

From: [Stahl, Megan D.](#)
To: [Tiernan Lennon](#)
Subject: MVP E&S Plans
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Attachments: [Narrative ESCP WV-stations rev Nov2016.pdf](#)
[Narrative ESCP WV-pipeline rev Nov2016 without attachments.pdf](#)

Tiernan,

As discussed yesterday, the stream crossing methods are described in MVP's site specific E&S plans for the project. These plans include Best Management Practices that will be utilized to protect streams and the resources within them.

WV:

The attached documents provide the narrative portion of the WV E&S plans. The drawings are too large to email, but you can access them on the WV DEP website or I can put them on a disc and mail them if you prefer that.

VA:

The VA E&S plans can be accessed using the following link, under the VADEQ Documents dropdown menu on the left side of the page. Documents are listed by construction spread. Also included is the approved Project Specific Standards and Specifications.

<http://www.Mountainvalleyenergy.com/line/Info/current/news>

Please let me know if you need anything else.

Megan

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Erosion and Sediment Control Plan Mountain Valley Pipeline Project

Wetzel, Harrison, Doddridge, Lewis, Braxton, Webster,
Nicholas, Greenbrier, Fayette, Summers, and Monroe
Counties, West Virginia

Prepared By:
Tetra Tech, Inc.
For



February 2016
Revised November 2016



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Attachments

- 1 Project Location Map
- 2 Special Protected Waters Crossed by MVP
- 3 Slip Mitigation Plan
- 4 Soils Report
- 5 E&S Plan Sheets

1.0 Introduction

Tetra Tech, Inc. (Tt) has prepared this Erosion & Sediment Control Plan (E&SCP) as part of the Stormwater Pollution Prevention Plan (SWPPP) for Mountain Valley Pipeline, LLC (MVP). The Plan addresses activities associated with the Mountain Valley Pipeline Project H-600 (Project) installation. The proposed pipeline will extend from the existing Equitrans, L.P. transmission system and other natural gas facilities in Wetzel County, West Virginia to Transcontinental Gas Pipe Line Company, LLC's (Transco) Zone 5 Compressor Station 165 in Pittsylvania County, Virginia. In addition to the pipeline, the Project will include approximately 171,600 horsepower (hp) of compression at three compressor stations currently planned along the route, as well as measurement, regulation, and other ancillary facilities required for the safe and reliable operation of the pipeline. The pipeline is designed to transport up to 2.0 million dekatherms per day of natural gas.

A site location map is provided in Attachment 1. This E&SCP, if properly implemented, will provide for effective E&SCs throughout construction.

Project Name: Mountain Valley Pipeline Project
Project Start: Lat: 39° 33' 45", Long: -80° 32' 34"
Project End (in WV): Lat: 37° 24' 10", Long: -80° 41' 21"
Counties: Wetzel, Harrison, Doddridge, Lewis, Braxton, Webster, Nicholas, Greenbrier, Fayette, Summers, and Monroe

1.1 Project Description

The pipeline will extend from an interconnection with Equitrans' existing H-302 pipeline near the MarkWest Liberty Midstream & Resources, L.L.C. (MarkWest) Mobley processing facility in Wetzel County, West Virginia and traverse south-southeast to the Virginia border near the town of Lindside. The pipeline then heads in a general southeast direction following the terrain until it terminates at Station 165, near Transco Village, in Pittsylvania County, Virginia. The Project route avoids the U.S. Forest Service Ownership Boundary for the Monongahela National Forest. The pipeline then crosses the Jefferson National Forest (MP 195.3 to 196.9) including the Appalachian National Scenic Trail (between MP 195.4 and 195.5) northwest of the town of Goldbond, Giles County, Virginia.

MVP Proposed Pipeline by County		
Approximate Milepost	County, State	Length (Miles)
0.0-9.6	Wetzel, WV	9.6
9.6-31.5, 32.6-33.6, 37.4-38	Harrison, WV	23.7
31.5-32.6, 33.7-37.3	Doddridge, WV	4.8

MVP Proposed Pipeline by County		
Approximate Milepost	County, State	Length (Miles)
38-65.4	Lewis, WV	27.5
65.5-80.3	Braxton, WV	14.7
80.3-109.8, 110-110.9	Webster, WV	30.0
109.8-110, 110.9-135.4	Nicholas, WV	24.7
135.4-154.2, 154.7-157.2	Greenbrier, WV	21.2
154.2-154.7	Fayette, WV	0.5
157.2-174.3	Summers, WV	16.7
174.3-196.4	Monroe, WV	22.0
Total		196.4

Fifty feet will be maintained as permanent right-of-way (ROW). In general, the construction LOD will be 125 feet, which is needed to provide a safe, non-congested working area. The additional temporary right-of-way will be necessary for the safe travel of construction and maintenance vehicles and equipment as well as stockpiling any additional material that may be encountered during trenching. Given the ruggedness of the terrain and steep slopes, the full 125-foot construction right-of-way will be necessary in forested areas for the safe construction of the Project. At a majority of the wetland and stream crossings, the LOD has been reduced to 75 feet in an effort to reduce impacts to these aquatic resources. Additional Temporary Workspaces (ATWS) are also provided within the limits of disturbance (LOD) to provide areas for vehicle parking, material storage, turning radius along access roads, staging areas, and support areas for stream and wetland crossings. Pipeyards identified for this project will not require any grading other than minor blading to level the surface and provide a base for gravel or matting. MVP will employ special construction techniques where the slopes typically exceed 30 to 35 percent, which may also require expanded workspace areas.

