# Baseline Assessment – Stream Attributes

# Reach S-L4 (Pipeline ROW)
# Perennial
# Spread F
# Summers County, West Virginia

| Data | Included |
|---|---|
| Photos | ✓ |
| SWVM Form | ✓ |
| FCI Calculator and HGM Form | N/A – Perennial stream (not shadeable, slope >4%) |
| RBP Physical Characteristics Form | ✓ |
| Water Quality Data | N/A – No flow |
| RBP Habitat Form | ✓ |
| RBP Benthic Form | ✓ |
| Benthic Identification Sheet | N/A– No flow |
| Wolman Pebble Count | ✓ |
| Reference Reach Software Pebble Count Data | ✓ |
| Longitudinal Profile and Cross Sections | ✓ |

*No Flow – Modified RBP.


Photo Type: CP, DS
Location, Orientation, Photographer Initials: Center of Right of Way, Downstream View, AJ/MB


Photo Type: CP, US
Location, Orientation, Photographer Initials: Center of Right of Way, Upstream View, AJ/MB


Photo Type: LDB, DS
Location, Orientation, Photographer Initials: Left Descending Bank, Downstream View, AJ/MB


Photo Type: LDB, US
Location, Orientation, Photographer Initials: Left Descending Bank, Upstream View, AJ/MB


Photo Type: RDB, DS
Location, Orientation, Photographer Initials: Right Descending Bank, Downstream View, AJ/MB


Photo Type: RDB, US View
Location, Orientation, Photographer Initials: Right Descending Bank, Upstream View, AJ/MB

*"Q:\Charleston\2021 Projects\21-0244- MVP- STREAM AND WETLAND CONDITIONS ASSESSMENT AND SURVEY PLAN\002 - Pre-Crossing Monitoring\Spread F\S-L4"*

West Virginia Stream and Wetland Valuation Metric (SWVM)
Version 2.1, September 2017

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **USACE FILE NO./ Project Name:** (v2.1, Sept 2015) | **MOUNTAIN VALLEY PIPELINE** | **IMPACT COORDINATES: (in Decimal Degrees)** | **Lat.** | **37.673213** | **Lon.** | **-80.729772** | **WEATHER:** | **Sunny** | **DATE:** 9/2/2021 |
| **IMPACT STREAM/SITE ID AND SITE DESCRIPTION:** (watershed size {acreage}, unaltered or impairments) | **UNT to Greenbrier River (S-L4)** | **MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION:** (watershed size {acreage}, unaltered or impairments) | | | | | | | **Comments:** |
| **STREAM IMPACT LENGTH:** **77** | **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** 11.43

**HGM Score (attach data forms):**

| | | Average |
|---|---|---|
| Hydrology | | 0 |
| Biogeochemical Cycling | | |
| Habitat | | |

**PART I - Physical, Chemical and Biological Indicators**

**PHYSICAL INDICATOR** (Applies to all streams classifications)

**USEPA RBP (High Gradient Data Sheet)**

| | Points Scale | Range | Site Score |
|---|---|---|---|
| 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 | | 13 |
| 9. Vegetative Protection (LB & RB) | 0-20 | | 13 |
| 10. Riparian Vegetative Zone Width (LB & RB) | 0-20 | | 8 |
| Total RBP Score | Poor | | 34 |
| Sub-Total | | | 0.17 |

**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 |
|---|---|---|
| 0.485 | 77 | 37.345 |

## Column No. 2- Mitigation Existing Condition - Baseline (Credit)

**Stream Classification:**

**Percent Stream Channel Slope**

**HGM Score (attach data forms):**

| | | Average |
|---|---|---|
| Hydrology | | 0 |
| Biogeochemical Cycling | | |
| Habitat | | |

