ___ Open

Indicate the dominant type (Check one)
___ Trees ___ Shrubs
✔ Grasses ___ Herbaceous

Floodplain Width
___ Wide > 30ft ___ Moderate 15-30ft
✔ Narrow <16ft

Wetland Present ___ Yes ✔ No
Wetland ID

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
___ Rooted emergent ___ Rooted submergent ___ Rooted floating ___ Free floating
___ Floating algae ___ Attached algae

MACROINVERTEBRATES OR OTHER WILDLIFE OBSERVED/OTHER OBSERVATIONS AND NOTES

Drains from ditch adjacent to access road on the north side of railroad tracks. Sampled during heavy rain and high flows. Water is black in color at time of sampling (coal from trains?). Crosses road and loses structure for short stretch within ATWS.

West Virginia Stream and Wetland Valuation Metric (SWVM)
Version 2.1, September 2015

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	**Mountain Valley Pipeline Project SWVM v2.1**		**IMPACT COORDINATES: (in Decimal Degrees)**	**Lat.**	**37.675070**	**Lon.**	**-80.734447**	**WEATHER:**	**Rain, 50°**	**DATE:**	**November 9, 2016**
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)	**S-K10; UNT to Greenbrier River; 10.96ac watershed** **Form of Mitigation: Mitigation Bank**		**MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION:** (watershed size {acreage}, unaltered or impairments)							**Comments:**	**No/low water flow at time of survey. Unable to sample water quality or WVSCI**
STREAM IMPACT LENGTH:	**31**	**FORM OF MITIGATION:**	**RESTORATION (Levels I-III)**	**MIT COORDINATES: (in Decimal Degrees)**	**Lat.**		**Lon.**		**PRECIPITATION PAST 48 HRS:**	**0.40"**	**Mitigation Length:**

Column No. 1- Impact Existing Condition (Debit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope			**8**
HGM Score (attach data forms):			
			Average
Hydrology	**0.44**		
Biogeochemical Cycling	**0.17**		**0.233333333**
Habitat	**0.09**		
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	**8**
2. Embeddedness	0-20		**1**
3. Velocity/ Depth Regime	0-20		**0**
4. Sediment Deposition	0-20		**10**
5. Channel Flow Status	0-20		**0**
6. Channel Alteration	0-20		**6**
7. Frequency of Riffles (or bends)	0-20		**0**
8. Bank Stability (LB & RB)	0-20		**10**
9. Vegetative Protection (LB & RB)	0-20		**6**
10. Riparian Vegetative Zone Width (LB & RB)	0-20		**0**
Total RBP Score	Poor		**41**
Sub-Total			**0.205**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
100-199 - 85 points	0-90	0-1	
pH			
5.6-5.9 = 45 points	0-80		
DO			
	10-30		
Sub-Total			
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
0	0-100	0-1	
Sub-Total			**0**

Column No. 2- Mitigation Existing Condition - Baseline (Credit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope			
HGM Score (attach data forms):			
			Average
Hydrology			
Biogeochemical Cycling			**0**
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

Column No. 3- Mitigation Projected at Five Years Post Completion (Credit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope			**0**
HGM Score (attach data forms):			
			Average
Hydrology			
Biogeochemical Cycling			**0**
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		5.6
DO			
	10-30		
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

Column No. 4- Mitigation Projected at Ten Years Post Completion (Credit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope			**0**
HGM Score (attach data forms):			
			Average
Hydrology			
Biogeochemical Cycling			**0**
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

Column No. 5- Mitigation Projected at Maturity (Credit)			
Stream Classification:	**Intermittent**		
Percent Stream Channel Slope			**0**
HGM Score (attach data forms):			
			Average
Hydrology			
Biogeochemical Cycling			**0**
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0.368	**31**	**11.40541667**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART III - Impact Factors
(See instruction page to insert default values for MITIGATION BANKING and ILF)

Temporal Loss-Construction

**Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).*

Years	0
Sub-Total	0

Temporal Loss-Maturity

**Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).*

% Add. Mitigation	Temporal Loss-Maturity (Years)
0%	0
Sub-Total	0

Long-term Protection

% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
0 + 5/10 Year Monitoring	101
Sub-Total	0

PART IV - Index to Unit Score Conversion

Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
0.367916667	31	11.40541667	$9,124.33

PART V- Comparison of Unit Scores and Projected Balance

Final Unit Score (Debit) [No Net Loss Value]	11.40541667	Mitigation Existing Condition - Baseline (Credit)		Mitigation Projected at Five Years Post Completion (Credit)		Mitigation Projected at Ten Years Post Completion (Credit)		Mitigation Projected At Maturity (Credit)	
FINAL PROJECTED NET BALANCE					0		0		0

Part VI - Mitigation Considerations (Incentives)

Extent of Stream Restoration

***Note1: Reference the Instructional handout to determine the correct Restoration Levels (below) for your project**
***Note2: Place an "X" in the appropriate category (only select one).**

☐ Restoration Level 1	
☐ Restoration Level 2	
☐ Restoration Level 3	

Compensatory Mitigation Plan incorporates HUC 12-based watershed approach? (Yes or No) *Note: HUC 12-based watershed approach required to obtain Stream Restoration incentive	No

Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)
S-K10	11.40541667	#DIV/0!

Extended Upland Buffer Zone

***Note[1]: Reference Instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below)**
***Note[2]: Enter the buffer width for each channel side (Left Bank and Right Bank)**
***Note[3]: Select the appropriate mitigation type**

Buffer Width	Left Bank	
	0-50	None
	51-150	None
Buffer Width	**Right Bank**	
	0-50	None
	51-150	None
Average Buffer Width/Side	0	

	Straight Preservation Ratio (v2.1, Sept 2015)
Final Mitigation Unit Yield	
#DIV/0!	

Ver. 1-25-11

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the UPPERMOST STRATUM of the plant community is determined based on the calculated value for $V_{CCANOPY}$ (≥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 Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: MVP
Location: S-K10 (Summers County, WV)
Sampling Date: 11/09/2016

Project Site Before Project

Subclass for this SAR:
Intermittent Stream

Uppermost stratum present at this SAR:
Shrub/Herb Strata

SAR number:

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.44
Biogeochemical Cycling	0.17
Habitat	0.09

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canpoy over channel.	Not Used, <20%	Not Used
V_{EMBED}	Average embeddedness of channel.	1.00	0.10
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.08	0.04
V_{BERO}	Total percent of eroded stream channel bank.	30.00	0.91
V_{LWD}	Number of down woody stems per 100 feet of stream.	0.00	0.00
V_{TDBH}	Average dbh of trees.	Not Used	Not Used
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	0.00	0.00
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	20.00	0.24
V_{HERB}	Average percent cover of herbaceous vegetation.	118.75	1.00
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.81	0.85

Version 1-25-11

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia
Field Data Sheet and Calculator

Team:	C. Vileno, C. Stoliker	Latitude/UTM Northing:	37.675070
Project Name:	MVP	Longitude/UTM Easting:	-80.734447
Location:	S-K10 (Summers County, WV)	Sampling Date:	11/09/2016

SAR Number: | Reach Length (ft): 100 | Stream Type: Intermittent Stream

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

Site and Timing: Project Site | Before Project

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ 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.)

Not Used, <20%

List the percent cover measurements at each point below:

0									

2 V_{EMBED} 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.

1.0

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

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	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1

3 $V_{SUBSTRATE}$ 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_{EMBED}.

0.08 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	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08

4 V_{BERO} 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%.

30 %

Left Bank: 15 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_{LWD} 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. **0.0**

Number of downed woody stems: 0

6 V_{TDBH} Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. **Not Used**

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

Left Side					Right Side				

7 V_{SNAG} 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_{SSD} 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. **0.0**

Left Side: 0 Right Side: 0

9 V_{SRICH} 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)			
☐	*Acer rubrum*	☐	*Magnolia tripetala*	☐	*Ailanthus altissima*	☐	*Lonicera japonica*
☐	*Acer saccharum*	☐	*Nyssa sylvatica*	☐	*Albizia julibrissin*	☐	*Lonicera tatarica*
☐	*Aesculus flava*	☐	*Oxydendrum arboreum*	☐	*Alliaria petiolata*	☐	*Lotus corniculatus*
☐	*Asimina triloba*	☐	*Prunus serotina*	☐	*Alternanthera philoxeroides*	☐	*Lythrum salicaria*
☐	*Betula alleghaniensis*	☐	*Quercus alba*			☐	*Microstegium vimineum*
☐	*Betula lenta*	☐	*Quercus coccinea*	☐	*Aster tataricus*	☐	*Paulownia tomentosa*
☐	*Carya alba*	☐	*Quercus imbricaria*	☐	*Cerastium fontanum*	☐	*Polygonum cuspidatum*
☐	*Carya glabra*	☐	*Quercus prinus*	☐	*Coronilla varia*	☐	*Pueraria montana*
☐	*Carya ovalis*	☐	*Quercus rubra*	☐	*Elaeagnus umbellata*	☐	*Rosa multiflora*
☐	*Carya ovata*	☐	*Quercus velutina*	☐	*Lespedeza bicolor*	☐	*Sorghum halepense*
☐	*Cornus florida*	☐	*Sassafras albidum*	☐	*Lespedeza cuneata*	☐	*Verbena brasiliensis*
☐	*Fagus grandifolia*	☐	*Tilia americana*	☐	*Ligustrum obtusifolium*		
☐	*Fraxinus americana*	☐	*Tsuga canadensis*	☐	*Ligustrum sinense*		
☐	*Liriodendron tulipifera*	☐	*Ulmus americana*				
☐	*Magnolia acuminata*						

0 Species in Group 1

0 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 $V_{DETRITUS}$ 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. **20.00 %**

Left Side				Right Side			
20	20	20	20	20	20	20	20

11 V_{HERB} 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. **119 %**

Left Side				Right Side			
100	110	120	130	120	130	140	100

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed: **0.81**

Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
Forest and native range (>75% ground cover)	1	75	75
Residential districts, 1/4 - 1/3 ac (38% to 30% cover)	0.1	10	85
Open space (pasture, lawns, parks, etc.), grass cover >75%	0.3	15	100

Summary

Variable	Value	VSI
$V_{CCANOPY}$	Not Used, <20%	Not Used
V_{EMBED}	1.0	0.10
$V_{SUBSTRATE}$	0.08 in	0.04
V_{BERO}	30 %	0.91
V_{LWD}	0.0	0.00
V_{TDBH}	Not Used	Not Used
V_{SNAG}	0.0	0.10
V_{SSD}	0.0	0.00
V_{SRICH}	0.00	0.00
$V_{DETRITUS}$	20.0 %	0.24
V_{HERB}	119 %	1.00
V_{WLUSE}	0.81	0.85

Notes:

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S-K10	LOCATION Summers Co., WV	
STATION #_____ RIVERMILE_____	STREAM CLASS Intermittent	
LAT 37.675070 LONG -80.734447	RIVER BASIN Little Muskingum-Middle Island	
STORET #	AGENCY Tetra Tech	
INVESTIGATORS C. Vileno, C. Stoliker		
FORM COMPLETED BY C. Vileno	DATE 11/09/2016 TIME 1:15pm	REASON FOR SURVEY SWVM

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	**1. Epifaunal Substrate/ Available Cover**	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 not new fall and not 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.
	SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	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.
	SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	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).
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	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.
	SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	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.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	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.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	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.
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	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.
SCORE 5 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	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 3 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	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 0 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 0 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

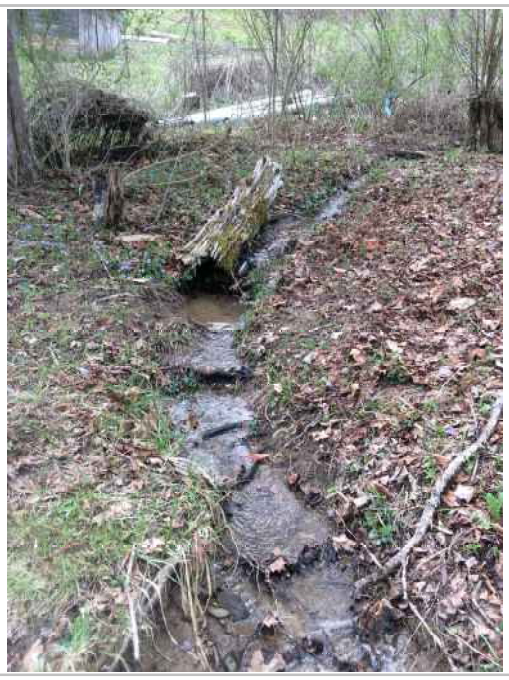
Total Score 41

No / low flow at time of survey. Unable to sample water quality or WVSCI.