Pipeline construction activities will involve tree removal, clearing and grubbing within the ROW, trenching, pipe installation, and site restoration. All required State and Federal Permits, including USFWS and USACE clearances, will be acquired prior to construction.

There will be three compressor stations and three meter (interconnect) stations for receipt or delivery with other pipelines, these permanent above ground facilities are addressed under a separate SWPPP. Additional ancillary aboveground facilities will include pig launcher and receiver sites at the compressor stations and the beginning and end of the pipeline and meter stations, along with mainline block valve (MLV) sites within the pipeline right-of-way.

stations and the beginning and end of the pipeline and meter stations, along with mainline block valve (MLV) sites within the pipeline right-of-way.

Field investigations identified the availability of previously used roads and other existing roads should be sufficient to provide access to most work areas for the pipeline. Temporary and permanent access roads will be necessary for the safe construction and future operation/maintenance of the Pipeline. In most instances, temporary access roads are already in existence and would only be used during the construction phase of the project. Once construction is complete, the use and ownership of the temporary access roads will be returned to the private landowner. The permanent access roads are necessary for safe operation/maintenance of the pipeline. Through landowner agreements, MVP will be responsible for permanent access road maintenance. The attached Erosion and Sediment Control Plans Construction Sheets identify both the permanent and temporary access roads as either being “Maintained” or “Graded and Maintained”. A “Maintained” access road will only require crushed stone placement and appropriate smoothing if rutting or roadway degradation occurs – widening or significant grading is not anticipated. The sheet flow along the “Maintained” roadway will be controlled using the existing drainage infrastructure. Additional BMPs would be installed as necessary to prevent any off-site movement of sediments. A “Graded and Maintained” roadway may require widening, grading, and/or crushed stone placement. The sheet flow along these roadways will be controlled with drainage channels, broad based dips, and waterbars. Additional BMPs would be installed as necessary to prevent any off-site movement of sediments. New access roads are proposed in limited areas, including to the permanent above-ground facilities. Streams, wetlands, or other aquatic features along the existing access roads will be crossed according to the appropriate detail on the Plan Sheets. Access roads will utilize culverts where they exist and all other streams will be crossed utilizing timber mats, temporary bridging or culverts as dictated by field conditions during construction. Culverts to be replaced were sized using the Rational Formula for a 24-hr 10-year storm and Manning’s Equation. In areas with unexpected drainage, culverts will be appropriately installed and sized according to the Culvert Sizing Chart from the 2006 WVDEP Erosion and Sediment Control Best Management Practice Manual.

This E&SCP has been prepared in accordance with the 2006 West Virginia Department of Environmental Protection (WVDEP) Best Management Protection (BMP) Manual. For more information on the project refer to the E&SCP and Project Location Mapping provided in this report, Attachment 1 and 5.

1.2 Existing Site Conditions and Adjacent Areas

The WV portion of the Project crosses Wetzel, Harrison, Doddridge, Lewis, Braxton, Webster, Nicholas, Greenbrier, Fayette, Summers, and Monroe Counties. Relevant topographic features including streams, streets, pipelines, structures, utility lines, fences, paving and other significant items along the gas line alignment are indicated on the plans and U.S. Geological Survey (USGS) Maps (Attachment 1). The E&S Plan Sheets are provided in Attachment 5 and provide information regarding the typical controls and construction sequence to be followed.

To the extent practicable, the pipeline has been aligned parallel to existing corridors. As currently proposed, the pipeline is aligned parallel to existing utility corridors, trails, and roads for approximately 53 miles to limit additional clearing. Past and present land use of the project area and surrounding area is agricultural, pasture/hay, open space/grassland and forested land. Future land use will be a maintained vegetated natural gas pipeline ROW.

The table below lists the watersheds crossed by this Project. The rainfall zones crossed by this project are 1-Western Plateau, with an annual median rainfall total of 43.7 inches/year and 3-Mountains, with an annual median rainfall total of 52.7 inches/year.

Watersheds Crossed by the MVP Project			
Major Region (2-digit HUC)	Sub-basin (8-digit HUC)	Watershed (10-digit HUC)	County
West Virginia			
Ohio Region (05)	Little Muskingum-Middle Island (05030201) (Mid-Ohio North)	Fishing Creek (0503020102)	Wetzel, Harrison
	West Fork (05020002)	Tenmile Creek (0502000205)	Doddridge, Harrison
	Little Muskingum-Middle Island (05030201)	Headwaters Middle Island Creek (0503020104)	Doddridge, Harrison
	West Fork (05020002)	Middle West Fork River (0502000203)	Doddridge, Harrison
	Little Kanawha (05030203)	Leading Creek (0503020302)	Lewis
	West Fork (05020002)	Upper West Fork River (0502000201)	Lewis
	Little Kanawha (05030203)	Sand Fork (0503020301)	Lewis
	Little Kanawha (05030203)	Upper Little Kanawha River (0503020303)	Braxton, Lewis
	Elk (05050007)	Holly River (0505000703)	Braxton, Webster
	Elk (05050007)	Middle Elk River (0505000706)	Braxton, Webster
	Elk (05050007)	Laurel Creek (0505000702)	Webster
	Elk (05050007)	Birch River (0505000704)	Nicholas, Webster
	Gauley (05050005)	Headwaters Gauley River (0505000503)	Nicholas, Webster
	Gauley (05050005)	Outlet Gauley River (0505000508)	Nicholas
	Gauley (05050005)	Hominy Creek (0505000505)	Greenbrier, Nicholas