**PART I - Physical, Chemical and Biological Indicators**

**PHYSICAL INDICATOR** (Applies to all streams classifications)

**USEPA RBP (Low Gradient Data Sheet)**

| | Points Scale | Range | Site Score |
|---|---|---|---|
| 1. Epifaunal Substrate/Available Cover | 0-20 | 0-1 | |
| 2. Pool Substrate Characterization | 0-20 | | |
| 3. Pool Variability | 0-20 | | |
| 4. Sediment Deposition | 0-20 | | |
| 5. Channel Flow Status | 0-20 | | |
| 6. Channel Alteration | 0-20 | | |
| 7. Channel Sinuosity | 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:** 0

**Percent Stream Channel Slope** 0

**HGM Score (attach data forms):**

| | | Average |
|---|---|---|
| Hydrology | | 0 |
| Biogeochemical Cycling | | |
| Habitat | | |

**PART I - Physical, Chemical and Biological Indicators**

**PHYSICAL INDICATOR** (Applies to all streams classifications)

**USEPA RBP (High Gradient Data Sheet)**

| | Points Scale | Range | Site Score |
|---|---|---|---|
| 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:** 0

**Percent Stream Channel Slope** 0

**HGM Score (attach data forms):**

| | | Average |
|---|---|---|
| Hydrology | | 0 |
| Biogeochemical Cycling | | |
| Habitat | | |

**PART I - Physical, Chemical and Biological Indicators**

**PHYSICAL INDICATOR** (Applies to all streams classifications)

**USEPA RBP (High Gradient Data Sheet)**

| | Points Scale | Range | Site Score |
|---|---|---|---|
| 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:** 0

**Percent Stream Channel Slope** 0

**HGM Score (attach data forms):**

| | | Average |
|---|---|---|
| Hydrology | | 0 |
| Biogeochemical Cycling | | |
| Habitat | | |

**PART I - Physical, Chemical and Biological Indicators**

**PHYSICAL INDICATOR** (Applies to all streams classifications)

**USEPA RBP (High Gradient Data Sheet)**

| | Points Scale | Range | Site Score |
|---|---|---|---|
| 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 |

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

| | | |
|---|---|---|
| STREAM NAME UNT to Greenbrier River | LOCATION S-L4 | |
| STATION # _____ RIVERMILE _____ | STREAM CLASS Perennial | |
| LAT 37.673213 LONG -80.729772 | COUNTY Summers | |
| STORET # | AGENCY Edge/Potesta | |
| INVESTIGATORS | | |
| FORM COMPLETED BY AJ | DATE 09/02/2021 TIME 1:28 PM | REASON FOR SURVEY Preliminary Assessment |

**WEATHER CONDITIONS**

| Now | | Past 24 hours |
|---|---|---|
| | storm (heavy rain) | |
| | rain (steady rain) | ☑ |
| | showers (intermittent) | |
| ____% | %cloud cover | ____% |
| ☑ | clear/sunny | |

**Has there been a heavy rain in the last 7 days?** ☑ Yes ☐ No

**Air Temperature** 24 °C

**Other** _____

**SITE LOCATION/MAP**

**Draw a map of the site and indicate the areas sampled (or attach a photograph)**

No assessment, dry stream bed with dense vegetation.

**STREAM CHARACTERIZATION**

**Stream Subsystem** ☑ Perennial ☐ Intermittent ☐ Tidal

**Stream Type** ☐ Coldwater ☑ Warmwater

**Stream Origin**
- ☐ Glacial
- ☐ Non-glacial montane
- ☐ Swamp and bog
- ☐ Spring-fed
- ☐ Mixture of origins
- ☑ Other unknown

**Catchment Area** _____ $km^2$

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

**WATERSHED FEATURES**

**Predominant Surrounding Landuse**
☑ Forest ☐ Commercial
☑ Field/Pasture ☐ Industrial
☑ Agricultural ☐ Other _____
☐ Residential