S-K4

Stream Photograph Page

Stream ID S-K4



Photograph Direction West

Date: 04/13/2015

Comments: 2015 stream identification.

Photograph Direction NE

Date: 10/22/2019

Comments: 2019 stream identification confirmation.

STREAM ID S-K4	**STREAM NAME** UNT to Kelly Creek
LAT 37.665806 **LONG** -80.725709	**DATE** 04/13/2015
CLIENT MVP	**PROJECT NAME** MVP
INVESTIGATORS J. Hart, B. Czeck, N. Katsiaficas	
FLOW REGIME Perennial___ Intermittent ✓ Ephemeral___	**WATER TYPE** TNW___ RPW ✓ NRPW___

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 2.0 in
Top of Bank Height:
LB 6.0 in RB 6.0 in
Water Depth: 1.50 in
Water Width: 1.0 ft
High Water Mark: 18.0 in
Flow Direction: East

Stream Erosion
___None ✓ Moderate ___Heavy

Artificial, Modified or Channelized
___ Yes ✓ No

Dam Present ___Yes ✓ No

Sinuosity ✓ Low ___ Medium ___ High

Gradient
___ Flat (0.5/100 ft) ✓ Moderate (2 ft/100 ft) ___Severe (10 ft/100 ft)

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
___ Stream bed moist
___ Standing water
✓ Flowing water

Velocity
___ Fast ___ Moderate
✓ Slow

Proportion of Reach Represented by Stream Morphology Types
Riffle 20 % Run 80 %
Pool %

Turbidity
✓ Clear ___Slightly turbid ___Turbid
___ Opaque ___Stained
___Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		10
Boulder	> 256 mm (10")	0
Cobble	64-256 mm (2.5"-10")	10
Gravel	2-64 mm (0.1"-2.5")	20
Sand	0.06-2mm (gritty)	10
Silt	0.004-0.06 mm	20
Clay	< 0.004 mm (slick)	30

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
___ Forest ___ Commercial
✓ Field/Pasture ___Industrial
___ Agricultural ___ Residential
___ Other:

Canopy Cover
___Partly open ✓ Partly shaded
___ Shaded ___ Open

Indicate the dominant type (Check one)
___ Trees ✓ Shrubs
___ Grasses ___ Herbaceous

Floodplain Width
___ Wide > 30ft ___ Moderate 15-30ft
✓ Narrow <16ft

Wetland Present ___Yes ✓ No
Wetland ID

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
___Rooted emergent ___Rooted submergent ___Rooted floating ___Free floating
___Floating algae ___Attached algae

MACROINVERTEBRATES OR OTHER WILDLIFE OBSERVED/OTHER OBSERVATIONS AND NOTES

Information listed on this form represents the data collected in 2015. The stream was revisited on 10/22/2019. The presence of a stream channel and OHWM was confirmed.

West Virginia Stream and Wetland Valuation Metric (SWVM)
Version 2.1, September 2015

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	Mountain Valley Pipeline Project SWVM v2.1	IMPACT COORDINATES: (in Decimal Degrees)	Lat.	37.665806	Lon.	-80.725709	WEATHER:	Cloudy, 50	DATE:	June 2, 2016
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)	S-K4; UNT to Keller Creek; 6.5ac Watershed Form of Mitigation: Mitigation Bank	MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)							Comments:	No/low water flow at time of survey. Unable to sample water quality or WVSCI
STREAM IMPACT LENGTH: 22	FORM OF MITIGATION: RESTORATION (Levels I-III)	MIT COORDINATES: (in Decimal Degrees)	Lat.		Lon.		PRECIPITATION PAST 48 HRS:		Mitigation Length:	

Column No. 1- Impact Existing Condition (Debit)			
Stream Classification:	Intermittent		
Percent Stream Channel Slope	22		
HGM Score (attach data forms):			
			Average
Hydrology	0.23		0.22
Biogeochemical Cycling	0.36		
Habitat	0.07		
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	4
2. Embeddedness	0-20		5
3. Velocity/ Depth Regime	0-20		0
4. Sediment Deposition	0-20		5
5. Channel Flow Status	0-20		0
6. Channel Alteration	0-20		8
7. Frequency of Riffles (or bends)	0-20		0
8. Bank Stability (LB & RB)	0-20		12
9. Vegetative Protection (LB & RB)	0-20		4
10. Riparian Vegetative Zone Width (LB & RB)	0-20		6
Total RBP Score	Poor		44
Sub-Total			0.22
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
100-199 - 85 points	0-90	0-1	
pH			
5.6-5.9 = 45 points	0-80		
DO			
	10-30		
Sub-Total			
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
0	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0.365	22	8.03

Column No. 2- Mitigation Existing Condition - Baseline (Credit)			
Stream Classification:	Intermittent		
Percent Stream Channel Slope			
HGM Score (attach data forms):			
			Average
Hydrology			0
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		0
Sub-Total			0
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			0
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

Column No. 3- Mitigation Projected at Five Years Post Completion (Credit)			
Stream Classification:	Intermittent		
Percent Stream Channel Slope	0		
HGM Score (attach data forms):			
			Average
Hydrology			0
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		0
Sub-Total			0
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		5.6
DO			
	10-30		
Sub-Total			0
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

Column No. 4- Mitigation Projected at Ten Years Post Completion (Credit)			
Stream Classification:	Intermittent		
Percent Stream Channel Slope	0		
HGM Score (attach data forms):			
			Average
Hydrology			0
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		0
Sub-Total			0
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			0
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

Column No. 5- Mitigation Projected at Maturity (Credit)			
Stream Classification:	Intermittent		
Percent Stream Channel Slope	0		
HGM Score (attach data forms):			
			Average
Hydrology			0
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		0
Sub-Total			0
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			0
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

PART III - Impact Factors
(See instruction page to insert default values for MITIGATION BANKING and ILF)

Temporal Loss-Construction

**Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).*

Years	0
Sub-Total	0

Temporal Loss-Maturity

**Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).*

% Add. Mitigation	Temporal Loss-Maturity (Years)
0%	0
Sub-Total	0

Long-term Protection

% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
0 + 5/10 Year Monitoring	101
Sub-Total	0

PART IV - Index to Unit Score Conversion

Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
0.365	22	8.03	$6,424.00

PART V- Comparison of Unit Scores and Projected Balance

Final Unit Score (Debit) [No Net Loss Value]	8.03	Mitigation Existing Condition - Baseline (Credit)		Mitigation Projected at Five Years Post Completion (Credit)		Mitigation Projected at Ten Years Post Completion (Credit)		Mitigation Projected At Maturity (Credit)	
FINAL PROJECTED NET BALANCE					0		0		0

Part VI - Mitigation Considerations (Incentives)

Extent of Stream Restoration

**Note1: Reference the Instructional handout to determine the correct Restoration Levels (below) for your project*
**Note2: Place an "X" in the appropriate category (only select one).*

Restoration Level 1	
Restoration Level 2	
Restoration Level 3	

Compensatory Mitigation Plan incorporates HUC 12-based watershed approach? (Yes or No) *Note: HUC 12-based watershed approach required to obtain Stream Restoration incentive	No

Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)
S-K4	8.03	#DIV/0!

Extended Upland Buffer Zone

**Note[1]: Reference Instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below)*
**Note[2]: Enter the buffer width for each channel side (Left Bank and Right Bank)*
**Note[3]: Select the appropriate mitigation type*

Buffer Width	Left Bank	
	0-50	None
	51-150	None
Buffer Width	**Right Bank**	
	0-50	None
	51-150	None
Average Buffer Width/Side	0	

Straight Preservation Ratio (v2.1, Sept 2015)	
Final Mitigation Unit Yield	
#DIV/0!	

Ver. 1-25-11

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the UPPERMOST STRATUM of the plant community is determined based on the calculated value for $V_{CCANOPY}$ (≥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 Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: MVP
Location: S-K4 (Summers County)
Sampling Date: 11/06/2019

Project Site Before Project

Subclass for this SAR:
Intermittent Stream

Uppermost stratum present at this SAR:
Shrub/Herb Strata

SAR number:

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.23
Biogeochemical Cycling	0.36
Habitat	0.07

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canpoy over channel.	Not Used, <20%	Not Used
V_{EMBED}	Average embeddedness of channel.	3.00	0.82
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.10	0.05
V_{BERO}	Total percent of eroded stream channel bank.	0.00	1.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	0.00	0.00
V_{TDBH}	Average dbh of trees.	Not Used	Not Used
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	2.00	0.03
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	10.00	0.12
V_{HERB}	Average percent cover of herbaceous vegetation.	50.00	0.67
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.42	0.44

Version 1-25-11

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia
Field Data Sheet and Calculator

Team:	C. Vileno, R. Aber	Latitude/UTM Northing:	37.665807
Project Name:	MVP	Longitude/UTM Easting:	-80.725708
Location:	S-K4 (Summers County)	Sampling Date:	11/06/2019
SAR Number:		Reach Length (ft): 100	Stream Type: Intermittent Stream

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

Site and Timing: Project Site | Before Project

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ 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.)

Not Used, <20%

List the percent cover measurements at each point below:

10	8	0	0	0					

2 V_{EMBED} 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.

3.0

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

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:

3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3

3 $V_{SUBSTRATE}$ 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_{EMBED}.

