

## Baseline Assessment – Stream Attributes

### Reach S-CC13 (Timber Mat Crossing) Intermittent Spread I Pittsylvania County, Virginia

Data	Included
Photos	✓
SWVM Form	✓
FCI Calculator and HGM Form	✓
RBP Physical Characteristics Form	✓
Water Quality Data	N/A - Low Flow
RBP Habitat Form	✓
RBP Benthic Form	✓
Benthic Identification Sheet	N/A – Lack of habitat
Wolman Pebble Count	✓
RiverMorph Data Sheet	✓
USM Form (Virginia Only)	✓
Longitudinal Profile and Cross Sections	✓

**Spread I      Stream S-CC13 (Timber Mat Crossing)      Pittsylvania County**



Photo Type: US VIEW

Location, Orientation, Photographer Initials: Downstream at ROW/LOD looking N upstream, RAH



Photo Type: DS COND

Location, Orientation, Photographer Initials: Downstream at ROW/LOD looking SW downstream, RAH



**Spread I      Stream S-CC13 (Timber Mat Crossing)      Pittsylvania County**



Photo Type: LB CL

Location, Orientation, Photographer Initials: On thalweg at pipe centerline looking W at right streambank, RAH



Photo Type: RB CL

Location, Orientation, Photographer Initials: On thalweg at pipe centerline looking SE at left streambank, RAH



**Spread I      Stream S-CC13 (Timber Mat Crossing)      Pittsylvania County**



Photo Type: US COND

Location, Orientation, Photographer Initials: Upstream at ROW/LOD looking NW upstream, RAH



Photo Type: DS VIEW

Location, Orientation, Photographer Initials: Upstream at ROW/LOD looking S downstream, RAH





### High-Gradient Headwater Streams in Appalachia Field Data Sheet and Calculator

Team: **DW, RH, RC** Latitude/UTM Northing: **36.905307**  
 Project Name: **Mountain Valley Pipeline** Longitude/UTM Easting: **-79.471574**  
 Location: **S-CC13** Sampling Date: **9/2/21**  
 SAR Number: **S-CC13** Reach Length (ft): **65** 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	30	30	0	0	0	0	0	0	0
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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

Measure at least 30 points

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

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. 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				
0					0				

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. 115.4

Left Side: **35** Right Side: **40**

9	V <sub>SRICH</sub>	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	0.00
Group 1 = 1.0		Group 2 (-1.0)	
<input type="checkbox"/>	<i>Acer rubrum</i>	<input type="checkbox"/>	<i>Magnolia tripetala</i>
<input type="checkbox"/>	<i>Acer saccharum</i>	<input type="checkbox"/>	<i>Nyssa sylvatica</i>
<input type="checkbox"/>	<i>Aesculus flava</i>	<input type="checkbox"/>	<i>Oxydendrum arboreum</i>
<input type="checkbox"/>	<i>Asimina triloba</i>	<input type="checkbox"/>	<i>Prunus serotina</i>
<input type="checkbox"/>	<i>Betula alleghaniensis</i>	<input type="checkbox"/>	<i>Quercus alba</i>
<input type="checkbox"/>	<i>Betula lenta</i>	<input type="checkbox"/>	<i>Quercus coccinea</i>
<input type="checkbox"/>	<i>Carya alba</i>	<input type="checkbox"/>	<i>Quercus imbricaria</i>
<input type="checkbox"/>	<i>Carya glabra</i>	<input type="checkbox"/>	<i>Quercus prinus</i>
<input type="checkbox"/>	<i>Carya ovalis</i>	<input type="checkbox"/>	<i>Quercus rubra</i>
<input type="checkbox"/>	<i>Carya ovata</i>	<input type="checkbox"/>	<i>Quercus velutina</i>
<input type="checkbox"/>	<i>Cornus florida</i>	<input type="checkbox"/>	<i>Sassafras albidum</i>
<input type="checkbox"/>	<i>Fagus grandifolia</i>	<input type="checkbox"/>	<i>Tilia americana</i>
<input type="checkbox"/>	<i>Fraxinus americana</i>	<input type="checkbox"/>	<i>Tsuga canadensis</i>
<input type="checkbox"/>	<i>Liriodendron tulipifera</i>	<input type="checkbox"/>	<i>Ulmus americana</i>
<input type="checkbox"/>	<i>Magnolia acuminata</i>		
0 Species in Group 1		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 <sub>DETRITUS</sub>	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	92.50 %																								
		<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>100</td> <td>100</td> <td></td> <td></td> <td>70</td> <td>100</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	Left Side				Right Side				100	100			70	100											
Left Side				Right Side																							
100	100			70	100																						
11	V <sub>HERB</sub>	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	7 %																								
		<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>0</td> <td>0</td> <td></td> <td></td> <td>25</td> <td>2</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	Left Side				Right Side				0	0			25	2											
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Sample Variable 12 within the entire catchment of the stream.