**Local Watershed NPS Pollution**
☐ No evidence ☐ Some potential sources
☑ Obvious sources

**Local Watershed Erosion**
☐ None ☑ Moderate ☐ Heavy

**RIPARIAN VEGETATION (18 meter buffer)**

**Indicate the dominant type and record the dominant species present**
☐ Trees ☐ Shrubs ☐ Grasses ☑ Herbaceous

**Dominant species present** _____

**INSTREAM FEATURES**

**Estimated Reach Length** _____m

**Estimated Stream Width** _____m

**Sampling Reach Area** _____$m^2$

**Area in $km^2$ ($m^2$x1000)** _____$km^2$

**Estimated Stream Depth** _____m

**Surface Velocity (at thalweg)** _____m/sec

**Stream Dry** ☐

**Canopy Cover**
☑ Partly open ☐ Partly shaded ☐ Shaded

**High Water Mark** _____m

**Proportion of Reach Represented by Stream Morphology Types**
Riffle_____% Run_____%
Pool_____%

**Channelized** ☐ Yes ☑ No

**Dam Present** ☐ Yes ☑ No

**LARGE WOODY DEBRIS**

**LWD** _____$m^2$

**Density of LWD** _____$m^2/km^2$ **(LWD/ reach area)**

**AQUATIC VEGETATION**

**Indicate the dominant type and record the dominant species present**
☑ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

**Dominant species present** jewelweed, smart weed

**Portion of the reach with aquatic vegetation** 70 %

**WATER QUALITY**

**Temperature**_____° C

**Specific Conductance**_____

**Dissolved Oxygen** _____

**pH** _____

**Turbidity** _____

**WQ Instrument Used** No water

**Water Odors**
☐ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

**Water Surface Oils**
☐ Slick ☐ Sheen ☐ Globs Flecks
☐ None ☐ Other_____

**Turbidity (if not measured)**
☐ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

**SEDIMENT/ SUBSTRATE**

**Odors**
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

**Oils**
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

**Deposits**
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

**Looking at stones which are not deeply embedded, are the undersides black in color?**
☐ 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) | 70 |
| Boulder | > 256 mm (10") | | | | |
| Cobble | 64-256 mm (2.5"-10") | 20 | Muck-Mud | black, very fine organic (FPOM) | - |
| Gravel | 2-64 mm (0.1"-2.5") | 60 | | | |
| Sand | 0.06-2mm (gritty) | 20 | 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 UNT to Greenbrier River | LOCATION S-L4 | |
| STATION # _____ RIVERMILE _____ | STREAM CLASS Perennial | |
| LAT 37.673213 LONG -80.729772 | COUNTY Summers | |
| STORET # | AGENCY Edge/Potesta | |
| INVESTIGATORS AJ/MB | | |
| FORM COMPLETED BY AJ | DATE 09/02/2021 TIME 1:28 PM AM PM | REASON FOR SURVEY Preliminary Assessment |

Parameters to be evaluated in sampling reach

| Habitat Parameter | Condition Category | | | |
|---|---|---|---|---|
| | Optimal | Suboptimal | Marginal | Poor |
| **1. Epifaunal Substrate/ Available Cover** ☐ N/A | 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 0 | 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** ☐ N/A | 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 0 | 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** ☐ N/A | 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 |

In stream characteristics not assessed. No water.

## 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 0 | 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)** ☐ N/A | 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 | Left Bank 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| SCORE 7 | 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 | Left Bank 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| SCORE 7 | 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 | Left Bank 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| SCORE 4 | Right Bank 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |

**Total Score** 34

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

| | | |
|---|---|---|
| STREAM NAME UNT to Greenbrier River | LOCATION S-L4 | |
| STATION #_____ RIVERMILE_____ | STREAM CLASS Perennial | |
| LAT 37.673213 LONG -80.729772 | COUNTY Summers | |
| STORET # | AGENCY Edge/Potesta | |
| INVESTIGATORS AJ/MB | | LOT NUMBER |
| FORM COMPLETED BY AJ | DATE 09/02/2021<br>TIME 1:28 PM | REASON FOR SURVEY Preliminary Assessment |