0.10 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):

0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

4 V_{BERO} 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%.

0 %

Left Bank: 0 ft Right Bank: 0 ft

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

5	V_{LWD}	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. Number of downed woody stems: 0	0.0
6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.	Not Used
7	V_{SNAG}	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. Left Side: 0 Right Side: 0	0.0
8	V_{SSD}	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. Left Side: 2 Right Side: 0	2.0
9	V_{SRICH}	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

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

Left Side					Right Side				

Group 1 = 1.0				Group 2 (-1.0)			
☐	*Acer rubrum*	☐	*Magnolia tripetala*	☐	*Ailanthus altissima*	☑	*Lonicera japonica*
☐	*Acer saccharum*	☐	*Nyssa sylvatica*	☐	*Albizia julibrissin*	☐	*Lonicera tatarica*
☐	*Aesculus flava*	☐	*Oxydendrum arboreum*	☐	*Alliaria petiolata*	☐	*Lotus corniculatus*
☐	*Asimina triloba*	☑	*Prunus serotina*	☐	*Alternanthera philoxeroides*	☐	*Lythrum salicaria*
☐	*Betula alleghaniensis*	☐	*Quercus alba*			☑	*Microstegium vimineum*
☐	*Betula lenta*	☐	*Quercus coccinea*	☐	*Aster tataricus*	☐	*Paulownia tomentosa*
☐	*Carya alba*	☐	*Quercus imbricaria*	☐	*Cerastium fontanum*	☐	*Polygonum cuspidatum*
☐	*Carya glabra*	☐	*Quercus prinus*	☐	*Coronilla varia*	☐	*Pueraria montana*
☐	*Carya ovalis*	☐	*Quercus rubra*	☐	*Elaeagnus umbellata*	☑	*Rosa multiflora*
☐	*Carya ovata*	☐	*Quercus velutina*	☐	*Lespedeza bicolor*	☐	*Sorghum halepense*
☐	*Cornus florida*	☐	*Sassafras albidum*	☐	*Lespedeza cuneata*	☐	*Verbena brasiliensis*
☐	*Fagus grandifolia*	☐	*Tilia americana*	☐	*Ligustrum obtusifolium*		
☐	*Fraxinus americana*	☐	*Tsuga canadensis*	☐	*Ligustrum sinense*		
☐	*Liriodendron tulipifera*	☐	*Ulmus americana*				
☐	*Magnolia acuminata*						

1	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 $V_{DETRITUS}$ 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.

10.00 %

Left Side				Right Side			
10	10	10		10	10	10	

11 V_{HERB} 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.

50 %

Left Side				Right Side			
50	50			50	50		

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed: **0.42**

Land Use (Choose From Drop List)	Runoff Score	% in Catch-ment	Running Percent (not >100)
Open space (pasture, lawns, parks, etc.), grass cover <50%	0.1	40	40
Forest and native range (50% to 75% ground cover)	0.7	40	80
Forest and native range (<50% ground cover)	0.5	20	100

Summary

Variable	Value	VSI
$V_{CCANOPY}$	Not Used, <20%	Not Used
V_{EMBED}	3.0	0.82
$V_{SUBSTRATE}$	0.10 in	0.05
V_{BERO}	0 %	1.00
V_{LWD}	0.0	0.00
V_{TDBH}	Not Used	Not Used
V_{SNAG}	0.0	0.10
V_{SSD}	2.0	0.03
V_{SRICH}	0.00	0.00
$V_{DETRITUS}$	10.0 %	0.12
V_{HERB}	50 %	0.67
V_{WLUSE}	0.42	0.44

Notes:

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S-K4	LOCATION Summers County	
STATION #_____ RIVERMILE_____	STREAM CLASS Intermittent	
LAT 37.665807 LONG -80.725708	RIVER BASIN Hungard Creek-Greenbrier River	
STORET #	AGENCY Tetra Tech	
INVESTIGATORS CV, RA		
FORM COMPLETED BY C.Vileno	DATE 11/06/2019 TIME 4:00	REASON FOR SURVEY Proposed pipeline

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	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 not new fall and not 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.
SCORE 4	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	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.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	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).
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	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.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	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.
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Stream Name:

S-K4

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

	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
Parameters to be evaluated broader than sampling reach	**6. Channel Alteration**	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.
	SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	7. Frequency of Riffles (or bends)	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.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	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.
	SCORE 6 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	9. Vegetative Protection (score each bank)	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 2 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	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 3 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 44

DO: _____

pH: _____

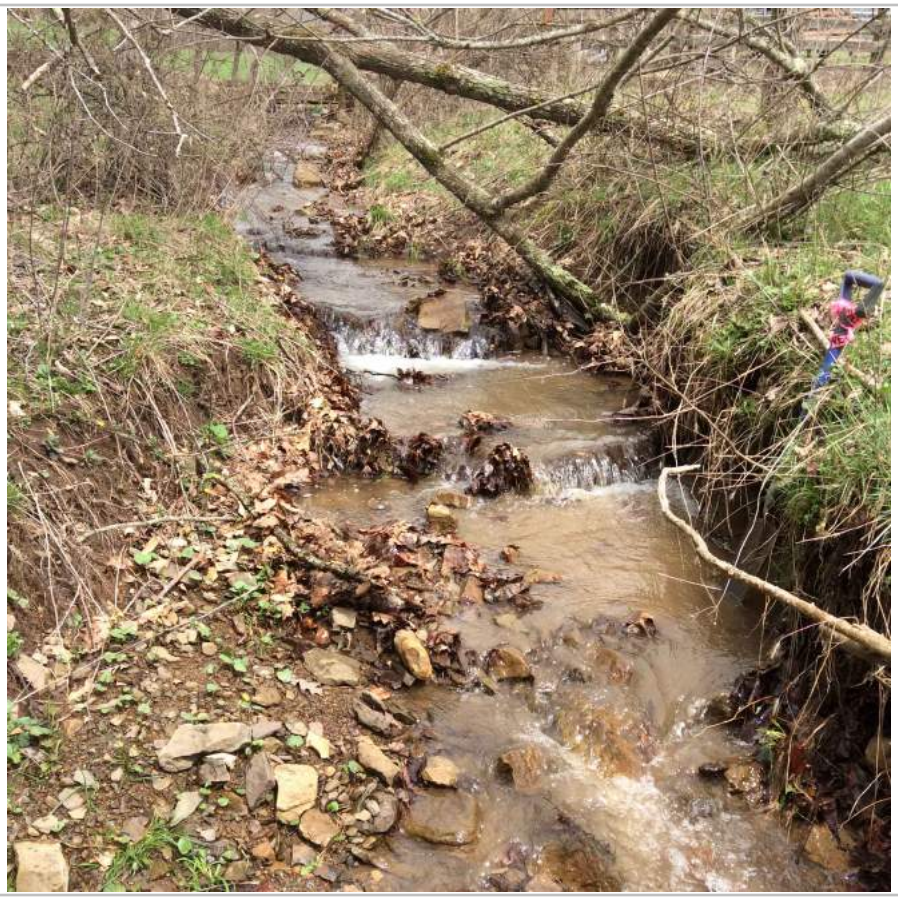
SC: _____

No / low flow at time of survey. Unable to sample water quality or WVSCI.

S-A63

Stream Photograph Page

Stream ID S-A63 Date: 04/10/2015



Photograph Direction NE

Comments:

STREAM ID S-A63	**STREAM NAME** Slate Run
LAT 37.560504 **LONG** -80.71002	**DATE** 04/10/2015
CLIENT MVP	**PROJECT NAME** MVP
INVESTIGATORS Yarbrough, Stoliker, Heule	
FLOW REGIME Perennial ✔ Intermittent ___ Ephemeral ___	**WATER TYPE** TNW ___ RPW ✔ NRPW ___

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 10.0 ft
Top of Bank Height:
LB 31.0 in RB 17.0 in
Water Depth: 4.00 in
Water Width: 68.0 in
High Water Mark: 16.0 in
Flow Direction: SW

Stream Erosion
___ None ✔ Moderate ___ Heavy

Artificial, Modified or Channelized
___ Yes ✔ No

Dam Present ___ Yes ✔ No

Sinuosity ✔ Low ___ Medium ___ High

Gradient
___ Flat (0.5/100 ft) ✔ Moderate (2 ft/100 ft) ___ Severe (10 ft/100 ft)

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
___ Stream bed moist
___ Standing water
✔ Flowing water

Velocity
✔ Fast ___ Moderate
___ Slow

Proportion of Reach Represented by Stream Morphology Types
Riffle 60 % Run 15 %
Pool 25 %

Turbidity
___ Clear ___ Slightly turbid ___ Turbid
___ Opaque ✔ Stained
___ Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	20
Cobble	64-256 mm (2.5"-10")	30
Gravel	2-64 mm (0.1"-2.5")	30
Sand	0.06-2mm (gritty)	20
Silt	0.004-0.06 mm	
Clay	< 0.004 mm (slick)	

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
✔ Forest ___ Commercial
___ Field/Pasture ___ Industrial
___ Agricultural ___ Residential
___ Other:

Canopy Cover
___ Partly open ___ Partly shaded
✔ Shaded ___ Open

Indicate the dominant type (Check one)
✔ Trees ✔ Shrubs
✔ Grasses ___ Herbaceous

Floodplain Width
___ Wide > 30ft ✔ Moderate 15-30ft
___ Narrow <16ft

Wetland Present ___ Yes ✔ No
Wetland ID

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
___ Rooted emergent ___ Rooted submergent ___ Rooted floating ___ Free floating
___ Floating algae ___ Attached algae

MACROINVERTEBRATES OR OTHER WILDLIFE OBSERVED/OTHER OBSERVATIONS AND NOTES

Perennial stream in forest, but near a rural residence.

West Virginia Stream and Wetland Valuation Metric (SWVM)
Version 2.1, September 2015

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	Mountain Valley Pipeline Project SWVM v2.1	IMPACT COORDINATES: (in Decimal Degrees)	Lat.	37.560504	Lon.	-80.710001	WEATHER:	Cloudy, 50	DATE:	June 2, 2016
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)	S-A63; Slate Run Form of Mitigation: Mitigation Bank	MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)							Comments:	No/low water flow at time of survey. Unable to sample water quality or WVSCI
STREAM IMPACT LENGTH: 25	FORM OF MITIGATION: RESTORATION (Levels I-III)	MIT COORDINATES: (in Decimal Degrees)	Lat.		Lon.		PRECIPITATION PAST 48 HRS:		Mitigation Length:	

Column No. 1- Impact Existing Condition (Debit)			
Stream Classification:	Perennial		
Percent Stream Channel Slope	5		
HGM Score (attach data forms):			
			Average
Hydrology			0
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	11
2. Embeddedness	0-20		12
3. Velocity/ Depth Regime	0-20		1
4. Sediment Deposition	0-20		11
5. Channel Flow Status	0-20		1
6. Channel Alteration	0-20		16
7. Frequency of Riffles (or bends)	0-20		1
8. Bank Stability (LB & RB)	0-20		14
9. Vegetative Protection (LB & RB)	0-20		12
10. Riparian Vegetative Zone Width (LB & RB)	0-20		14
Total RBP Score	Marginal		93
Sub-Total			0.465
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
100-199 - 85 points	0-90	0-1	
pH			
5.6-5.9 = 45 points	0-80		
DO			
	10-30		
Sub-Total			
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
0	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0.633	25	15.8125

Column No. 2- Mitigation Existing Condition - Baseline (Credit)			
Stream Classification:	Intermittent		
Percent Stream Channel Slope			
HGM Score (attach data forms):			
			Average
Hydrology			0
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		0
Sub-Total			0
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			0
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

Column No. 3- Mitigation Projected at Five Years Post Completion (Credit)			
Stream Classification:	Intermittent		
Percent Stream Channel Slope	0		
HGM Score (attach data forms):			
			Average
Hydrology			0
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		0
Sub-Total			0
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			0
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