12	V <sub>WLUSE</sub>	Weighted Average of Runoff Score for watershed:	0.41																																				
		<table border="1"> <thead> <tr> <th>Land Use (Choose From Drop List)</th> <th>Runoff Score</th> <th>% in Catchment</th> <th>Running Percent (not &gt;100)</th> </tr> </thead> <tbody> <tr> <td>Forest and native range (&lt;50% ground cover)</td> <td>0.5</td> <td>0</td> <td>0</td> </tr> <tr> <td>Forest and native range (&gt;75% ground cover)</td> <td>1</td> <td>21</td> <td>21</td> </tr> <tr> <td>Impervious areas (parking lots, roofs, driveways, etc)</td> <td>0</td> <td>11</td> <td>32</td> </tr> <tr> <td>Newly graded areas (bare soil, no vegetation or pavement)</td> <td>0</td> <td>0</td> <td>32</td> </tr> <tr> <td>Open space (pasture, lawns, parks, etc.), grass cover &lt;50%</td> <td>0.1</td> <td>0</td> <td>32</td> </tr> <tr> <td>Open space (pasture, lawns, parks, etc.), grass cover &gt;75%</td> <td>0.3</td> <td>68</td> <td>100</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (<50% ground cover)	0.5	0	0	Forest and native range (>75% ground cover)	1	21	21	Impervious areas (parking lots, roofs, driveways, etc)	0	11	32	Newly graded areas (bare soil, no vegetation or pavement)	0	0	32	Open space (pasture, lawns, parks, etc.), grass cover <50%	0.1	0	32	Open space (pasture, lawns, parks, etc.), grass cover >75%	0.3	68	100									
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S-CC13			Notes:
Variable	Value	VSI	Land Cover Analysis was completed using the 2019 National Land Cover Database (NLCD), from Landsat satellite imagery and other supplementary datasets. Watershed boundaries are based off of field delineated stream impacts. *Percentages in catchment values have been rounded to the nearest full number
V <sub>CCANOPY</sub>	Not Used, <20%	Not Used	
V <sub>EMBED</sub>	1.0	0.10	
V <sub>SUBSTRATE</sub>	0.08 in	0.04	
V <sub>BERO</sub>	0 %	1.00	
V <sub>LWD</sub>	0.0	0.00	
V <sub>TDBH</sub>	Not Used	Not Used	
V <sub>SNAG</sub>	0.0	0.10	
V <sub>SSD</sub>	115.4	1.00	
V <sub>SRICH</sub>	0.00	0.00	
V <sub>DETRITUS</sub>	92.5 %	1.00	
V <sub>HERB</sub>	7 %	0.09	
V <sub>WLUSE</sub>	0.41	0.43	

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

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

**Project Name:** Mountain Valley Pipeline

**Location:** S-CC13

**Sampling Date:** 9/2/21

Project Site      Before Project

**Subclass for this SAR:**

Intermittent Stream

**Uppermost stratum present at this SAR:**

Shrub/Herb Strata

**SAR number:**      S-CC13

**Functional Results Summary:**

**Enter Results in Section A of the Mitigation Sufficiency Calculator**

Function	Functional Capacity Index
Hydrology	0.23
Biogeochemical Cycling	0.15
Habitat	0.11

**Variable Measure and Subindex Summary:**

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy 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.	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.	115.38	1.00
$V_{SRICH}$	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	92.50	1.00
$V_{HERB}$	Average percent cover of herbaceous vegetation.	6.75	0.09
$V_{WLUSE}$	Weighted Average of Runoff Score for Catchment.	0.41	0.43



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

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

<b>WEATHER CONDITIONS</b>	Now _____ storm (heavy rain) _____ rain (steady rain) _____ showers (intermittent) _____ %cloud cover _____ clear/sunny _____	Past 24 hours _____%	Has there been a heavy rain in the last 7 days? Yes No Air Temperature _____ °C Other _____						
<b>SITE LOCATION/MAP</b>	Draw a map of the site and indicate the areas sampled (or attach a photograph) 								
<b>STREAM CHARACTERIZATION</b>	<table style="width: 100%;"> <tr> <td style="width: 33%;"> <b>Stream Subsystem</b>            Perennial Intermittent Tidal         </td> <td style="width: 33%;"> <b>Stream Type</b>            Coldwater Warmwater         </td> <td style="width: 34%;"></td> </tr> <tr> <td> <b>Stream Origin</b>            Glacial _____            Non-glacial montane _____            Swamp and bog _____         </td> <td>           Spring-fed _____            Mixture of origins _____            Other _____         </td> <td> <b>Catchment Area</b> _____ km<sup>2</sup> </td> </tr> </table>			<b>Stream Subsystem</b> Perennial Intermittent Tidal	<b>Stream Type</b> Coldwater Warmwater		<b>Stream Origin</b> Glacial _____ Non-glacial montane _____ Swamp and bog _____	Spring-fed _____ Mixture of origins _____ Other _____	<b>Catchment Area</b> _____ km <sup>2</sup>
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## PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