| | |
|---|---|
| **HABITAT TYPES** | **Indicate the percentage of each habitat type present**<br>☑ Cobble 20 % ☐ Snags ____% ☑ Vegetated Banks 70 % ☑ Sand 10 %<br>☐ Submerged Macrophytes ____% ☐ Other ( )____% |
| **SAMPLE COLLECTION** | **Gear used** ☐ D-frame ☐ kick-net ☐ Other _____<br>**How were the samples collected?** ☐ wading ☐ from bank ☐ from boat<br>**Indicate the number of jabs/kicks taken in each habitat type.**<br>☐ Cobble____ ☐ Snags____ ☐ Vegetated Banks____ ☐ Sand____<br>☐ Submerged Macrophytes____ ☐ Other ( )____ |
| **GENERAL COMMENTS** | No samples taken, stream dry. |

dense vegetation in stream

**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 | | | | | | |

SITE ID: S-L4 UNT to Greenbrier River

DATE: 09/22/21

COLLECTOR(S): LJ MB

| Wolman Pebble Count (Reach Wide) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 58 | 119 | 117 | 33 | 3 | 82 | 181 | 19 | 126 | 35 |
| 130 | 15 | 57 | 48 | 115 | 49 | 27 | 49 | 35 | 25 |
| 14 | 18 | 122 | 175 | 38 | 6 | 160 | 56 | 46 | 23 |
| 42 | 4 | 1 | 39 | 28 | 17 | 43 | 1 | 57 | 33 |
| 15 | 181 | 93 | 24 | 165 | 116 | 30 | 126 | 2 | 54 |
| 24 | 39 | 59 | 174 | 5 | 14 | 65 | 33 | 16 | 137 |
| 9 | 24 | 57 | 19 | 1 | 49 | 74 | 138 | 37 | 9 |
| 55 | 83 | 18 | 33 | 96 | 189 | 46 | 99 | 7 | 38 |
| 3 | 2 | 179 | 24 | 159 | 54 | 3 | 27 | 74 | 25 |
| 139 | 20 | 5 | 25 | 43 | 30 | 124 | 37 | 40 | 202 |

NOTES:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

NOTES:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

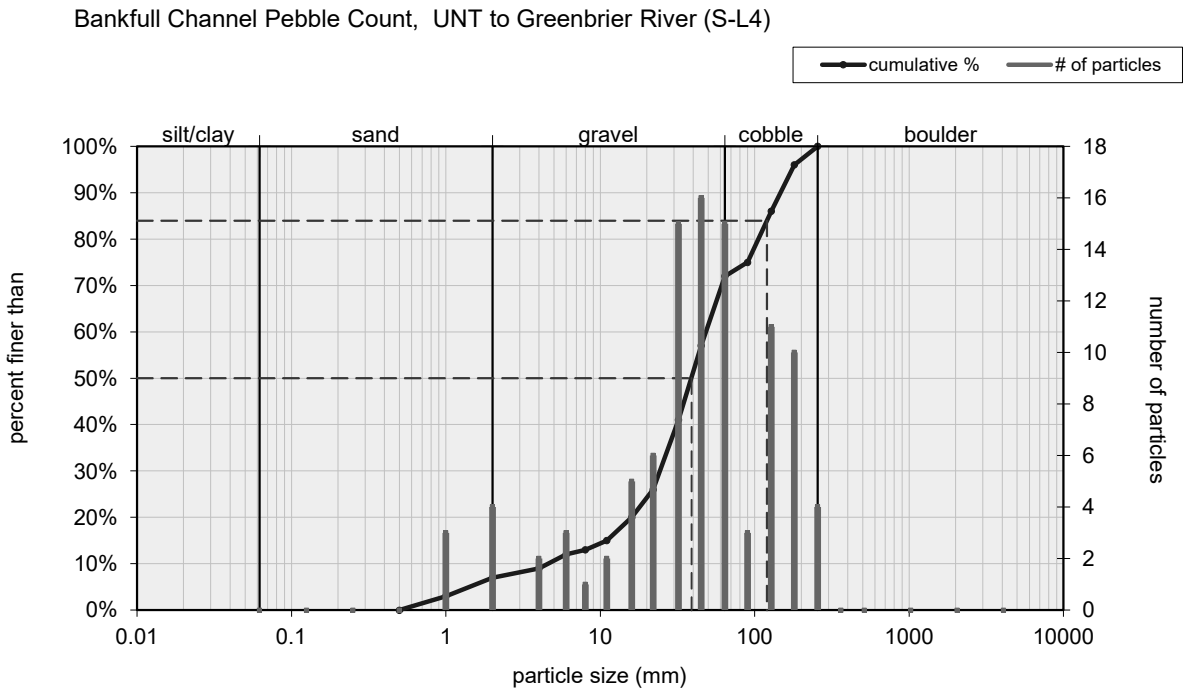
NOTES:

| Inches | PARTICLE | Millimeters | |
|---|---|---|---|
| | Silt / Clay | < .062 | S/C |
| | Very Fine | .062 - .125 | SAND |
| | Fine | .125 - .25 | |
| | Medium | .25 - .50 | |
| | Coarse | .50 - 1.0 | |
| .04 - .08 | Very Coarse | 1.0 - 2 | |
| .08 - .16 | Very Fine | 2 - 4 | GRAVEL |
| .16 - .22 | Fine | 4 - 5.7 | |
| .22 - .31 | Fine | 5.7 - 8 | |
| .31 - .44 | Medium | 8 - 11.3 | |
| .44 - .63 | Medium | 11.3 - 16 | |
| .63 - .89 | Coarse | 16 - 22.6 | |
| .89 - 1.3 | Coarse | 22.6 - 32 | |
| 1.3 - 1.8 | Very Coarse | 32 - 45 | |
| 1.8 - 2.5 | Very Coarse | 45 - 64 | |
| 2.5 - 3.5 | Small | 64 - 90 | COBBLE |
| 3.5 - 5.0 | Small | 90 - 128 | |
| 5.0 - 7.1 | Large | 128 - 180 | |
| 7.1 - 10.1 | Large | 180 - 256 | |
| 10.1 - 14.3 | Small | 256 - 362 | BOULDER |
| 14.3 - 20 | Small | 362 - 512 | |
| 20 - 40 | Medium | 512 - 1024 | |
| 40 - 80 | Large-Vry Large | 1024 - 2048 | |
| | Bedrock | | BDR |

Bankfull Channel

| Material | Size Range (mm) | Count |
|---|---|---|
| silt/clay | 0 - 0.062 | **0** |
| very fine sand | 0.062 - 0.125 | **0** |
| fine sand | 0.125 - 0.25 | **0** |
| medium sand | 0.25 - 0.5 | **0** |
| coarse sand | 0.5 - 1 | **3** |
| very coarse sand | 1 - 2 | **4** |
| very fine gravel | 2 - 4 | **2** |
| fine gravel | 4 - 6 | **3** |
| fine gravel | 6 - 8 | **1** |
| medium gravel | 8 - 11 | **2** |
| medium gravel | 11 - 16 | **5** |
| coarse gravel | 16 - 22 | **6** |
| coarse gravel | 22 - 32 | **15** |
| very coarse gravel | 32 - 45 | **16** |
| very coarse gravel | 45 - 64 | **15** |
| small cobble | 64 - 90 | **3** |
| medium cobble | 90 - 128 | **11** |
| large cobble | 128 - 180 | **10** |
| very large cobble | 180 - 256 | **4** |
| small boulder | 256 - 362 | **0** |
| small boulder | 362 - 512 | **0** |
| medium boulder | 512 - 1024 | **0** |
| large boulder | 1024 - 2048 | **0** |
| very large boulder | 2048 - 4096 | **0** |
| total particle count: | | 100 |
| bedrock | ---------- | |
| clay hardpan | ---------- | |
| detritus/wood | ---------- | |
| artificial | ---------- | |
| total count: | | 100 |