Column No. 4- Mitigation Projected at Ten Years Post Completion (Credit)			
Stream Classification:	Intermittent		
Percent Stream Channel Slope	0		
HGM Score (attach data forms):			
			Average
Hydrology			0
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		0
Sub-Total			0
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			0
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

Column No. 5- Mitigation Projected at Maturity (Credit)			
Stream Classification:	Intermittent		
Percent Stream Channel Slope	0		
HGM Score (attach data forms):			
			Average
Hydrology			0
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		0
Sub-Total			0
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			0
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

West Virginia Stream and Wetland Valuation Metric (SWVM)
Version 2.1, September 2015

PART III - Impact Factors
(See instruction page to insert default values for MITIGATION BANKING and ILF)

Temporal Loss-Construction

**Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).*

Years	0
Sub-Total	0

Temporal Loss-Maturity

**Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).*

% Add. Mitigation	Temporal Loss-Maturity (Years)
0%	0
Sub-Total	0

Long-term Protection

% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
0 + 5/10 Year Monitoring	101
Sub-Total	0

PART IV - Index to Unit Score Conversion

Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
0.6325	25	15.8125	$12,650.00

PART V- Comparison of Unit Scores and Projected Balance

Final Unit Score (Debit) [No Net Loss Value]	15.8125	Mitigation Existing Condition - Baseline (Credit)		Mitigation Projected at Five Years Post Completion (Credit)		Mitigation Projected at Ten Years Post Completion (Credit)		Mitigation Projected At Maturity (Credit)	
FINAL PROJECTED NET BALANCE					0		0		0

Part VI - Mitigation Considerations (Incentives)

Extent of Stream Restoration

**Note1: Reference the Instructional handout to determine the correct Restoration Levels (below) for your project*
**Note2: Place an "X" in the appropriate category (only select one).*

Restoration Level 1	
Restoration Level 2	
Restoration Level 3	

Compensatory Mitigation Plan incorporates HUC 12-based watershed approach? (Yes or No) *Note: HUC 12-based watershed approach required to obtain Stream Restoration incentive	No

Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)
S-K4	15.8125	#DIV/0!

Extended Upland Buffer Zone

**Note[1]: Reference Instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below)*
**Note[2]: Enter the buffer width for each channel side (Left Bank and Right Bank)*
**Note[3]: Select the appropriate mitigation type*

Buffer Width	Left Bank	
	0-50	None
	51-150	None
Buffer Width	**Right Bank**	
	0-50	None
	51-150	None
Average Buffer Width/Side	0	

Straight Preservation Ratio (v2.1, Sept 2015)	
Final Mitigation Unit Yield	
#DIV/0!	

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S-A63	LOCATION Monroe County	
STATION #_____ RIVERMILE_____	STREAM CLASS Perennial	
LAT 37.560504 LONG -80.710001	RIVER BASIN Middle Indian Creek	
STORET #	AGENCY Tetra Tech	
INVESTIGATORS CV, RA		
FORM COMPLETED BY C.Vileno	DATE 11/06/2019 TIME 4:30	REASON FOR SURVEY Proposed pipeline

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	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 not new fall and not 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.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	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.
SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	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).
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	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.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	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.
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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

	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
Parameters to be evaluated broader than sampling reach	**6. Channel Alteration**	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.
	SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	7. Frequency of Riffles (or bends)	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.
	SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	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.
	SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	9. Vegetative Protection (score each bank)	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 6 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	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 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 93

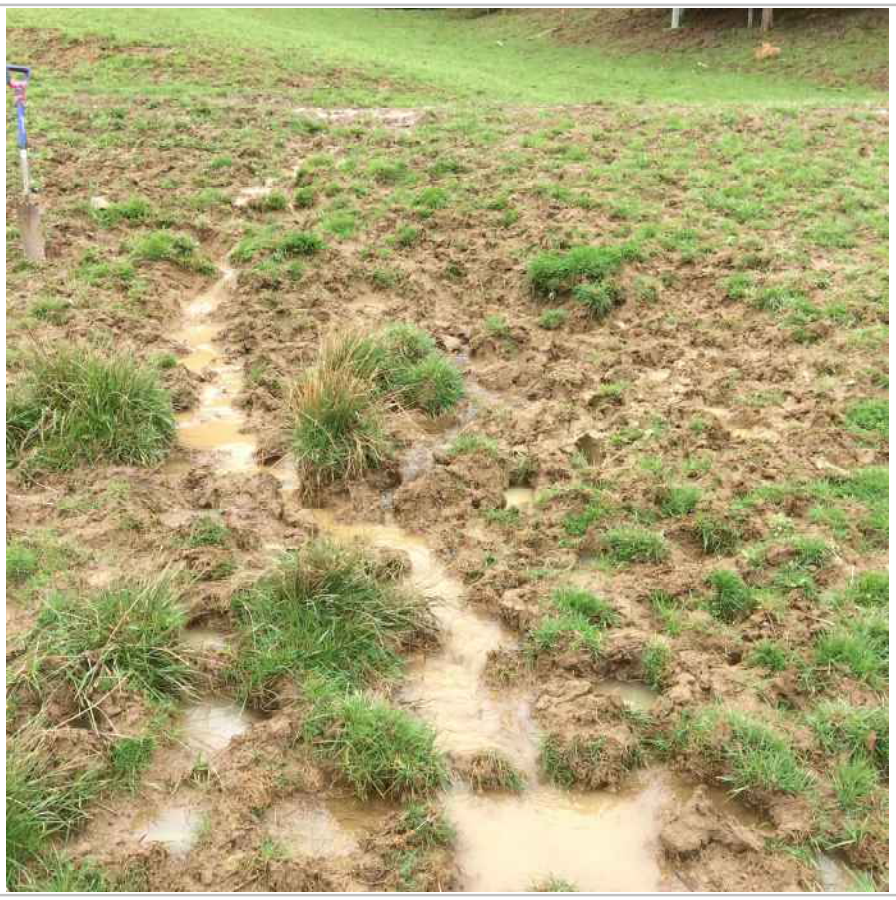
DO: _____
pH: _____
SC: _____

No / low flow at time of survey. Unable to sample water quality or WVSCI.

S-A61

Stream Photograph Page

Stream ID S-A61 Date: 04/10/2015



Photograph Direction East

Comments:

STREAM ID S-A61	**STREAM NAME** UNT to Slate Run
LAT 37.559328 **LONG** -80.710071	**DATE** 04/10/2015
CLIENT MVP	**PROJECT NAME** MVP
INVESTIGATORS Yarbrough, Stoliker, Heule	
FLOW REGIME Perennial ___ Intermittent ___ Ephemeral ✓	**WATER TYPE** TNW ___ RPW ___ NRPW ✓

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 7.0 ft
Top of Bank Height:
LB 6.0 in RB 6.0 in
Water Depth: 2.00 in
Water Width: 41.0 in
High Water Mark: 4.0 in
Flow Direction: W

Stream Erosion
___ None ✓ Moderate ___ Heavy

Artificial, Modified or Channelized
___ Yes ✓ No

Dam Present ___ Yes ✓ No

Sinuosity ✓ Low ___ Medium ___ High

Gradient
___ Flat (0.5/100 ft) ✓ Moderate (2 ft/100 ft) ___ Severe (10 ft/100 ft)

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
___ Stream bed moist
___ Standing water
✓ Flowing water

Velocity
___ Fast ✓ Moderate
___ Slow

Proportion of Reach Represented by Stream Morphology Types
Riffle 20 % Run 60 %
Pool 20 %

Turbidity
___ Clear ✓ Slightly turbid ___ Turbid
___ Opaque ___ Stained
___ Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	
Cobble	64-256 mm (2.5"-10")	
Gravel	2-64 mm (0.1"-2.5")	40
Sand	0.06-2mm (gritty)	40
Silt	0.004-0.06 mm	
Clay	< 0.004 mm (slick)	20

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
___ Forest ___ Commercial
✓ Field/Pasture ___ Industrial
___ Agricultural ___ Residential
___ Other:

Canopy Cover
___ Partly open ___ Partly shaded
___ Shaded ✓ Open

Indicate the dominant type (Check one)
___ Trees ___ Shrubs
✓ Grasses ___ Herbaceous

Floodplain Width
___ Wide > 30ft ___ Moderate 15-30ft
✓ Narrow <16ft

Wetland Present ✓ Yes ___ No
Wetland ID W-A13

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
___ Rooted emergent ___ Rooted submergent ___ Rooted floating ___ Free floating
___ Floating algae ___ Attached algae

MACROINVERTEBRATES OR OTHER WILDLIFE OBSERVED/OTHER OBSERVATIONS AND NOTES

This feature is only flowing now because of the rainfall over the last couple of days.

West Virginia Stream and Wetland Valuation Metric (SWVM)
Version 2.1, September 2015

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	**Mountain Valley Pipeline Project SWVM v2.1**		**IMPACT COORDINATES: (in Decimal Degrees)**	**Lat.**	**37.559328**	**Lon.**	**-80.710071**	**WEATHER:**		**DATE:**	**8/10/2015**
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)	**S-A61; UNT to Slate Run; 11.5ac watershed** **Form of Mitigation: Mitigation Bank**		**MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION:** (watershed size {acreage}, unaltered or impairments)							**Comments:**	**No/low water flow at time of survey. Unable to sample water quality or WVSCI**
STREAM IMPACT LENGTH:	**26**	**FORM OF MITIGATION:**	**RESTORATION (Levels I-III)**	**MIT COORDINATES: (in Decimal Degrees)**	**Lat.**		**Lon.**	**PRECIPITATION PAST 48 HRS:**		**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:	**Ephemeral**			**Stream Classification:**	**Ephemeral**			**Stream Classification:**	**Ephemeral**			**Stream Classification:**	**Ephemeral**			**Stream Classification:**	**Ephemeral**		
Percent Stream Channel Slope				**Percent Stream Channel Slope**				**Percent Stream Channel Slope**	**0**			**Percent Stream Channel Slope**	**0**			**Percent Stream Channel Slope**	**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	**0.33**			**Hydrology**				**Hydrology**				**Hydrology**				**Hydrology**			
Biogeochemical Cycling	**0.33**		**0**	**Biogeochemical Cycling**			**0**	**Biogeochemical Cycling**			**0**	**Biogeochemical Cycling**			**0**	**Biogeochemical Cycling**			**0**
Habitat	**0.08**			Habitat				Habitat				Habitat				Habitat			
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 Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	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 (High 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	**0**	1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1		1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		**1**	2. Embeddedness	0-20			2. Embeddedness	0-20			2. Embeddedness	0-20			2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		**0**	3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20			3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		**5**	4. Sediment Deposition	0-20			4. Sediment Deposition	0-20			4. Sediment Deposition	0-20			4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		**0**	5. Channel Flow Status	0-20			5. Channel Flow Status	0-20			5. Channel Flow Status	0-20			5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		**8**	6. Channel Alteration	0-20			6. Channel Alteration	0-20			6. Channel Alteration	0-20			6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		**0**	7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20			7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		**6**	8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20			8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		**4**	9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20			9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		**6**	10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20			10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**30**	Total RBP Score	Poor		**0**	Total RBP Score	Poor		**0**	Total RBP Score	Poor		**0**	Total RBP Score	Poor		**0**
Sub-Total			**0.25**	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	0-90	0-1			0-90	0-1			0-90	0-1			0-90	0-1			0-90	0-1	
pH				**pH**				**pH**				**pH**				**pH**			
5.6-5.9 = 45 points	0-80				5-90				5-90		5.6		5-90				5-90		
DO				**DO**				**DO**				**DO**				**DO**			
	10-30				10-30				10-30				10-30				10-30		
Sub-Total				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			0-100	0-1			0-100	0-1			0-100	0-1			0-100	0-1	
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**
0.525	**26**	**13.65**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