Watersheds Crossed by the MVP Project			
Major Region (2-digit HUC)	Sub-basin (8-digit HUC)	Watershed (10-digit HUC)	County
	Gauley (05050005)	Meadow River (0505000506)	Fayette, Greenbrier, Nicholas, Summers
	Lower New (05050004)	Glade Creek-New River (0505000402)	Greenbrier, Summers
	Greenbrier (05050003)	Wolf Creek-Greenbrier River (0505000309)	Monroe, Summers
	Middle New (05050002)	Indian Creek (0505000207)	Monroe
	Middle New (05050002)	East River-New River (0505000206)	Monroe

MVP has reviewed Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for areas crossed by the Project and recorded the location of 100-year flood zones. A summary of 100-year flood zones is listed in the table below.

FEMA-100 year Flood Zones crossed by the MVP Project			
County	Floodplain Waterbody	Flood Zone	Milepost
Wetzel	North Fork Fishing Creek	A	0.7
Wetzel	Price Run	A	5
Harrison	Little Tenmile Creek	AE	15.4
Harrison	Rockcamp Run	A	18.8
Harrison	Indian Run	A	23
Harrison	Salem Fork	A	25.9
Doddridge	Laurel Run	AE	34.8
Lewis	Right Fork Freemans Creek	A	42.5
Lewis	Left Fork Freemans Creek	A	45.8
Lewis	Sand Fork	A	55.1
Lewis	Indian Fork	A	58.5
Lewis	Oil Creek	A	62.2
Braxton	Falls Run	A	72.4
Braxton	Little Kanawha River	A	74.9
Webster	Left Fork Holly River	A	81.6
Webster	Oldlick Creek	A	82.3

Webster	Right Fork Holly River	A	84.1
Webster	Elk River	A	87.3
Webster	Camp Creek	A	93.1
Webster	Amos Run	A	97.6
Webster	Lost Run	AE	98.6
Webster	Laurel Creek	AE	98.9
Webster	Strouds Creek	AE	110.1
Nicholas	Big Beaver Creek	A	114.3
Nicholas	Big Beaver Creek	A	116.2
Nicholas	Gauley River	A	118.9
Nicholas	Hominy Creek	A	126.9
Greenbrier	Meadow Creek	A	140.4
Greenbrier	Meadow River	AE	144
Greenbrier	Little Sewell Creek	A	147
Greenbrier	Buffalo Creek	A	154.8
Greenbrier	Morris Fork	A	155.8
Summers	Hungard Creek	A	169.9
Summers	Greenbrier River	AE	171.4
Summers	Kelly Creek	AE	171.6
Monroe	Indian Creek	A	182.8
Monroe	Hans Creek	A	187.6
Monroe	Dry Creek	A	192

1.3 Critical Areas

Waterbodies

It is anticipated that all stream and wetland impacts within the pipeline limit-of-disturbance will be temporary, occurring during pipeline construction activities. Wetlands within the LOD but not within the pipeline trench area will be covered with timber mats during construction. Once construction in these areas is complete and the crossings are no longer necessary, the mat(s) will be removed and the resource restored and protected with the appropriate BMPs. These temporary resource impacts will not result in an adverse impact to water quality, physical or biological habitat, or aquatic species within the Project area due to the temporary stream crossing construction activities and implementing the Erosion and Sedimentation Control Plan's best management practices. The methods used includes silt fence, compost filter sock (CFS), and/or reinforced filtration devices and permanent vegetative cover. MVP will obtain all necessary local, state, and federal permits. MVP will obtain necessary clearance from county floodplain coordinators for temporary impacts within 100-year FEMA floodplains. In an effort to reduce permanent impacts, the existing culverts will not be replaced and will be spanned if necessary.

Some of the watersheds crossed by the Project are classified as Tier 3, warm water or trout streams, refer to attached table in Attachment 2. In-stream work in designated warm water streams and their adjacent tributaries is restricted during the fish spawning season of April – June. In-stream work in designated trout waters and their adjacent tributaries is restricted during the spawning season September 15-March 31st. Refer to Table 1 in Attachment 2 for a listing of affected streams. MVP may request a waiver from the West Virginia Division of Natural Resources, Wildlife Resources Section to avoid this restriction. In stream work may occur during the respective spawning season in ephemeral waters without a waiver if all reasonable measures are taken to minimize turbidity and sedimentation downstream associated with the proposed project.