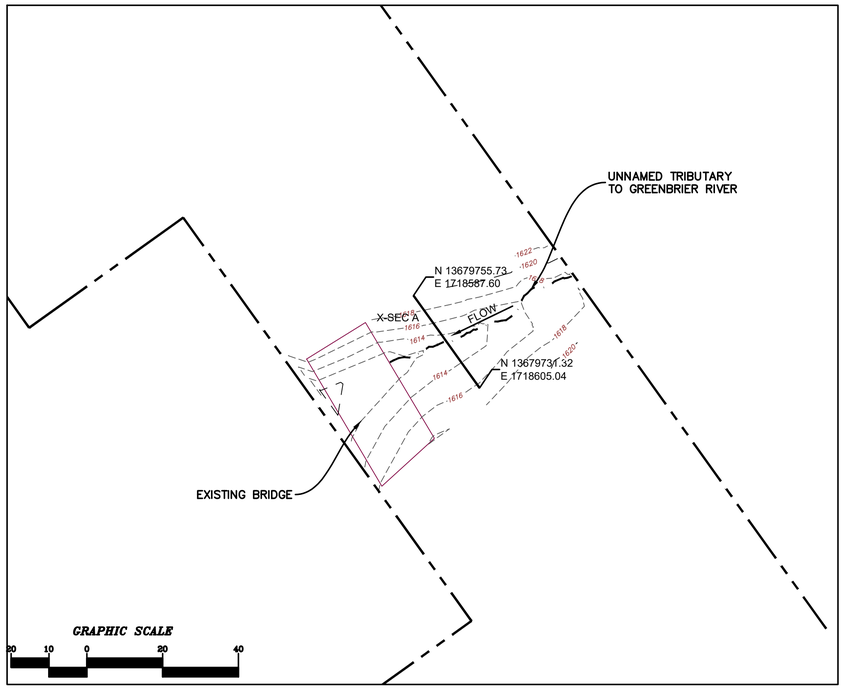
Note:




| Size (mm) | |
|---|---|
| D16 | 12 |
| D35 | 28 |
| D50 | 39 |
| D65 | 54 |
| D84 | 120 |
| D95 | 170 |

| Size Distribution | |
|---|---|
| mean | 37.9 |
| dispersion | 3.2 |
| skewness | -0.01 |

| Type | |
|---|---|
| silt/clay | 0% |
| sand | 7% |
| gravel | 65% |
| cobble | 28% |
| boulder | 0% |




S-L4

NORTH

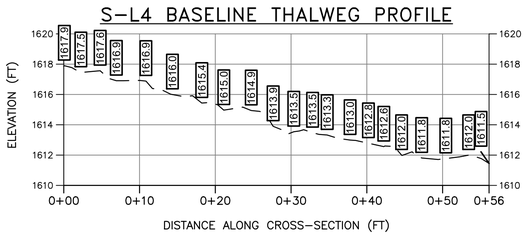
## LEGEND

- STUDY AREA (EASEMENT)
- EXISTING SURVEY-LOCATED THALWEG
- 1176.87 + EXISTING SURVEYED GROUND SHOT ELEVATION

SURVEY NOTES:

1. THIS MAP HAS BEEN ORIENTED TO NAD 1983 UTM ZONE 17N, AND VERTICALLY TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88), USING REAL TIME DGPS. FIELD LOCATIONS WERE COMPLETED ON SEPTEMBER 13, 2021.
2. EASEMENT LINES SHOWN ON PLAN VIEW WERE PROVIDED BY MOUNTAIN VALLEY PIPELINE.
3. SURVEY POINTS FOR CROSS SECTIONS AND THALWEG PROFILES COLLECTED IN 2021 HAVE BEEN USED IN COMBINATION WITH SURVEY POINTS COLLECTED PREVIOUSLY IN 2020 IN ORDER TO GENERATE THE PRE-CROSSING SURFACE SHOWN IN PLAN. DUE TO NATURAL EROSIONAL STREAM PROCESSES THAT CAN OCCUR OVER TIME, MINOR ADJUSTMENTS TO THE PROFILE ALIGNMENTS MAY HAVE BEEN REQUIRED IN ORDER TO GENERATE A CLEAN PRE-CROSSING SURFACE.
4. ALL SECTION VIEWS SHOWN LEFT TO RIGHT FACING DOWNSTREAM.
5. POST-CROSSING SURVEY INFORMATION SHOWN IN RED. DATA PENDING.
6. POST-CROSSING SURVEY POINTS FOR CROSS SECTIONS AND THALWEG ARE PROJECTED ONTO PRE-CROSSING SECTION AND PROFILE VIEWS FOR COMPARISON.