PART III - Impact Factors
(See instruction page to insert default values for MITIGATION BANKING and ILF)

Temporal Loss-Construction

**Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).*

Years	0
Sub-Total	0

Temporal Loss-Maturity

**Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).*

% Add. Mitigation	Temporal Loss-Maturity (Years)
0%	0
Sub-Total	0

Long-term Protection

% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
0 + 5/10 Year Monitoring	101
Sub-Total	0

PART IV - Index to Unit Score Conversion

Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
0.525	26	13.65	$10,920.00

PART V- Comparison of Unit Scores and Projected Balance

Final Unit Score (Debit) [No Net Loss Value]	13.65	Mitigation Existing Condition - Baseline (Credit)		Mitigation Projected at Five Years Post Completion (Credit)		Mitigation Projected at Ten Years Post Completion (Credit)		Mitigation Projected At Maturity (Credit)	
FINAL PROJECTED NET BALANCE					0		0		0

Part VI - Mitigation Considerations (Incentives)

Extent of Stream Restoration

**Note1: Reference the Instructional handout to determine the correct Restoration Levels (below) for your project*
**Note2: Place an "X" in the appropriate category (only select one).*

Restoration Level 1	
Restoration Level 2	
Restoration Level 3	

Compensatory Mitigation Plan incorporates HUC 12-based watershed approach? (Yes or No) *Note: HUC 12-based watershed approach required to obtain Stream Restoration incentive	No

Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)
S-A61	13.65	#DIV/0!

Extended Upland Buffer Zone

**Note[1]: Reference Instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below)*
**Note[2]: Enter the buffer width for each channel side (Left Bank and Right Bank)*
**Note[3]: Select the appropriate mitigation type*

Buffer Width	Left Bank	
	0-50	None
	51-150	None
Buffer Width	**Right Bank**	
	0-50	None
	51-150	None
Average Buffer Width/Side	0	

Straight Preservation Ratio (v2.1, Sept 2015)	
Final Mitigation Unit Yield	
#DIV/0!	

Ver. 1-25-11

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the UPPERMOST STRATUM of the plant community is determined based on the calculated value for $V_{CCANOPY}$ (≥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 Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: MVP
Location: S-A61 (Monroe County)
Sampling Date: 11/06/2019

Project Site Before Project

Subclass for this SAR:
Ephemeral Stream

Uppermost stratum present at this SAR:
Shrub/Herb Strata

SAR number:

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.33
Biogeochemical Cycling	0.33
Habitat	0.08

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canpoy over channel.	Not Used, <20%	Not Used
V_{EMBED}	Average embeddedness of channel.	5.00	0.50
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.10	0.05
V_{BERO}	Total percent of eroded stream channel bank.	0.00	1.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	0.00	0.00
V_{TDBH}	Average dbh of trees.	Not Used	Not Used
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	0.00	0.00
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	5.00	0.06
V_{HERB}	Average percent cover of herbaceous vegetation.	70.00	0.93
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.60	0.63

Version 1-25-11

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia
Field Data Sheet and Calculator

Team:	C. Vileno, R. Aber	Latitude/UTM Northing:	37.559328
Project Name:	MVP	Longitude/UTM Easting:	-80.710071
Location:	S-A61 (Monroe County)	Sampling Date:	11/06/2019

SAR Number: | Reach Length (ft): 100 | Stream Type: Ephemeral Stream

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

Site and Timing: Project Site | Before Project

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ 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.)

Not Used, <20%

List the percent cover measurements at each point below:

0									

2 V_{EMBED} 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.

5.0

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

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:

5	5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5	5

3 $V_{SUBSTRATE}$ 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_{EMBED}.

0.10 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):

0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

4 V_{BERO} 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%.

0 %

Left Bank: 0 ft Right Bank: 0 ft

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

5	V_{LWD}	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. Number of downed woody stems: 0	0.0
6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.	Not Used
7	V_{SNAG}	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. Left Side: 0 Right Side: 0	0.0
8	V_{SSD}	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. Left Side: 0 Right Side: 0	0.0
9	V_{SRICH}	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

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

Left Side					Right Side				

Group 1 = 1.0				Group 2 (-1.0)			
☐	*Acer rubrum*	☐	*Magnolia tripetala*	☐	*Ailanthus altissima*	☐	*Lonicera japonica*
☐	*Acer saccharum*	☐	*Nyssa sylvatica*	☐	*Albizia julibrissin*	☐	*Lonicera tatarica*
☐	*Aesculus flava*	☐	*Oxydendrum arboreum*	☐	*Alliaria petiolata*	☐	*Lotus corniculatus*
☐	*Asimina triloba*	☐	*Prunus serotina*	☐	*Alternanthera philoxeroides*	☐	*Lythrum salicaria*
☐	*Betula alleghaniensis*	☐	*Quercus alba*			☐	*Microstegium vimineum*
☐	*Betula lenta*	☐	*Quercus coccinea*	☐	*Aster tataricus*	☐	*Paulownia tomentosa*
☐	*Carya alba*	☐	*Quercus imbricaria*	☐	*Cerastium fontanum*	☐	*Polygonum cuspidatum*
☐	*Carya glabra*	☐	*Quercus prinus*	☐	*Coronilla varia*	☐	*Pueraria montana*
☐	*Carya ovalis*	☐	*Quercus rubra*	☐	*Elaeagnus umbellata*	☐	*Rosa multiflora*
☐	*Carya ovata*	☐	*Quercus velutina*	☐	*Lespedeza bicolor*	☐	*Sorghum halepense*
☐	*Cornus florida*	☐	*Sassafras albidum*	☐	*Lespedeza cuneata*	☐	*Verbena brasiliensis*
☐	*Fagus grandifolia*	☐	*Tilia americana*	☐	*Ligustrum obtusifolium*		
☐	*Fraxinus americana*	☐	*Tsuga canadensis*	☐	*Ligustrum sinense*		
☐	*Liriodendron tulipifera*	☐	*Ulmus americana*				
☐	*Magnolia acuminata*						
0 Species in Group 1				0 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 $V_{DETRITUS}$ 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.

5.00 %

Left Side				Right Side			
5	5	5		5	5	5	

11 V_{HERB} 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.

70 %

Left Side				Right Side			
80	80	20		80	80	80	

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed:

0.60

Land Use (Choose From Drop List)	Runoff Score	% in Catch-ment	Running Percent (not >100)
Forest and native range (50% to 75% ground cover)	0.7	70	70
Forest and native range (<50% ground cover)	0.5	20	90
Open space (pasture, lawns, parks, etc.), grass cover <50%	0.1	10	100

Summary

Variable	Value	VSI
$V_{CCANOPY}$	Not Used, <20%	Not Used
V_{EMBED}	5.0	0.50
$V_{SUBSTRATE}$	0.10 in	0.05
V_{BERO}	0 %	1.00
V_{LWD}	0.0	0.00
V_{TDBH}	Not Used	Not Used
V_{SNAG}	0.0	0.10
V_{SSD}	0.0	0.00
V_{SRICH}	0.00	0.00
$V_{DETRITUS}$	5.0 %	0.06
V_{HERB}	70 %	0.93
V_{WLUSE}	0.6	0.63

Notes:

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S-A61	LOCATION Monroe County	
STATION #_____ RIVERMILE_____	STREAM CLASS Ephemeral	
LAT 37.559328 LONG -80.710071	RIVER BASIN Middle Indian Creek	
STORET #	AGENCY Tetra Tech	
INVESTIGATORS CV, RA		
FORM COMPLETED BY C.Vileno	DATE 11/06/2019 TIME 4:30	REASON FOR SURVEY Proposed pipeline

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	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 not new fall and not 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.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	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.
	SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	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).
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	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.
	SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	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.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Stream Name:

S-A61

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

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated broader than sampling reach	**6. Channel Alteration**	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.
	SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	7. Frequency of Riffles (or bends)	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.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	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.
	SCORE 3 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	9. Vegetative Protection (score each bank)	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 2 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	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 3 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 30

DO: _____

pH: _____

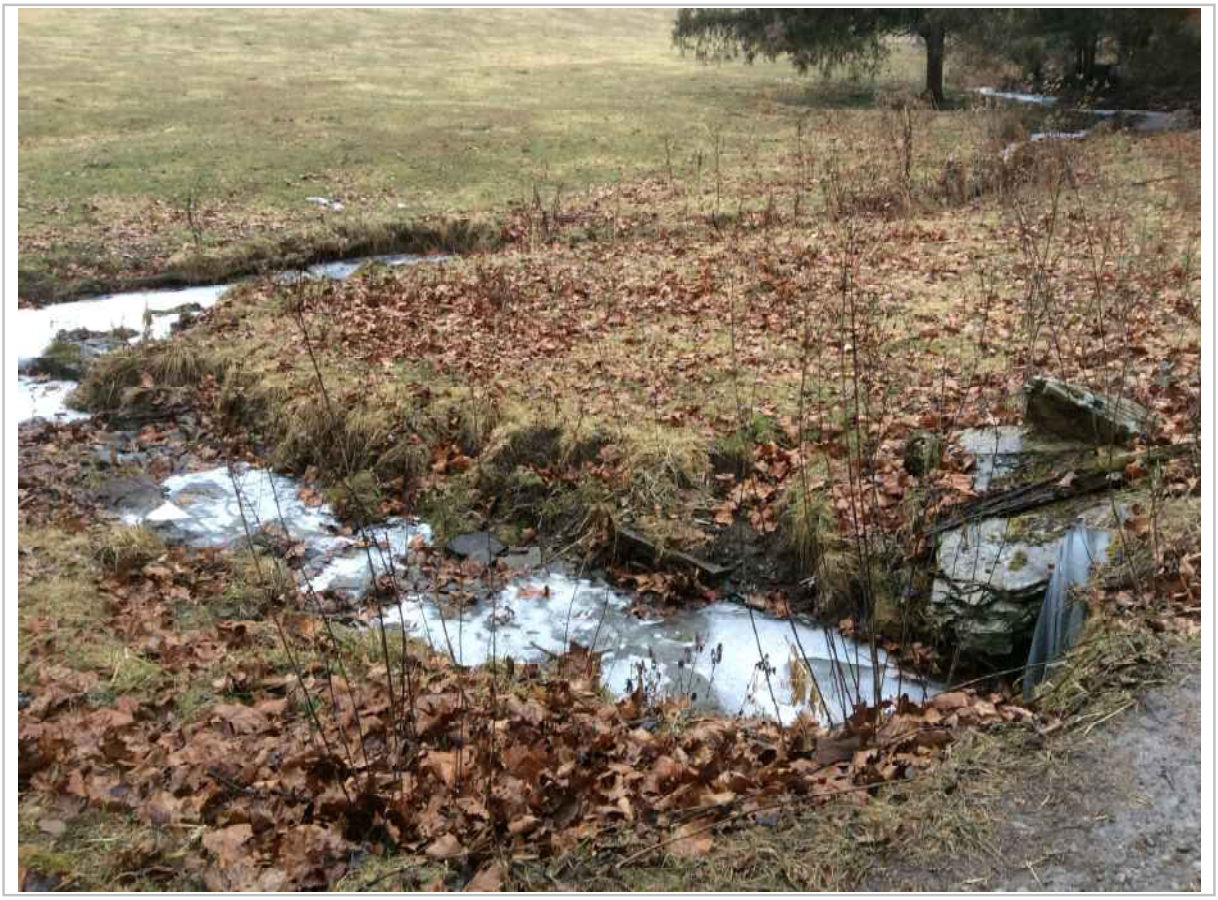
SC: _____

No / low flow at time of survey. Unable to sample water quality or WVSCI.