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

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



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

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

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

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

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

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



## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

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

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

### QUALITATIVE LISTING OF AQUATIC BIOTA

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

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

### FIELD OBSERVATIONS OF MACROBENTHOS

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

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

### WOLMAN PEBBLE COUNT FORM

County:	Pittsylvania	Stream ID:	S-CC13
Stream Name:	UNT to Cherrystone Creek	Basin:	Banister
HUC Code:	03010105		
Survey Date:	9/2/2021		
Surveyors:	DW, RH, RC		
Type:	Representative		

PEBBLE COUNT							
Inches	PARTICLE	Millimeters		Particle Count	Total #	Item %	% Cum
	Silt/Clay	< .062	S/C	▲ ▼	100	100.00	100.00
	Very Fine	.062-.125	S A N D	▲ ▼		0.00	100.00
	Fine	.125-.25		▲ ▼		0.00	100.00
	Medium	.25-.5		▲ ▼		0.00	100.00
	Coarse	.50-1.0		▲ ▼		0.00	100.00
.04-.08	Very Coarse	1.0-2		▲ ▼		0.00	100.00
.08 - .16	Very Fine	2 - 4		G R A V E L	▲ ▼		0.00
.16 - .22	Fine	4 - 5.7	▲ ▼			0.00	100.00
.22 - .31	Fine	5.7 - 8	▲ ▼			0.00	100.00
.31 - .44	Medium	8 - 11.3	▲ ▼			0.00	100.00
.44 - .63	Medium	11.3 - 16	▲ ▼			0.00	100.00
.63 - .89	Coarse	16 - 22.6	▲ ▼			0.00	100.00
.89 - 1.26	Coarse	22.6 - 32	▲ ▼			0.00	100.00
1.26 - 1.77	Vry Coarse	32 - 45	▲ ▼			0.00	100.00
1.77 - 2.5	Vry Coarse	45 - 64	▲ ▼			0.00	100.00
2.5 - 3.5	Small	64 - 90	C O B B L E		▲ ▼		0.00
3.5 - 5.0	Small	90 - 128		▲ ▼		0.00	100.00
5.0 - 7.1	Large	128 - 180		▲ ▼		0.00	100.00
7.1 - 10.1	Large	180 - 256		▲ ▼		0.00	100.00
10.1 - 14.3	Small	256 - 362	B O U L D E R	▲ ▼		0.00	100.00
14.3 - 20	Small	362 - 512		▲ ▼		0.00	100.00
20 - 40	Medium	512 - 1024		▲ ▼		0.00	100.00
40 - 80	Large	1024 - 2048		▲ ▼		0.00	100.00
80 - 160	Vry Large	2048 - 4096		▲ ▼		0.00	100.00
	Bedrock		BDRK	▲ ▼		0.00	100.00
				Totals:	100		
Total Tally:							



RIVERMORPH PARTICLE SUMMARY

-----  
 River Name: UNT to Cherrystone Creek  
 Reach Name: S-CC13  
 Sample Name: Representative  
 Survey Date: 09/02/2021  
 -----

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	100	100.00	100.00
0.062 - 0.125	0	0.00	100.00
0.125 - 0.25	0	0.00	100.00
0.25 - 0.50	0	0.00	100.00
0.50 - 1.0	0	0.00	100.00
1.0 - 2.0	0	0.00	100.00
2.0 - 4.0	0	0.00	100.00
4.0 - 5.7	0	0.00	100.00
5.7 - 8.0	0	0.00	100.00
8.0 - 11.3	0	0.00	100.00
11.3 - 16.0	0	0.00	100.00
16.0 - 22.6	0	0.00	100.00
22.6 - 32.0	0	0.00	100.00
32 - 45	0	0.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00

D16 (mm)	0.01
D35 (mm)	0.02
D50 (mm)	0.03
D84 (mm)	0.05
D95 (mm)	0.06
D100 (mm)	0.06
Silt/Clay (%)	100
Sand (%)	0
Gravel (%)	0
Cobble (%)	0
Boulder (%)	0
Bedrock (%)	0

Total Particles = 100.

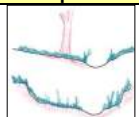
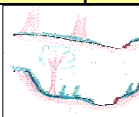
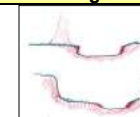
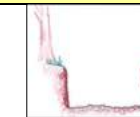

# Stream Assessment Form (Form 1)

Unified Stream Methodology for use in Virginia

For use in wadeable channels classified as intermittent or perennial

Project #	Project Name (Applicant)	Locality	Cowardin Class.	HUC	Date	SAR #	Impact Length	Impact Factor	
22865.06	Mountain Valley Pipeline (Mountain Valley Pipeline, LLC)	Pittsylvania	R4	03010105	9/2/2021	S-CC13	20	1	
Name(s) of Evaluator(s)		Stream Name and Information					SAR Length		
DW, RH, RC		UNT to Cherrystone Creek					65		