Additional protective measures will be employed at crossings of and in proximity to Tier 3 and trout streams (refer to Table 1 in Attachment 2) such as:

- The use of reinforced filtration devices (defined as belted silt retention fence, triple stacked compost filter sock and/or super silt fence) at all downslope perimeters.
- Stream crossings in these areas will be completed within 72 hours once the crossing has begun.
- Permanent seeding and mulching must be accomplished within 4 days of reaching final grade.
- Temporary seeding and mulching must be accomplished within 4 days when areas will not be disturbed for more than 14 days.
- Disturbance will be limited as much as practicable.

MVP will pay special attention to the crossing of North Fork Fishing Creek (mile post 0.5) as requested by West Virginia Division of Natural Resources, Wildlife Resources Section. In order to limit potential impacts to downstream aquatic life, MVP will reduce the construction ROW to 75 feet and will keep temporary workspace areas 50 feet from this stream. Super silt fence or compost filter sock will be installed to limit sedimentation from leaving the worksite. Other Best Management Practices will be the use of timber mats for temporary vehicle crossing and trench plugs on either side of the stream.

Construction across waterbodies will be performed in a manner that minimizes the amount of time that the pipeline trenches will be left open. Construction methods at waterbody crossings will vary with the characteristics of the waterbody encountered. Typical stream crossing details are provided in the details section of the E&SCPs. Proposed methods for waterbody crossings include: dam and pump, flume, cofferdam and open-cut.

Intermediate waterbodies (between 10 and 100 feet wide at water's edge) and minor waterbodies (less than 10 feet wide at water's edge) will be crossed by the open-cut/conventional lay or dry ditch crossing methods, unless otherwise required. Where a dry-ditch crossing method is not specifically required by the FERC Procedures, the waterbody may be crossed using the open-cut crossing method.

The pipeline will be installed to provide a minimum of four feet of cover from the waterbody bottom to the top of the pipeline, except in consolidated rock, where a minimum of two feet of cover will be required. Trench spoil will be placed on the bank above the high water mark for use as backfill. Major

waterbodies (over 100 feet wide at water's edge) have been assessed on a case by case basis to determine the best crossing method and site specific construction and restoration plans. MVP proposes to use cofferdam construction open cut-dry ditch method to cross the Elk River, Gauley River, Meadow River and Greenbrier River.

Some waterbodies crossed by the Project are directly associated with or adjacent to roads or railroads. Where these roads or railroads are to be crossed using a horizontal boring machine, the waterbody will typically be included within the length of the bore. Currently, due to constructability issues, there are no HDDs planned for MVP.

West Virginia State Land

The Project crosses the Burnsville Lake Wildlife Management Area (WMA) in Braxton County, West Virginia at approximate MP 68.8 for approximately 175 feet. The Burnsville Lake WMA is a 12,579-acre wildlife area that is managed by the West Virginia Division of Natural Resources (WVDNR) and is used for hunting, fishing, and camping (WVDNR 2015). Within the Burnsville Lake WMA, the Weston Gauley Bridge Turnpike is a hiking trail listed on the National Park Service's National Recreation Trail Register and the National Register of Historic Places. This trail is located in Braxton County, West Virginia and would cross the pipeline route at MP 72.9 adjacent to Barbecue Run and Left Fork Knawl Creek. The area is remote and heavily forested. MVP plans to bore the Weston Gauley Bridge Turnpike trail therefore impacts to users of the trail are expected to be temporary and minimal.

The Project passes within 0.3 mile of the Elk River WMA and within 0.4 mile of the Big Ditch WMA. Both of these areas are USACE-owned wildlife areas that are managed by the WVDNR. The Elk River WMA is an 18,225-acre site in Braxton County, West Virginia that is managed for hunting, fishing, and camping. The Big Ditch WMA is a 388-acre site in Webster County, West Virginia that is managed for hunting and fishing (WVDNR 2015). Due to the distance from these WMAs, impacts are not expected due to construction or operation of the Project.

The proposed route is located more than 1.3 miles from the Meadow River WMA; however, a laydown yard would impact 0.3 acre of this WMA during operation. No impacts are expected during operation of the Project.

The North Bend Rail Trail (NBRT), part of the American Discovery Trail, is a 72-mile, multi-use recreational trail operated by the West Virginia State Park system. The pipeline will cross the trail at MP 26.0 where the trail crosses under US Route 50. In addition to the pipeline there will be a temporary construction laydown yard and a temporary work area directly adjacent to the trail. There is a potential that the eastern and northeastern edges of the laydown yard could overlap the trail. Temporary impacts on trail users may also include noise and visual disturbance from construction equipment while in the vicinity of the trail crossing. Users of the trail during operation of the pipeline would not be impacted. Mitigation measures during construction may include flagging of work zones, signage for trail users, and temporary trail re-route. MVP will work with the West Virginia State Park system during final pipeline design to identify site-specific measures if needed to minimize disturbance to users of the North Bend Rail Trail in this vicinity.