S-CV26

Stream Photograph Page

Stream ID S-CV26 Date: 01/09/2018



Photograph Direction South

Comments:

STREAM ID S-CV26		**STREAM NAME** UNT to Slate Run	
CLIENT MVP		**PROJECT NAME** MVP	
LAT 37.556445	**LONG** -80.708883	**DATE** 01/09/2018	**COUNTY** Monroe
INVESTIGATORS CV, KP			
WATER TYPE TNW ☐ RPW ☑ NRPW ☐		**FLOW REGIME** Perennial ☑ Intermittent ☐ Ephemeral ☐	

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 6.0 ft
Top of Bank Height:
LB 3.0 ft RB 2.0 ft
Water Depth: 8.00 in
Water Width: 2.5 ft
Ordinary High Water Mark (Width): 3.0 ft
Ordinary High Water Mark (Height): 8.0 in
Flow Direction: Southwest

Sinuosity ___ Low ✓ Medium ___ High

Gradient ✓ Flat (0.5/100 ft) ___ Moderate (2 ft/100 ft) ___ Severe (10 ft/100 ft)

Stream Erosion
✓ None ___ Moderate ___ Heavy

Artificial, Modified or Channelized
___ Yes ✓ No

Within Roadside Ditch
___ Yes ✓ No

Culvert Present ✓ Yes ___ No
Culvert Material: Corrugated Metal
Culvert Size: 36 in

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
___ Stream bed moist
___ Standing water
✓ Flowing water

Velocity
___ Fast ___ Moderate
✓ Slow

Proportion of Reach Represented by Stream Morphology Types (Only enter if water present)
Riffle 50 % Run 30 %
Pool 20 %

Turbidity
✓ Clear ___ Slightly turbid ___ Turbid
___ Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%) 100

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	
Cobble	64-256 mm (2.5"-10")	30
Gravel	2-64 mm (0.1"-2.5")	20
Sand	0.06-2mm (gritty)	10
Silt	0.004-0.06 mm	
Clay	< 0.004 mm (slick)	40

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
___ Forest ___ Commercial
✓ Field/Pasture ___ Industrial
___ Agricultural ___ Residential
___ ROW ___ Other:

Canopy Cover
___ Open ✓ Partly shaded
___ Shaded

Floodplain Width
___ Wide > 30ft ___ Moderate 15-30ft
✓ Narrow <15ft

MACROINVERTEBRATES/OTHER WILDLIFE OBSERVED OR OTHER NOTES AND OBSERVATIONS

West Virginia Stream and Wetland Valuation Metric (SWVM)
Version 2.1, September 2015

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	**Mountain Valley Pipeline Project SWVM v2.1**	**IMPACT COORDINATES: (in Decimal Degrees)**	**Lat.**	**37.556445**	**Lon.**	**-80.708883**	**WEATHER:**	**Cloudy, 50**	**DATE:**	**8/10/2015**
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)	**S-CV26; UNT to Slate Run; 240ac Watershed** **Form of Mitigation: Mitigation Bank**	**MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION:** (watershed size {acreage}, unaltered or impairments)							**Comments:**	
STREAM IMPACT LENGTH:	**32**	**FORM OF MITIGATION:**	**RESTORATION (Levels I-III)**	**MIT COORDINATES: (in Decimal Degrees)**	**Lat.**		**Lon.**		**PRECIPITATION PAST 48 HRS:**		**Mitigation Length:**	

Column No. 1- Impact Existing Condition (Debit)			
Stream Classification:	**Perennial**		
Percent Stream Channel Slope			
HGM Score (attach data forms):			
			Average
Hydrology			**0**
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	**10**
2. Embeddedness	0-20		**11**
3. Velocity/ Depth Regime	0-20		**10**
4. Sediment Deposition	0-20		**11**
5. Channel Flow Status	0-20		**7**
6. Channel Alteration	0-20		**13**
7. Frequency of Riffles (or bends)	0-20		**8**
8. Bank Stability (LB & RB)	0-20		**14**
9. Vegetative Protection (LB & RB)	0-20		**8**
10. Riparian Vegetative Zone Width (LB & RB)	0-20		**14**
Total RBP Score	Marginal		**106**
Sub-Total			**0.53**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
300-399 - 70 points	0-90	0-1	**326**
pH			
6.0-8.0 = 80 points	0-80		**7.78**
DO			
>5.0 = 30 points	10-30		**8.68**
Sub-Total			**0.9**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
Fair	0-100	0-1	**55.1**
Sub-Total			**0.451**

Column No. 2- Mitigation Existing Condition - Baseline (Credit)			
Stream Classification:	**Perennial**		
Percent Stream Channel Slope			
HGM Score (attach data forms):			
			Average
Hydrology			**0**
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

Column No. 3- Mitigation Projected at Five Years Post Completion (Credit)			
Stream Classification:	**Perennial**		
Percent Stream Channel Slope	**0**		
HGM Score (attach data forms):			
			Average
Hydrology			**0**
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		5.6
DO			
	10-30		
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

Column No. 4- Mitigation Projected at Ten Years Post Completion (Credit)			
Stream Classification:	**Perennial**		
Percent Stream Channel Slope	**0**		
HGM Score (attach data forms):			
			Average
Hydrology			**0**
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

Column No. 5- Mitigation Projected at Maturity (Credit)			
Stream Classification:	**Perennial**		
Percent Stream Channel Slope	**0**		
HGM Score (attach data forms):			
			Average
Hydrology			**0**
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0.627	**32**	**20.064**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART III - Impact Factors
(See instruction page to insert default values for MITIGATION BANKING and ILF)

Temporal Loss-Construction

Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).

Years	0
Sub-Total	0

Temporal Loss-Maturity

Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).

% Add. Mitigation	Temporal Loss-Maturity (Years)
0%	0
Sub-Total	0

Long-term Protection

% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
0 + 5/10 Year Monitoring	101
Sub-Total	0

PART IV - Index to Unit Score Conversion

Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
0.627	32	20.064	$16,051.20

PART V- Comparison of Unit Scores and Projected Balance

Final Unit Score (Debit) [No Net Loss Value]	20.064	Mitigation Existing Condition - Baseline (Credit)		Mitigation Projected at Five Years Post Completion (Credit)		Mitigation Projected at Ten Years Post Completion (Credit)		Mitigation Projected At Maturity (Credit)	
FINAL PROJECTED NET BALANCE					0		0		0

Part VI - Mitigation Considerations (Incentives)

Extent of Stream Restoration

*Note1: Reference the Instructional handout to determine the correct Restoration Levels (below) for your project
*Note2: Place an "X" in the appropriate category (only select one).

☐ Restoration Level 1	
☐ Restoration Level 2	
☐ Restoration Level 3	

Compensatory Mitigation Plan incorporates HUC 12-based watershed approach? (Yes or No) *Note: HUC 12-based watershed approach required to obtain Stream Restoration incentive	No

Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)
S-CV26	20.064	#DIV/0!

Extended Upland Buffer Zone

*Note[1]: Reference Instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below)
*Note[2]: Enter the buffer width for each channel side (Left Bank and Right Bank)
*Note[3]: Select the appropriate mitigation type

Buffer Width	Left Bank	
	0-50	None
	51-150	None
Buffer Width	**Right Bank**	
	0-50	None
	51-150	None
Average Buffer Width/Side	0	

Straight Preservation Ratio (v2.1, Sept 2015)	
Final Mitigation Unit Yield	
#DIV/0!	

Insects	Count	Tolerance	TV
Ephemeroptera			0
Ameletidae		2	0
Baetidae		4	0
Beatiscidae		4	0
Caenidae		5	0
Ephemerellidae		3	0
Ephemeridae		5	0
Heptageniidae		3	0
Isonychiidae		3	0
Leptophlebiidae		4	0
Potamanthidae		5	0
Siphlonuridae		3	0
Tricorythidae		5	0
Plecoptera			82
Capniidae		2	0
Chloroperlidae		2	0
Leuctridae	82	2	164
Nemouridae		2	0
Peltoperlidae		1	0
Perlidae		1	0
Perlodidae		1	0
Pteronarcyidae		1	0
Taeniopterygidae		2	0
Trichoptera			0
Brachycentridae		2	0
Glossosomatidae		2	0
Helicopsychidae		3	0
Hydropsychidae		5	0
Hydroptilidae		3	0
Lepidostomatidae		3	0
Leptoceridae		3	0
Limnephilidae		4	0
Molannidae		3	0
Philopotamidae		4	0
Phryganeidae		4	0
Polycentropodidae		5	0
Psychomiidae		3	0
Rhyacophilidae		3	0
Uenoidae		2	0
Total Tolerance Value			207

Insects	Count	Tolerance	TV
Odonata			0
Aeshnidae		3	0
Calopterygidae		6	0
Coenagrionidae		7	0
Cordulegastridae		3	0
Gomphidae		5	0
Lestidae		7	0
Libellulidae		7	0
Coleoptera			4
Chrysomelidae		7	0
Dryopidae		5	0
Dytiscidae		6	0
Elmidae	1	4	4
Gyrinidae		5	0
Haliplidae		7	0
Hydrophilidae	3	7	21
Psephenidae		3	0
Ptilodactylidae		5	0
Hemiptera			0
Belostomatidae		8	0
Corixidae		8	0
Gerridae		10	0
Hydrometridae		8	0
Nepidae		8	0
Notonectidae		8	0
Megaloptera			0
Corydalidae		3	0
Sialidae		6	0
Diptera			2
Athericidae		3	0
Blephariceridae		2	0
Ceratopogonidae		8	0
Chironomidae	2	9	18
Culicidae		10	0
Dixidae		6	0
Empididae		7	0
Psychodidae		8	0
Ptychopteridae		8	0
Simuliidae		6	0
Stratiomyidae		10	0
Syrphidae		10	0
Tabanidae		7	0
Tipulidae		5	0

Non-Insects	Count	Tolerance	TV
Crustacea			0
Asellidae		7	0
Cambaridae		5	0
Gammaridae		5	0
Palaemonidae		5	0
Annelida			0
Hirudinea		10	0
Nematoda		10	0
Nematomorpha		10	0
Oligochaeta		10	0
Turbellaria			0
Turbellaria		7	0
Bivalvia			0
Corbiculidae		6	0
Sphaeriidae		5	0
Unionidae		4	0
Gastropoda			0
Ancylidae		7	0
Hydrobiidae		4	0
Physidae		7	0
Planorbidae		5	0
Pleuroceridae		5	0
Viviparidae		5	0
Miscellaneous			0
Collembola		6	0
Lepidoptera		5	0
Neuroptera		5	0
Hydrachnidae		6	0
Totals	**Total number**		**88**
	Total families		**4**

Metric calculations			
Richness			**Additional metrics**	
Total Taxa	4	18.2	Ephemeroptera Taxa	0
EPT Taxa	1	7.7	Plecoptera Taxa	1
Tolerance			Trichoptera Taxa	0
Biotic Index	2.35	100.0	Long-lived Taxa	3
% Tolerant	5.7	96.2	Odonata Taxa	0
Composition			Diptera Taxa	1
% EPT Abundance	93.2	100.0	COET Taxa	2
% Dominance	93.2	8.5	% Sensitive	93.2
% Net-spinners	0.0	NA	% Chironomidae	2.3
Stream Condition Index		**55.1**	% Clingers	94.3
Integrity Rating	**Marginal**		More diversity measures	

West Virginia Save Our Streams
601 57th Street, SE, Charleston WV 25304
http://www.dep.wv.gov/sos

Note: There may be instances when families are collected that are not listed above. In those cases choose a similar family/tolerance value if known, to calculate the metrics. You should contact the WV Save Our Streams Coordinator to confirm your choice. Provide as much detail as possible so that family-level identification can be determined.