## 1. Channel Condition: Assess the cross-section of the stream and prevailing condition (erosion, aggradation)

	Conditional Category					
	Optimal	Suboptimal	Marginal	Poor	Severe	
<b>Channel Condition</b>	 Very little incision or active erosion; 80-100% stable banks. Vegetative surface protection or natural rock, prominent (80-100%), AND/OR Stable point bars / bankfull benches are present. Access to their original floodplain or fully developed wide bankfull benches. Mid-channel bars and transverse bars few. Transient sediment deposition covers less than 10% of bottom.	 Slightly incised, few areas of active erosion or unprotected banks. Majority of banks are stable (60-80%). Vegetative protection or natural rock prominent (60-80%) AND/OR Depositional features contribute to stability. The bankfull and low flow channels are well defined. Stream likely has access to bankfull benches, or newly developed floodplains along portions of the reach. Transient sediment covers 10-40% of the stream bottom.	 Often incised, but less than Severe or Poor. Banks more stable than Severe or Poor due to lower bank slopes. Erosion may be present on 40-60% of both banks. Vegetative protection on 40-60% of banks. Streambanks may be vertical or undercut. AND/OR 40-60% Sediment may be temporary / transient, contribute to instability. Deposition that contribute to stability, may be forming/present. AND/OR V-shaped channels have vegetative protection on > 40% of the banks and depositional features which contribute to stability.	 Overwidened/incised. Vertically / laterally unstable. Likely to widen further. Majority of both banks are near vertical. Erosion present on 60-80% of banks. Vegetative protection present on 20-40% of banks, and is insufficient to prevent erosion. AND/OR 60-80% of the stream is covered by sediment. Sediment is temporary / transient in nature, and contributing to instability. AND/OR V-shaped channels have vegetative protection is present on > 40% of the banks and stable sediment deposition is absent.	 Deeply incised (or excavated), vertical/lateral instability. Severe incision, flow contained within the banks. Streambed below average rooting depth, majority of banks vertical/undercut. Vegetative protection present on less than 20% of banks, is not preventing erosion. Obvious bank sloughing present. Erosion/raw banks on 80-100%. AND/OR Aggrading channel. Greater than 80% of stream bed is covered by deposition, contributing to instability. Multiple thread channels and/or subterranean flow.	<b>CI</b>
<b>Scores</b>	<b>3</b>	<b>2.4</b>	<b>2</b>	<b>1.6</b>	<b>1</b>	<b>3.00</b>
<b>NOTES&gt;&gt;</b>						

## 2. RIPARIAN BUFFERS: Assess both bank's 100 foot riparian areas along the entire SAR. (rough measurements of length & width may be acceptable)

	Conditional Category							
	Optimal	High Suboptimal	Low Suboptimal	High Marginal	Low Marginal	High Poor		Low Poor
<b>Riparian Buffers</b>	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover. Wetlands located within the riparian areas.	<b>High Suboptimal:</b> Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	<b>Low Suboptimal:</b> Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and a maintained understory. Recent cutover (dense vegetation).	<b>High Marginal:</b> Non-maintained, dense herbaceous vegetation with either a shrub layer or a tree layer (dbh > 3 inches) present, with <30% tree canopy cover.	<b>Low Marginal:</b> Non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, hay production, ponds, open water. If present, tree stratum (dbh > 3 inches) present, with <30% tree canopy cover with maintained understory.	<b>High Poor:</b> Lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, recently seeded and stabilized, or other comparable condition.	<b>Low Poor:</b> Impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, trails, or other comparable conditions.	<b>NOTES&gt;&gt;</b>
<b>Scores</b>	<b>1.5</b>	<b>High 1.2</b>	<b>Low 1.1</b>	<b>High 0.85</b>	<b>Low 0.75</b>	<b>High 0.6</b>	<b>Low 0.5</b>	
1. Delineate riparian areas along each stream bank into Condition Categories and Condition Scores using the descriptors. 2. Determine square footage for each by measuring or estimating length and width. Calculators are provided for you below. 3. Enter the % Riparian Area and Score for each riparian category in the blocks below.							Ensure the sums of % Riparian Blocks equal 100	
<b>Right Bank</b>	% Riparian Area >	20%	70%	10%			100%	
	Score >	0.5	0.85	0.75				
<b>Left Bank</b>	% Riparian Area >	20%	70%	10%			100%	
	Score >	0.5	0.85	0.75				
								CI = (Sum % RA * Scores*0.01)/2
								Rt Bank CI > <b>0.77</b>
								Lt Bank CI > <b>0.77</b>
								<b>CI 0.77</b>

## 3. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths; woody and leafy debris; stable substrate; low embeddedness; shade; undercut banks; root mats; SAV; riffle/pool complexes, stable features.