Steep Terrain

In mountainous areas where the pipeline will encounter steep side slopes, MVP will employ special construction techniques where the slopes typically exceed 30 to 35 percent. Slopes of 30° or greater are identified on the attached plan sheets. In addition, MVP has developed details for potential mitigating measures which are included on the plan sheets and described in Attachment 3 – Slip Mitigation Plan. However, implementing the specific controls should be reviewed by geotechnical engineer before being installed. The steep terrain construction techniques will require expanded workspace areas. In rugged terrain, temporary sediment barriers, such as silt sock and reinforced silt fences will be installed during clearing to prevent movement of sediment off of the right-of-way. In addition, temporary slope breakers may be installed during grading in accordance with the E&SCP to reduce water runoff or divert water areas away from the disturbed areas. Construction activities on rugged terrain will be similar to the typical construction methods; however, equipment will be tethered via winch lines to other equipment at the top of the slopes to ensure the safety of the construction personnel and surrounding areas.

Karst

MVP has completed a karst hazard assessment and determined that portions of pipeline within Summers County will cross areas with the potential to contain karst features. MVP has made route adjustments to avoid areas containing dense concentrations of features, such as sinkholes, which are indicative of karst development; however, the route may encounter areas of karst geology that are not readily identifiable until construction activity. MVP will have a geotechnical contractor on site daily for construction in karst areas, which is further documented in the Karst Mitigation Plan. The contractor will be able to immediately identify potential problematic features and direct crews to immediately employ mitigation measures as needed. During construction, erosion and sediment controls will be installed along the edge of the construction right-of-way and other work areas upslope of known sinkholes or other karst features with a direct connection to the phreatic zone of the karst (i.e., groundwater).

To minimize the potential for impacts to a karst feature (e.g., sinkhole, cave opening, etc.) or a water resource (e.g., well, spring, stream, pond) from pipeline construction in karst areas, industry-standard ESC practices will be supplemented with enhanced BMPs to accomplish the following objectives:

- Minimize the volume of stormwater and other construction-related surface water run-off;
- Minimize the permanent alteration of land surface characteristics and surface runoff patterns (existing drainage patterns and features should be taken into consideration to minimize changes to the rate that water enters the subsurface through a karst feature);
- Promote broad and shallow surface water flow dispersion with suitable spreading or diversion techniques;
- Prevent uncontrolled release of surface water and sediment to a waterbody or karst feature;
- Prevent artificial routing of storm water to karst features;
- Prevent blockage or filling of karst features;
- Do not construct artificial storm water structures within karst features;
- Prevent disposal of materials into a karst feature that will degrade the quality of water entering the subsurface through karst feature;

-
- Install double lines of sediment control fencing upslope of a water body or karst feature;
 - Stock pile excavated material at least 100 feet from a water body so that the material cannot slough back into these areas;
 - Monitor ESC and stormwater management structures periodically during construction, and particularly after precipitation events (stormwater and ESC structures include sediment control fencing, temporary detention basins, diversion berms, or containerization - clean, repair, and replace structures as necessary);
 - Do not discharge hydrostatic test water in karst areas;
 - Establish staging areas for the crew, equipment, hazardous materials, chemicals, fuels, lubricating oils, etc., at least 100 feet from a water body or karst feature;
 - Install ESC and stormwater management structures surrounding staging areas to prevent run-on to, and then run-off and sediment migration from these sites;
 - Store construction waste materials, debris, and excess materials at least 100 feet from a water body or karst features;
 - Refuel and maintain construction equipment at least 100 feet from a water body or karst feature;
 - Limit the removal of riparian vegetation to only when it is necessary;
 - Re-vegetate all disturbed areas as soon as possible after construction using only native plants to reduce soil erosion. Annual species, such as rye or wheat, may initially be planted along with native species in areas subject to immediate soil loss, such as a steep slope, to provide rapid erosion control. Final re-vegetation should use native species only;
 - Replace woody riparian vegetation unavoidably lost using native riparian plants to help prevent the spread of invasive plants;
 - Where possible and practical, leave a minimum of 100-foot wide natural vegetated buffer area around a water body or karst feature. Plant a vegetative buffer of at least 100 feet around a waterbody or karst feature if the vegetation was previously cleared;
 - Apply fertilizers, herbicides, pesticides, or other chemicals no closer than 100 feet of a waterbody or karst feature;
 - Evaluate the establishment of vegetation after project completion and inspect all sediment control structures at one month intervals for at least 3 months. Retain sediment control structures until site stabilization is achieved;
 - Remove and dispose of all debris and excess construction materials properly upon project completion;
 - Remove temporary sediment/erosion control structures upon final site stabilization;
 - Clay dams or breakers should be included in pipeline installation design and constructed at appropriate intervals along the trench excavation to impede subsurface flow along the trench.

If karst features are uncovered, they will be evaluated by Karst Specialists to determine the need for mitigation measures, such as stabilization. A typical mitigation method for a sinkhole would be to excavate the feature to expose its throat, and then plug the throat using graded rock or sand fill to allow drainage and minimize alteration of flow patterns. The restoration of the pipeline and temporary work space LOD to a meadow condition or better. As a result of restoring these areas to a meadow in good condition and

maintaining pre-construction drainage patterns, there will be no increase in stormwater runoff rate or volume to karst features.

1.4 Soils

Project soils information was obtained from the Natural Resources Conservation Service (NRCS) Mapping Web Site, which utilizes data from the NRCS Soil Survey. The soils are listed in Attachment 4 which lists the soils potentially encountered within the project limits along with the limitations of each soil type.