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S-CV26	LOCATION Monroe County	
STATION #_____ RIVERMILE_____	STREAM CLASS Perennial	
LAT 37.556445 LONG -80.708883	RIVER BASIN Middle Indian Creek	
STORET #	AGENCY Tetra Tech	
INVESTIGATORS CV, RA		
FORM COMPLETED BY C.Vileno	DATE 11/06/2019 TIME 5:00	REASON FOR SURVEY Proposed pipeline

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	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 not new fall and not 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.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	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.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	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).
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	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.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	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.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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

	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
Parameters to be evaluated broader than sampling reach	**6. Channel Alteration**	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.
	SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	7. Frequency of Riffles (or bends)	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.
	SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	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.
	SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	9. Vegetative Protection (score each bank)	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 4 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	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 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

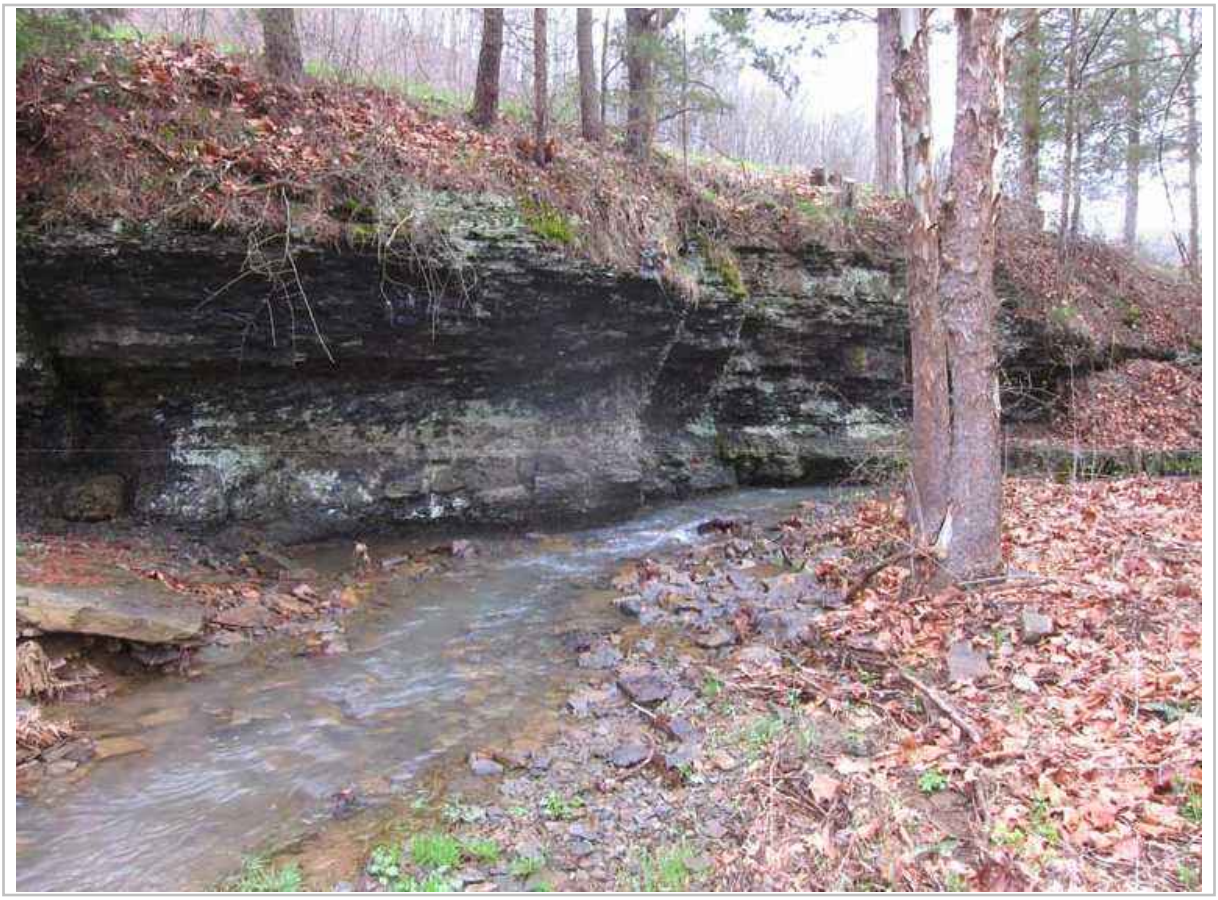
Total Score 106

No FCI form included. Not a high-gradient ephemeral or intermittent headwater stream.

S-F18

Stream Photograph Page

Stream ID S-F18 Date: 04/10/2015



Photograph Direction SW

Comments:

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	Mountain Valley Pipeline Project SWVM v2.1	IMPACT COORDINATES: (in Decimal Degrees)	Lat.	37.53826886	Lon.	-80.7190732	WEATHER:		DATE:	8/10/2015
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)	S-F18; UNT to Hans Creek Form of Mitigation: Mitigation Bank	MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)					S-F18; UNT to UNT to Hans Creek; 493.78 ac watershed		Comments:	
STREAM IMPACT LENGTH:	26	FORM OF MITIGATION:	RESTORATION (Levels I-III)	MIT COORDINATES: (in Decimal Degrees)	Lat.		Lon.		PRECIPITATION PAST 48 HRS:		Mitigation Length:	

Column No. 1- Impact Existing Condition (Debit)			
Stream Classification:	Perennial		
Percent Stream Channel Slope	2		
HGM Score (attach data forms):			
			Average
Hydrology			0
Biogeochemical Cycling			
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	10
2. Embeddedness	0-20		10
3. Velocity/ Depth Regime	0-20		2
4. Sediment Deposition	0-20		15
5. Channel Flow Status	0-20		3
6. Channel Alteration	0-20		16
7. Frequency of Riffles (or bends)	0-20		1
8. Bank Stability (LB & RB)	0-20		16
9. Vegetative Protection (LB & RB)	0-20		14
10. Riparian Vegetative Zone Width (LB & RB)	0-20		10
Total RBP Score	Marginal		97
Sub-Total			0.485
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
<=99 - 90 points	0-90	0-1	0.447
pH			
6.0-8.0 = 80 points	0-80		7.46
DO			
>5.0 = 30 points	10-30		120
Sub-Total			1
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
Fair	0-100	0-1	58.9
Sub-Total			0.489

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0.658	26	17.108

Column No. 2- Mitigation Existing Condition - Baseline (Credit)			
Stream Classification:	Intermittent		
Percent Stream Channel Slope			
HGM Score (attach data forms):			
			Average
Hydrology	1		0
Biogeochemical Cycling	1		
Habitat	1		
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	0
2. Embeddedness	0-20		0
3. Velocity/ Depth Regime	0-20		0
4. Sediment Deposition	0-20		0
5. Channel Flow Status	0-20		0
6. Channel Alteration	0-20		0
7. Frequency of Riffles (or bends)	0-20		0
8. Bank Stability (LB & RB)	0-20		0
9. Vegetative Protection (LB & RB)	0-20		0
10. Riparian Vegetative Zone Width (LB & RB)	0-20		0
Total RBP Score	Poor		0
Sub-Total			0
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	0
pH			
	5-90		0
DO			
	10-30		0
Sub-Total			0
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	0
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

Column No. 3- Mitigation Projected at Five Years Post Completion (Credit)			
Stream Classification:	Intermittent		
Percent Stream Channel Slope	0		
HGM Score (attach data forms):			
			Average
Hydrology	1		0
Biogeochemical Cycling	1		
Habitat	1		
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	0
2. Embeddedness	0-20		0
3. Velocity/ Depth Regime	0-20		0
4. Sediment Deposition	0-20		0
5. Channel Flow Status	0-20		0
6. Channel Alteration	0-20		0
7. Frequency of Riffles (or bends)	0-20		0
8. Bank Stability (LB & RB)	0-20		0
9. Vegetative Protection (LB & RB)	0-20		0
10. Riparian Vegetative Zone Width (LB & RB)	0-20		0
Total RBP Score	Poor		0
Sub-Total			0
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	0
pH			
	5-90		0
DO			
	10-30		0
Sub-Total			0
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	0
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

Column No. 4- Mitigation Projected at Ten Years Post Completion (Credit)			
Stream Classification:	Intermittent		
Percent Stream Channel Slope	0		
HGM Score (attach data forms):			
			Average
Hydrology	1		0
Biogeochemical Cycling	1		
Habitat	1		
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	0
2. Embeddedness	0-20		0
3. Velocity/ Depth Regime	0-20		0
4. Sediment Deposition	0-20		0
5. Channel Flow Status	0-20		0
6. Channel Alteration	0-20		0
7. Frequency of Riffles (or bends)	0-20		0
8. Bank Stability (LB & RB)	0-20		0
9. Vegetative Protection (LB & RB)	0-20		0
10. Riparian Vegetative Zone Width (LB & RB)	0-20		0
Total RBP Score	Poor		0
Sub-Total			0
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	0
pH			
	5-90		0
DO			
	10-30		0
Sub-Total			0
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	0
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

Column No. 5- Mitigation Projected at Maturity (Credit)			
Stream Classification:	Intermittent		
Percent Stream Channel Slope	0		
HGM Score (attach data forms):			
			Average
Hydrology	1		0
Biogeochemical Cycling	1		
Habitat	1		
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		0
Sub-Total			0
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90		
DO			
	10-30		
Sub-Total			0
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0	0	0

PART III - Impact Factors
(See instruction page to insert default values for MITIGATION BANKING and ILF)

Temporal Loss-Construction	
**Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).*	
Years	0
Sub-Total	0

Temporal Loss-Maturity	
**Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).*	
% Add. Mitigation	Temporal Loss-Maturity (Years)
0%	0
Sub-Total	0

Long-term Protection	
% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
0 + 5/10 Year Monitoring	101
Sub-Total	0

PART IV - Index to Unit Score Conversion

Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
0.658	26	17.108	$13,686.40

PART V- Comparison of Unit Scores and Projected Balance

Final Unit Score (Debit) [No Net Loss Value]	17.108	Mitigation Existing Condition - Baseline (Credit)		Mitigation Projected at Five Years Post Completion (Credit)		Mitigation Projected at Ten Years Post Completion (Credit)		Mitigation Projected At Maturity (Credit)	
FINAL PROJECTED NET BALANCE					0		0		0

Part VI - Mitigation Considerations (Incentives)

Extent of Stream Restoration
**Note1: Reference the Instructional handout to determine the correct Restoration Levels (below) for your project*
**Note2: Place an "X" in the appropriate category (only select one).*

☐ Restoration Level 1	
☐ Restoration Level 2	
☐ Restoration Level 3	

Compensatory Mitigation Plan incorporates HUC 12-based watershed approach? (Yes or No) *Note: HUC 12-based watershed approach required to obtain Stream Restoration incentive	No

Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)
S-F18	17.108	#DIV/0!