## S-L4 BASELINE THALWEG PROFILE



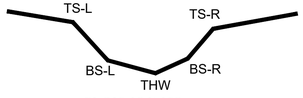

PROFILE LEGEND

EXISTING STREAM PROFILE INVERT ALONG THALWEG

**PROFILE**
**SCALE:** H: 1"=10'
V: 1"=5'

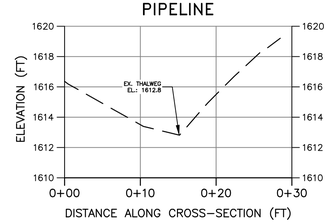
| AS-BUILT TABLE: S-L4 CROSS SECTION A | | | | | |
|---|---|---|---|---|---|
| | PRE-CROSSING | | | AS-BUILT | |
| PT. LOC. | NORTHING | EASTING | ELEV | VERT. DIFF. | HORZ. DIFF. |
| TS-L | 13679724.4500 | 1718603.2740' | 1617.643' | | |
| BS-L | 13679738.3500 | 1718594.7300' | 1613.053' | | |
| THW | 13679743.5700 | 1718595.8440' | 1612.782' | | |
| BS-R | 13679744.1500 | 1718592.8740' | 1613.135' | | |
| TS-R | 13679748.2000 | 1718590.1270' | 1616.242' | | |

TYPICAL 5-POINT CROSS-SECTION
(FACING DOWNSTREAM)




TS: TOP OF SLOPE
BS: BOTTOM OF SLOPE
THW: THALWEG (INVERT)

## S-L4 BASELINE CROSS-SECTION A
PIPELINE




CROSS SECTION LEGEND

- EXISTING GRADE

**CROSS SECTION**
**SCALE:** H: 1"=10'
V: 1"=5'

NOTE: ALL SECTIONS VIEWS SHOWN LEFT TO RIGHT FACING DOWNSTREAM.

PRE-CROSSING PHOTOS

PHOTO TAKEN LOOKING DOWNSTREAM FROM UPSTREAM IMPACT LIMITS



PHOTO TAKEN LOOKING UPSTREAM FROM DOWNSTREAM IMPACT LIMITS

POST-CROSSING PHOTOS

PENDING CROSSING

PHOTO TAKEN LOOKING DOWNSTREAM FROM UPSTREAM IMPACT LIMITS

PENDING CROSSING

PHOTO TAKEN LOOKING UPSTREAM FROM DOWNSTREAM IMPACT LIMITS

PRELIMINARY

PRE-CROSSING

CAD File No. –
Drawn JZ
Checked GH
Approved DW
Scale: NOTED
Date: SEPT. 2021
Project No. 112IC07157

TETRA TECH, INC.
661 ANDERSEN DRIVE FOSTER PLAZA 7
PITTSBURGH, PA 15220
TEL: (412) 921-7090 FAX: (412) 921-4040
E-Mail Address: WWW.TETRATECH.COM

TETRA TECH
www.tetratech.com

Client MOUNTAIN VALLEY PIPELINE, LLC
2200 ENERGY DRIVE, 2ND FLOOR
CANONSBURG, PA 15317

Title PROFILE AND CROSS-SECTIONS
BASELINE SURVEY
CROSSING S-L4 – UNNAMED TRIBUTARY
TO GREENBRIER RIVER (MP 172.02)
SUMMERS COUNTY, WV

Drawing No. 1