	Conditional Category				
	Optimal	Suboptimal	Marginal	Poor	
<b>Instream Habitat/ Available Cover</b>	Habitat elements are typically present in greater than 50% of the reach.	Stable habitat elements are typically present in 30-50% of the reach and are adequate for maintenance of populations.	Stable habitat elements are typically present in 10-30% of the reach and are adequate for maintenance of populations.	Habitat elements listed above are lacking or are unstable. Habitat elements are typically present in less than 10% of the reach.	<b>NOTES&gt;&gt;</b>
<b>Scores</b>	<b>1.5</b>	<b>1.2</b>	<b>0.9</b>	<b>0.5</b>	<b>Stream Gradient High / Low</b>
					<b>CI 0.50</b>



## Stream Impact Assessment Form Page 2

Project #	Project Name (Applicant)	Locality	Cowardin Class.	HUC	Date	SAR #	Impact Length	Impact Factor
22865.06	Mountain Valley Pipeline (Mountain Valley Pipeline, LLC)	Pittsylvania	R4	03010105	9/2/2021	S-CC13	20	1

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

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

**CI**  
**1.10**

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

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

<b>THE REACH CONDITION INDEX (RCI) &gt;&gt;</b>	<b>1.07</b>
RCI= (Sum of all CI's)/5, except if stream is ephemeral RCI = (Riparian CI/2)	
<b>COMPENSATION REQUIREMENT (CR) &gt;&gt;</b>	<b>21</b>
CR = RCI X L <sub>i</sub> X IF	