Extended Upland Buffer Zone
**Note[1]: Reference Instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below)*
**Note[2]: Enter the buffer width for each channel side (Left Bank and Right Bank)*
**Note[3]: Select the appropriate mitigation type*

Buffer Width	Left Bank	
	0-50	None
	51-150	None
Buffer Width	**Right Bank**	
	0-50	None
	51-150	None
Average Buffer Width/Side	0	

Straight Preservation Ratio (v2.1, Sept 2015)
Final Mitigation Unit Yield
#DIV/0!

STREAM ID S-F18	**STREAM NAME** UNT to Hans Creek
LAT 37.537587 **LONG** -80.717815	**DATE** 04/10/2015
CLIENT MVP	**PROJECT NAME** MVP
INVESTIGATORS E. Stromhaier, A. Flake, D. McCullough	
FLOW REGIME Perennial ✔ Intermittent ___ Ephemeral ___	**WATER TYPE** TNW ___ RPW ✔ NRPW ___

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 18.0 ft
Top of Bank Height:
LB 3.0 ft RB 3.0 ft
Water Depth: 1.00 in
Water Width: 6.0 ft
High Water Mark: 2.0 ft
Flow Direction: NW

Stream Erosion
___ None ✔ Moderate ___ Heavy

Artificial, Modified or Channelized
✔ Yes ___ No

Dam Present ___ Yes ✔ No

Sinuosity ___ Low ✔ Medium ___ High

Gradient
___ Flat (0.5/100 ft) ✔ Moderate (2 ft/100 ft) ___ Severe (10 ft/100 ft)

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
___ Stream bed moist
___ Standing water
✔ Flowing water

Velocity
___ Fast ✔ Moderate
___ Slow

Proportion of Reach Represented by Stream Morphology Types
Riffle 75 % Run 25 %
Pool %

Turbidity
___ Clear ✔ Slightly turbid ___ Turbid
___ Opaque ___ Stained
___ Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		55
Boulder	> 256 mm (10")	15
Cobble	64-256 mm (2.5"-10")	10
Gravel	2-64 mm (0.1"-2.5")	5
Sand	0.06-2mm (gritty)	5
Silt	0.004-0.06 mm	5
Clay	< 0.004 mm (slick)	5

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	10
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
___ Forest ___ Commercial
✔ Field/Pasture ___ Industrial
___ Agricultural ___ Residential
___ Other:

Canopy Cover
___ Partly open ___ Partly shaded
___ Shaded ✔ Open

Indicate the dominant type (Check one)
___ Trees ___ Shrubs
✔ Grasses ___ Herbaceous

Floodplain Width
___ Wide > 30ft ✔ Moderate 15-30ft
___ Narrow <16ft

Wetland Present ___ Yes ✔ No
Wetland ID

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
✔ Rooted emergent ✔ Rooted submergent ___ Rooted floating ___ Free floating
___ Floating algae ✔ Attached algae

MACROINVERTEBRATES OR OTHER WILDLIFE OBSERVED/OTHER OBSERVATIONS AND NOTES

STREAM ID S-F18	**STREAM NAME** UNT to Hans Creek
LAT 37.537587 **LONG** -80.717815	**DATE** 04/10/2015
CLIENT MVP	**PROJECT NAME** MVP
INVESTIGATORS E. Stromhaier, A. Flake, D. McCullough	
FLOW REGIME Perennial ✔ Intermittent ___ Ephemeral ___	**WATER TYPE** TNW ___ RPW ✔ NRPW ___

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 18.0 ft
Top of Bank Height:
LB 3.0 ft RB 3.0 ft
Water Depth: 1.00 in
Water Width: 6.0 ft
High Water Mark: 2.0 ft
Flow Direction: NW

Stream Erosion
___ None ✔ Moderate ___ Heavy

Artificial, Modified or Channelized
✔ Yes ___ No

Dam Present ___ Yes ✔ No

Sinuosity ___ Low ✔ Medium ___ High

Gradient
___ Flat (0.5/100 ft) ✔ Moderate (2 ft/100 ft) ___ Severe (10 ft/100 ft)

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
___ Stream bed moist
___ Standing water
✔ Flowing water

Velocity
___ Fast ✔ Moderate
___ Slow

Proportion of Reach Represented by Stream Morphology Types
Riffle 75 % Run 25 %
Pool %

Turbidity
___ Clear ✔ Slightly turbid ___ Turbid
___ Opaque ___ Stained
___ Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		55
Boulder	> 256 mm (10")	15
Cobble	64-256 mm (2.5"-10")	10
Gravel	2-64 mm (0.1"-2.5")	5
Sand	0.06-2mm (gritty)	5
Silt	0.004-0.06 mm	5
Clay	< 0.004 mm (slick)	5

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	10
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
___ Forest ___ Commercial
✔ Field/Pasture ___ Industrial
___ Agricultural ___ Residential
___ Other:

Canopy Cover
___ Partly open ___ Partly shaded
___ Shaded ✔ Open

Indicate the dominant type (Check one)
___ Trees ___ Shrubs
✔ Grasses ___ Herbaceous

Floodplain Width
___ Wide > 30ft ✔ Moderate 15-30ft
___ Narrow <16ft

Wetland Present ___ Yes ✔ No
Wetland ID

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
✔ Rooted emergent ✔ Rooted submergent ___ Rooted floating ___ Free floating
___ Floating algae ✔ Attached algae

MACROINVERTEBRATES OR OTHER WILDLIFE OBSERVED/OTHER OBSERVATIONS AND NOTES

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME S-F18	LOCATION Monroe County, WV	
STATION #_____ RIVERMILE_____	STREAM CLASS Perennial	
LAT 37.53826 LONG -80.719073	RIVER BASIN Middle Indian Creek	
STORET #	AGENCY Tetra Tech	
INVESTIGATORS C. Vileno, C. Stoliker		
FORM COMPLETED BY C. Vileno	DATE 11/09/2016 TIME 9:30	REASON FOR SURVEY SWVM

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	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 not new fall and not 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.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	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.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	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).
SCORE 2	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	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.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	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.
SCORE 3	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	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.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	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.
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	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.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	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 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	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 5 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 97

Insects	Count	Tolerance	TV
Ephemeroptera			10
Ameletidae		2	0
Baetidae		4	0
Beatiscidae		4	0
Caenidae		5	0
Ephemerellidae		3	0
Ephemeridae		5	0
Heptageniidae	8	3	24
Isonychiidae		3	0
Leptophlebiidae	2	4	8
Potamanthidae		5	0
Siphlonuridae		3	0
Tricorythidae		5	0
Plecoptera			0
Capniidae		2	0
Chloroperlidae		2	0
Leuctridae		2	0
Nemouridae		2	0
Peltoperlidae		1	0
Perlidae		1	0
Perlodidae		1	0
Pteronarcyidae		1	0
Taeniopterygidae		2	0
Trichoptera			2
Brachycentridae		2	0
Glossosomatidae		2	0
Helicopsychidae		3	0
Hydropsychidae		5	0
Hydroptilidae		3	0
Lepidostomatidae		3	0
Leptoceridae		3	0
Limnephilidae		4	0
Molannidae		3	0
Philopotamidae		4	0
Phryganeidae		4	0
Polycentropodidae		5	0
Psychomiidae		3	0
Rhyacophilidae	2	3	6
Uenoidae		2	0
Total Tolerance Value			72

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Insects	Count	Tolerance	TV
Odonata			0
Aeshnidae		3	0
Calopterygidae		6	0
Coenagrionidae		7	0
Cordulegastridae		3	0
Gomphidae		5	0
Lestidae		7	0
Libellulidae		7	0
Coleoptera			1
Chrysomelidae		7	0
Dryopidae		5	0
Dytiscidae		6	0
Elmidae	1	4	4
Gyrinidae		5	0
Haliplidae		7	0
Hydrophilidae		7	0
Psephenidae		3	0
Ptilodactylidae		5	0
Hemiptera			0
Belostomatidae		8	0
Corixidae		8	0
Gerridae		10	0
Hydrometridae		8	0
Nepidae		8	0
Notonectidae		8	0
Megaloptera			0
Corydalidae		3	0
Sialidae		6	0
Diptera			0
Athericidae		3	0
Blephariceridae		2	0
Ceratopogonidae		8	0
Chironomidae		9	0
Culicidae		10	0
Dixidae		6	0
Empididae		7	0
Psychodidae		8	0
Ptychopteridae		8	0
Simuliidae		6	0
Stratiomyidae		10	0
Syrphidae		10	0
Tabanidae		7	0
Tipulidae		5	0

Non-Insects	Count	Tolerance	TV
Crustacea			0
Asellidae		7	0
Cambaridae		5	0
Gammaridae		5	0
Palaemonidae		5	0
Annelida			3
Hirudinea		10	0
Nematoda		10	0
Nematomorpha		10	0
Oligochaeta	3	10	30
Turbellaria			0
Turbellaria		7	0
Bivalvia			0
Corbiculidae		6	0
Sphaeriidae		5	0
Unionidae		4	0
Gastropoda			0
Ancylidae		7	0
Hydrobiidae		4	0
Physidae		7	0
Planorbidae		5	0
Pleuroceridae		5	0
Viviparidae		5	0
Miscellaneous			0
Collembola		6	0
Lepidoptera		5	0
Neuroptera		5	0
Hydrachnidae		6	0

Totals		
	Total number	**16**
	Total families	**5**

Metric calculations				
Richness			**Additional metrics**	
Total Taxa	5	22.7	Ephemeroptera Taxa	2
EPT Taxa	3	23.1	Plecoptera Taxa	0
Tolerance			Trichoptera Taxa	1
Biotic Index	4.50	78.6	Long-lived Taxa	3
% Tolerant	18.8	82.9	Odonata Taxa	0
Composition			Diptera Taxa	0
% EPT Abundance	75.0	83.3	COET Taxa	4
% Dominance	50.0	62.5	% Sensitive	62.5
% Net-spinners	0.0	NA	% Chironomidae	0.0
Stream Condition Index		**58.9**	% Clingers	68.8
Integrity Rating	**Marginal**		More diversity measures	

Note: There may be instances when families are collected that are not listed above. In those cases choose a similar family/tolerance value if known, to calculate the metrics. You should contact the WV Save Our Streams Coordinator to confirm your choice. Provide as much detail as possible so that family-level identification can be determined.

No FCI form included. Not a high-gradient ephemeral or intermittent headwater stream.