2.0 Construction Sequence

Refer to the E&SC Plan drawings for the location of the proposed work and the associated BMPs. A generalized construction sequence is provided below. The construction sequence is intended to provide a general course of action in order to conform to the applicable regulatory agency requirements for temporary and permanent soil E&SCs. Necessary parts for proper and complete execution of work pertaining to this plan, whether specifically mentioned or not, are to be performed by the contractor. It is not intended that the drawings and this report show every detailed piece of material or equipment. The contractor will comply with all requirements listed in this section. The contractor may be required to alter controls based on effectiveness of controls or differing conditions encountered in the field. A copy of the SWPPP must be available at the Project site at all times.

1. At least 3 days prior to starting any earth disturbance activities, all contractors involved will notify Miss Utility of WV by calling 811 or 1-800-245-4848.
2. Install temporary erosion and sediment (E&S) controls prior to earth disturbance. Refer to best management practices (BMP) install and removal notes sheet. The appropriate BMPs should be placed around sensitive areas prior to earth disturbance. Stone construction entrances are to be provided at all locations where access roads and pipelines will be accessing or crossing a public roadway.
3. Install temporary E&S controls for stream crossings at locations shown on the E&S plans sheets. No earth disturbance activities within 50 feet of stream channels will be performed until materials needed to complete the crossing are at the location.
4. General clearing and grubbing of the trees and brush along the ROW for pipeline trenching may commence to the width specified in the ROW agreements or construction alignment sheets, whichever is less. Smaller debris such as shrubs and limbs are to be chipped and utilized on-site as part of the soil stabilization. Unless otherwise directed by the landowner, logs will be either hauled off-site or given to the landowner upon their request; stumps and/or logs will be ground, chipped, windrowed, or hauled off-site.
5. Install temporary waterbars immediately after initial disturbance of the soil in accordance with the waterbar spacing and sizing requirements shown on the plan and detail sheets. Waterbars will be constructed of soil, and used to reduce runoff velocity and divert water off the pipeline ROW. Waterbars will be installed with compost filter sock at the discharge end.

6. Excavate pipeline trench and begin grading of proposed meter and rectifier anode bed sites. The proposed construction ROW and extra workspaces are to be used as a work area for trench excavation, equipment movement and the temporary storage of soil stockpiles, as needed. Equipment, soil stockpiles and other materials are to remain upslope of BMPs during construction activities. Refer to BMP installation and removal sequence for the BMPs to be used for the protection during trench excavation and around temporary soil stockpiles. Segregation of topsoil and subsoil will be formed where trench excavation takes place in an agricultural, wetland, or residential area.
7. Pipeline sections will be transported to the work area and strung along the working side of the ROW parallel to the trench line. Welding can occur in or out of the trench. The pipeline will be bent to conform to the trench contour and placed on temporary supports alongside the trench. Welds will be visually and radio-graphically inspected and repaired as necessary. The pipe section will be lowered into the trench and placed on padding per MVP construction standards. Any wetness encountered during construction work will be dewatered by using pumps, hoses, and pumped filter (dewatering) bags, and will be discharged to a well vegetated, upland area. No standing water is permitted in the pipe trench, except in wetland areas.
8. Stream pipeline crossing construction methods will be installed at locations shown on the E&S plan sheets and as specific on detail sheet. Stream bank stabilization will be installed immediately following completion of pipeline installation as shown on the attached detail sheet.
9. Install trench breakers at locations shown on the drawings or as directed by MVP or as specified on the detail sheet.
10. The trench will subsequently be backfilled with suitable excavated material. The backfill material will be slightly crowned in upland areas to allow for settlement that may occur. Crowning the soil slightly over the pipeline will help prevent future storm water-related problems from settling of the backfilled area. No crowning of soils will take place in wetlands, streams or floodplains. In areas where topsoil has been segregated, the subsoil will be replaced first, and then the topsoil will be spread over the area from which it was removed. Disturbed areas will be restored to their approximate original topographic contours.
11. Stabilize exposed and unworked soils by application of effective BMPs that protect the soil from the erosive forces of raindrops, flowing water, and wind. Areas at final grade should be seeded and mulched or otherwise stabilized within 7 days and areas that will not be worked again for 21 days or more must be seeded and mulched or otherwise stabilized within 7 days.
12. In the unlikely event that there are excess excavated materials remaining after the trench has been backfilled, the material is to be disposed of within the existing ROW in an upland area outside of the 100-year floodplain. Material will be spread in a thin layer and tied into existing contours to create positive drainage for stormwater runoff.
13. Construct permanent waterbars after completion of grading in accordance with the waterbar spacing and sizing requirements shown on plan and detail sheets. Permanent waterbars are not permitted in agriculture or pasture lands.
14. Revegetated disturbed area per tables in Section 11.0 or per landowner request. For 3:1 or steeper slopes the disturbed area will have erosion control fabric (blanketing, hydroseeding,

-
- Flexterra, or approved equal) installed as shown on the detail sheet. Blanketing is not permitted in agriculture or pasture lands.
15. Re-establish appropriate drainage in existing road channels prior to seeding and mulching.
 16. Inspection of all erosion and sedimentation controls within disturbed areas will be, at a minimum, performed once every seven calendar days and within 24 hours after any storm event greater than 0.5 inches per 24 hours period. Repairs or maintenance shall be performed immediately to BMPs. A final inspection shall be requested once there is uniform, perennial 70 percent vegetative stabilization. The 70 percent requirement refers to the total area vegetated. Disturbed areas not attaining a uniform, perennial 70 percent vegetative coverage shall be re-seeded as needed until uniform, perennial 70 percent vegetative coverage is established.
 17. All pollutants, including waste materials and demolition debris that occur on site during construction shall be handled and legally disposed of in accordance with state and federal regulations. Woody debris may be chopped and spread on-site.