**INSERT PHOTOS:**

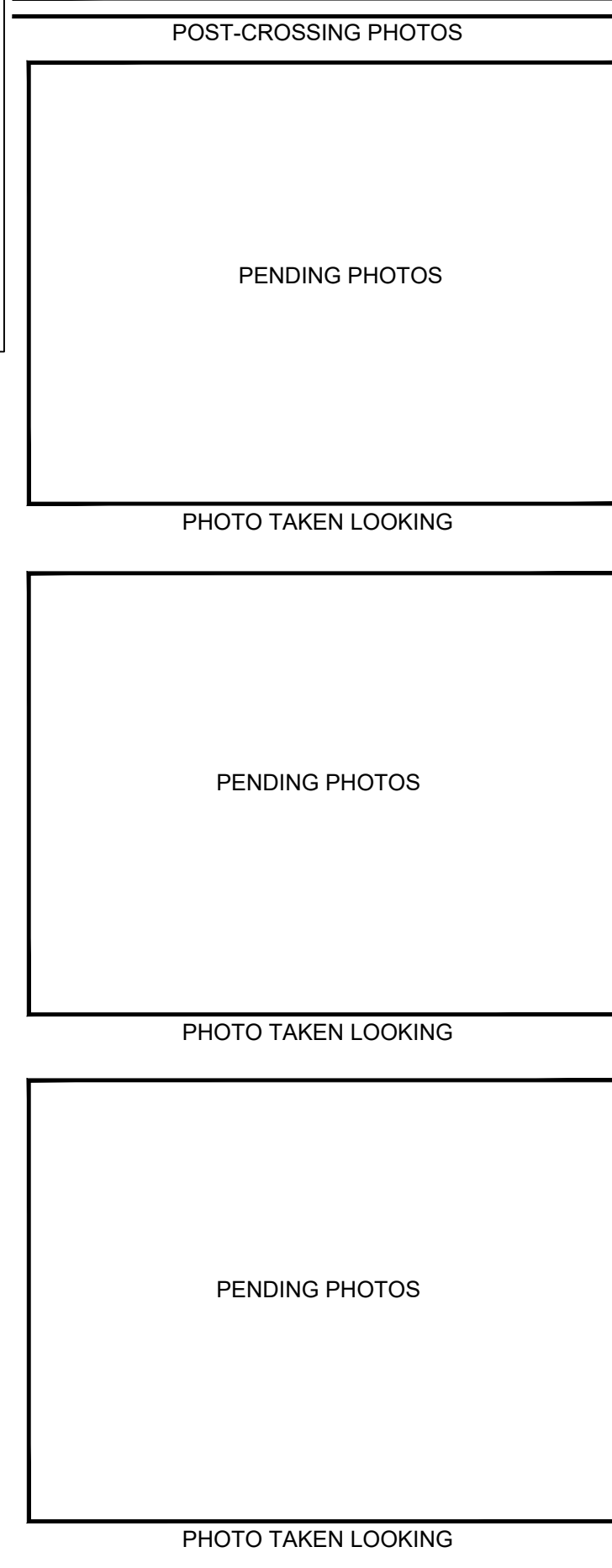
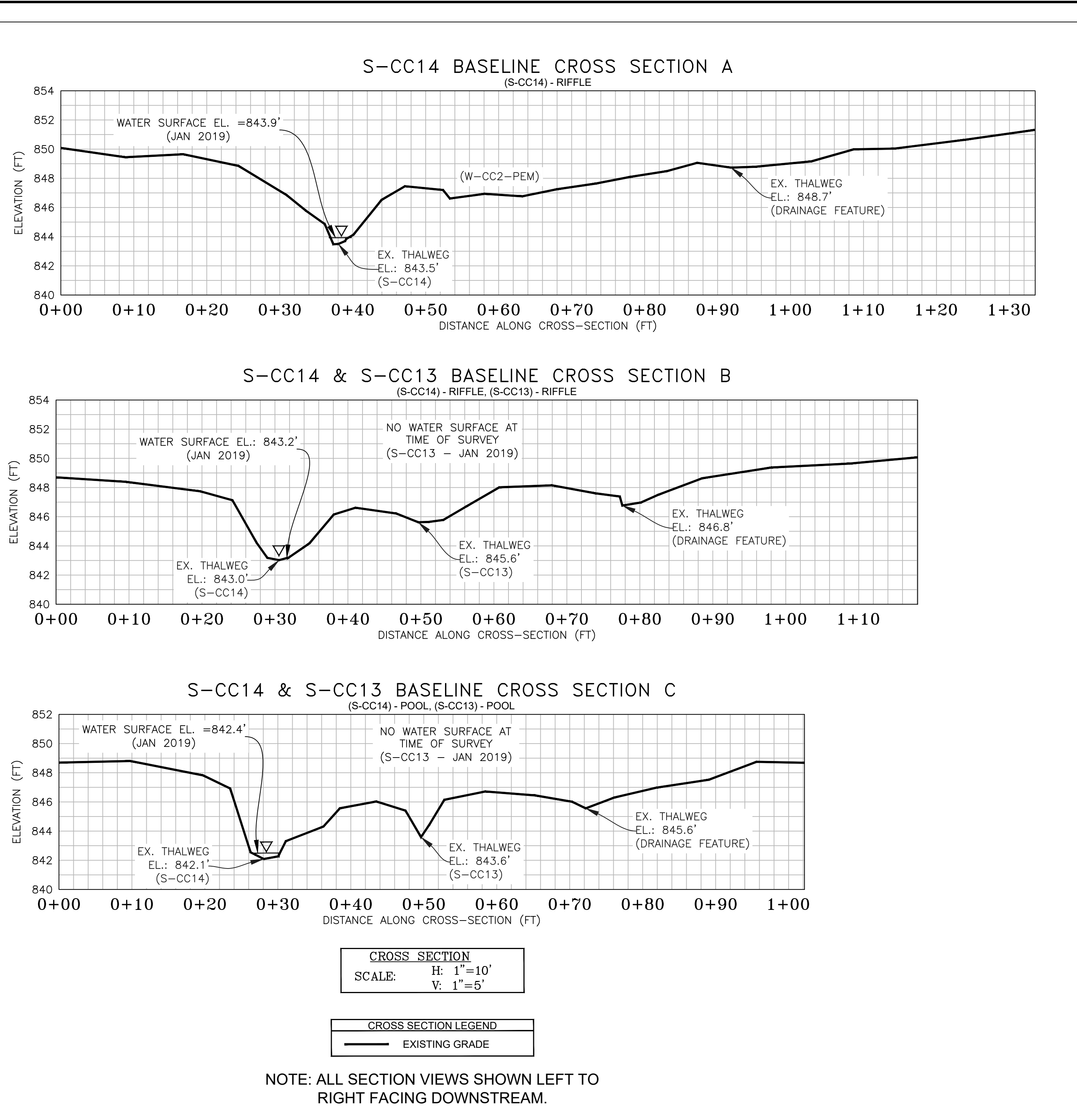
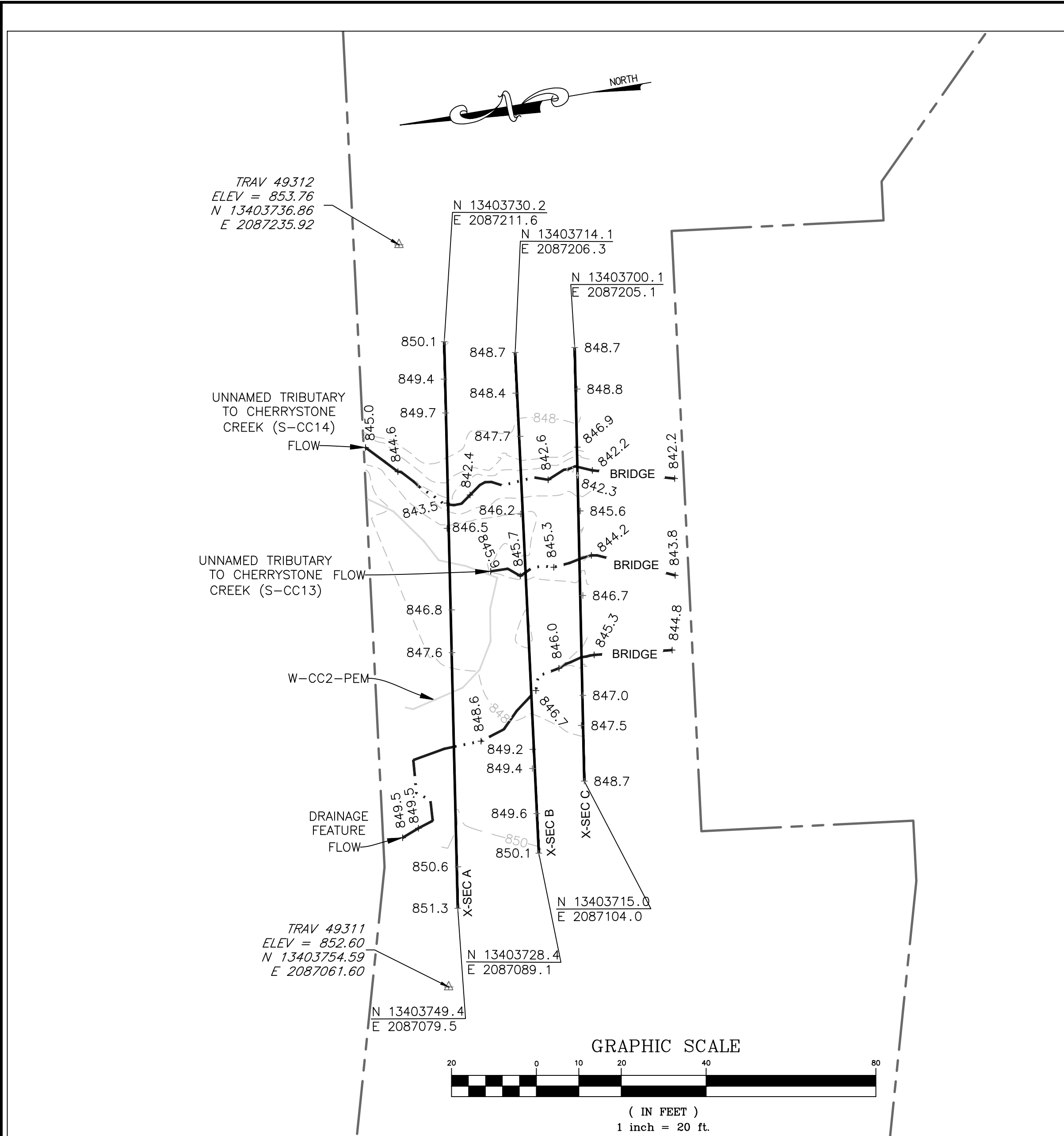