For stream crossings, refer to the following steps and Section 3.3.1:

1. Install temporary equipment bridge, bypass hose, flume, pump, or cofferdam as described in Stream Crossing details around the work area.
2. Dewater work area utilizing pump water filter bags. Where possible, excavation will be from the top of the stream bank. Stockpile stream bed material separately from other soils to be used during stream restoration activities.
3. Install trench plugs, pipe, and backfill. Stockpiled stream bed material will be the last material restored in the stream channel.
4. Stabilize channel excavation and stream banks prior to redirecting stream flow.
5. Remove bypass hose, flume, pump, and temporary dam as needed.

Additional protective measures will be employed at crossings of Tier 3 and trout streams (refer to Table 1 in Attachment 2) such as:

- The use of reinforced filtration devices (defined as belted silt retention fence, triple stacked compost filter sock or super silt fence) at all downslope perimeters.
- Stream crossings in these areas will be completed within 72 hours once the crossing has begun.
- Permanent seeding and mulching must be accomplished within 4 days of reaching final grade.
- Temporary seeding and mulching must be accomplished within 4 days when areas will not be disturbed for more than 14 days.
- Disturbance will be limited as much as practicable.

If working within a wetland area, follow the generalized construction sequence below:

1. Install either RFDs or compost filter socks along the perimeters of the site as shown on the construction drawings.

2. Mats, pads, or similar devices will be used during the crossings of wetlands. Original grades through wetlands must be restored after trenching and backfilling. Any excess fill materials must be removed from the wetland and not spread within wetlands.
3. Soil excavated from wetland areas will be carefully removed with the roots intact. This soil should be placed in a separate stockpile to be reused during the wetland surface restitution.
4. Dewater work area utilizing pump water filter bags.
5. Install pipe.
6. Install trench plugs in wetland areas to prevent the trench from draining the wetland or changing its hydrology.
7. Backfill pipe trench. Backfill the top 12-inches of the excavated trench with the stockpiled wetland soil to match original surface grades.
8. Compact backfill and grade the surface of the trench area to allow for positive drainage to soil E&SCs and to prepare disturbed areas for permanent trench restoration.
9. Maintain all E&SCs devices until site work is complete and a uniform 70-percent perennial vegetative cover is established.
10. Remove all soil and E&SC measures upon establishment of a uniform 70-percent vegetative cover over the disturbed area. Re-grade and revegetate areas disturbed during the removal of the soil E&SCs.

3.0 Erosion and Sediment Control Measures

General stabilization and structural controls will be used in sediment and erosion control practices to 1) divert stormwater flows away from exposed areas, 2) convey runoff, 3) prevent sediments from moving off-site, and 4) reduce the erosive forces of runoff waters.

1. Mark Clearing Limits

Clearing limits will be staked and visibly flagged prior to construction. Adjacent sensitive areas and no-access roads will utilize signage and/or orange construction fence.

2. Establish construction access

The majority of access to the site will be via existing access roads. Access roads will include the installation of a stabilized rock construction entrance to remove sediment prior to exiting the site. Stabilized construction entrances will follow the WVDEP standard detail provided in the BMP manual. In instances where there are private residential driveways along the access roads, the stabilized construction entrance has been moved past the residential driveways. This was done to prevent the residences from driving over the rock construction entrances.

3. Install sediment controls

The E&SC Plan utilizes several best management practices throughout the project area to prevent sediment from leaving the site. As depicted on the plans, controls will be placed along the boundary of

sensitive areas, at stream and wetland crossings, downslope of all stockpiles, and where the potential exists for off-site sediment transport. The BMPs to be used throughout this project include:

- Rock Construction Entrance
- Temporary ROW Diversion Berm and Sediment Trap Outlet
- Silt Fence, Super Silt Fence and Belted Silt Retention Fence
- Compost Filter Sock
- Waterbars
- Trench Plugs
- Pumped Water Filter Bag
- Erosion Control Blanket/Flexterra/or equivalent
- Vegetative Stabilization

Instream BMPs

If a stream crossing or encroachment is required, work will be in accordance with state and federal permits. Refer to E&SC detail sheets for stream crossing details. Procedures that will be followed at stream crossing locations include the following:

- Minimize clearing and grubbing of vegetation up to streams, as possible, until the time of pipeline installation.
- Only that area which is required for pipeline installation shall be disturbed within the proposed LOD at stream crossings;
- Locating staging areas 50 feet away from the stream, where possible;
- Storing chemicals, storing equipment, washing equipment, or refueling equipment must be done in areas that are greater than 100 feet away from stream;
- Spoil placement and BMPs will be monitored at all times during stream crossing procedures; once work within a stream area is started, it will be conducted continuously to completion, emphasis will be placed on minimizing time of disturbance
- Construction activities will be scheduled so that the trench is excavated immediately prior to pipe laying activities. The duration of construction within each waterbody will be limited to 24 hours for minor waterbodies (10 feet wide or less) and 48 hours for intermediate waterbodies (greater than 10 feet wide but less than or equal to 100 feet in width).
- Spoils from stream crossings must be placed at least 10 feet from the water's edge; and
- Construction equipment will not be allowed in the stream channel when excavation can be done from either side or a temporary crossing while working at the stream crossing.