CAPTION. Assessment is limited to areas within the temporary ROW.

**DESCRIBE PROPOSED IMPACT:**

PROVIDED UNDER SEPARATE COVER



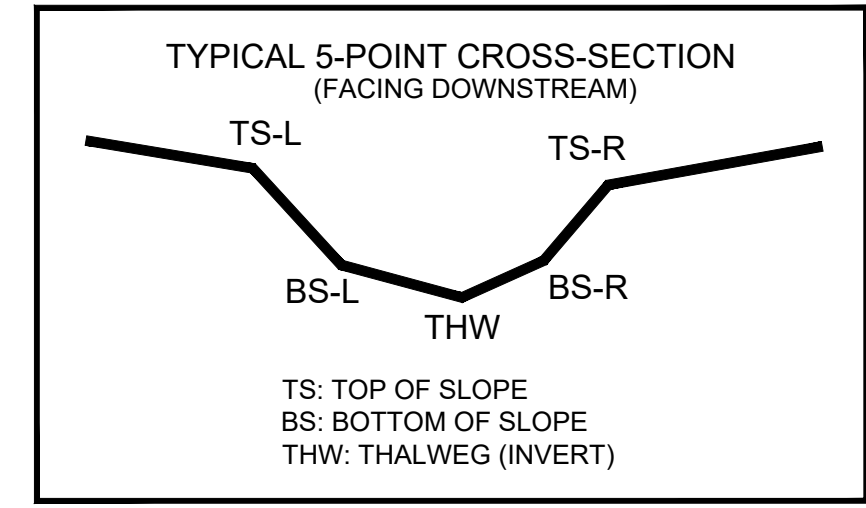


CL STAKEOUT POINTS: S-CC13 CROSS SECTION B (PIPE CL)

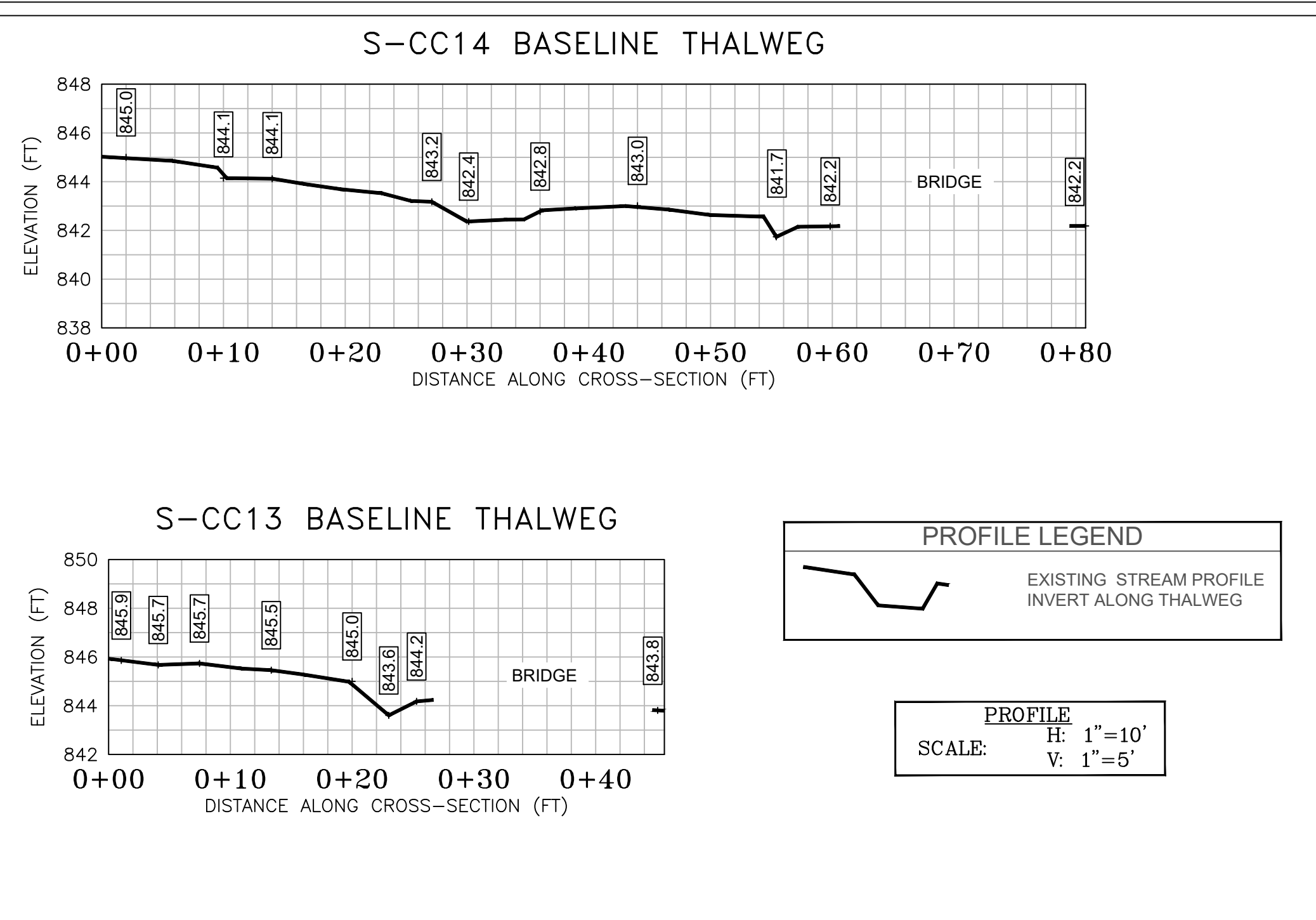
PT. LOC.	PRE-CROSSING			POST-CROSSING	
	NORTHING	EASTING	ELEV	VERT. DIFF.	HORZ. DIFF.
TS-L	13403719.46	2087165.61	846.62	----	----
BS-L	13403720.27	2087157.05	845.62	----	----
THW	13403720.31	2087155.63	845.64	----	----
BS-R	13403720.75	2087153.67	845.78	----	----
TS-R	13403721.75	2087146.03	848.02	----	----

CL STAKEOUT POINTS: S-CC14 CROSS SECTION B (PIPE CL)

PT. LOC.	PRE-CROSSING			POST-CROSSING	
	NORTHING	EASTING	ELEV	VERT. DIFF.	HORZ. DIFF.
TS-L	13403716.52	2087182.25	847.13	----	----
BS-L	13403717.74	2087177.62	843.06	----	----
THW	13403718.21	2087176.01	843.03	----	----
BS-R	13403718.18	2087174.90	843.17	----	----
TS-R	13403719.21	2087168.58	846.16	----	----



- SURVEY NOTES:
- This map has been oriented to NAD 1983 UTM ZONE 17N, and vertically to The North American Vertical Datum of 1988 (NAVD 88), using a Real Time Network (RTN) GPS. Field locations were completed on January 22, 2019.
  - Monumentation, including traverse stations and fly points, shown on this drawing should be used to orient any future boundary, topographic, or location survey.
  - Easement lines shown on plan view were provided by Mountain Valley Pipeline (MVP).
  - WSSI Contour Interval = 2.0'. Contours within the channel were interpolated using stream channel breaklines (i.e. top of slopes, toe of slopes, thalweg) and cross-sectional points. Contours outside the channel were interpolated using cross-sectional spot shots.
  - All section views shown are left to right facing downstream.
  - Cross-section B shot at location of pipe centerline (based on best professional judgement).



Wetland  
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Prepared For: MVP

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Profile and Cross-Sections Baseline Survey

S-CC13&S-CC14 - UNT to Little Cherrystone Creek (MP 293.2)

Pittsylvania County, Virginia

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No.	Date	Description	Rev. By	App. By

REVISIONS

Horizontal Datum: NAD 1983 UTM ZONE 17N  
Vertical Datum: NAVD 88  
Boundary and Topo Source: MVP  
WSSI 2' C.I. Topo

Design	Draft	Approved
EJC	JSF	NAS

Sheet #  
1 of 1

Computer File Name:  
L:\Survey\2020\2020\2903\2903\2903.dwg  
2021\_03-11\_MP\_293.2\_Sheet\_2.dwg

DATE: September, 2021 SCALE: AS NOTED