Dry Crossing Techniques

These techniques will be used to perform pipeline work in a relatively dry working condition or around the open excavation. These techniques include dam and pump around and flumed crossings, however the process is limited by stream size, flow, and water depth. Larger streams with greater flow or width that require dry working conditions will utilize cofferdam construction.

E&S control measures will be installed prior to any earth disturbance and addressed if necessary immediately after disturbance of the waterbody.

- **Flume Pipe Method.** Please see detail sheets for a detail of the flume method. This procedure involves construction two bulkheads, either sandbags or plastic dams, to direct the stream flow through a flume pipe placed over the trench prior to excavation. The flume shall be aligned as to prevent bank erosion and bed scour. The flume will not be removed during trenching, pipe laying, or backfilling.
- **Pump Around Method.** Please see the detail sheets for a detail of the dam and pump method. This procedure involves construction two bulkheads, either sandbags or plastic dams. The upstream dam will cause the water to pond where it can be pumped around the work area and be discharged behind the downstream bulkhead. Pumps of sufficient size to transmit the flow downstream will be used. Backup pumps must be on-site. Pump intakes must be screened. Pump discharges must not cause scour.
- **Cofferdam –** Please see the detail sheets for a detail of the cofferdam construction method. This procedure involves constructing a cofferdam around a portion of the stream crossing utilizing a combination of, but not necessarily all, sand bags, jersey barriers and stone. Following the installation of the cofferdam the water within the work area is pumped through a discharge filter bag and the construction will proceed with installation of the pipe in the dry open ditch. Following installation of the section of pipe the stream bed is restored, water is re-introduced to the work area and the cofferdam is removed. Then construction moves to the opposite-uncompleted side of the stream and the process is repeated to complete the crossing.
- **Portadam™** - Please see the detail sheets for a detail of the Portadam™ (or equivalent) construction method. This procedure is similar to the Cofferdam procedure and involves installing a Portadam™ (or equivalent) structure. Following the installation of the structure, the water within the work area is pumped through a discharge filter bag. The construction will proceed with installation of the pipe in the dry open ditch. Following installation of the section of pipe the stream bed is restored, water is re-introduced to the work area and the cofferdam is removed. Then construction moves to the opposite-uncompleted side of the stream and the process is repeated to complete the crossing

Stream Bank Stabilization

Permanent stabilization shall occur immediately upon installation, backfilling, and grading at each stream crossing.

Temporary Stream Crossings

Temporary stream crossings, consisting of bridges of timber mats or clean rock fill and flume(s), will be installed to cross minor or intermediate streams. Timber mats shall be used to cross smaller streams

where the span of the mat will stretch from bank to bank. Clean rock fill and flumed crossings will be utilized where it is not feasible to utilize timber mats. As an alternative, portable bridges may be used instead for small crossings. Equipment will not be allowed to ford flowing streams during construction activities. Temporary road crossings of streams must maintain adequate flow downstream.

4. Stabilize Soils

After pipeline installation, previously excavated material will be used to backfill the pipeline trench and restore the grade to pre-excavation conditions. The first 12 inches above the top of the pipe will be clean fill free of rocks from the excavation; where the previously excavated material contains large rocks or other materials that could damage the pipe or coating, clean fill will be used to protect the pipe. If additional fill is required, it will be either flowable fill or topsoil.

To prevent mixing of the soil horizons or incorporation of additional rock into the topsoil, topsoil segregation (topsoil set in a separate pile) will be performed in non-saturated wetlands, croplands, pastures, hayfields, and in areas requested by the landowner. Implementing proper topsoil segregation will help ensure post-construction revegetation success, thereby minimizing loss of crop productivity and the potential for long-term erosion problems. Up to 12 inches of topsoil will be removed from the ground surface, segregated, as appropriate, from all subsoil and replaced in the proper order during backfilling and final grading. Where topsoil is less than 12 inches deep, the actual depth of the topsoil will be removed and segregated. Segregated topsoil will be placed in the trench following subsoil backfilling. Topsoil segregation may not be practical in saturated wetlands with standing water.

The plans specify the utilization of temporary and permanent seed mixes, mulching and lime in accordance with the WVDEP BMP Manual (refer to Section 11.0).

Any additional subsoil material from pipeline trenching activities will be spread thinly (2-3 inches) along the ROW and within the disturbance limits in upland areas and revegetated. Additional material may not be placed within wetlands and streams. After installation of the pipeline, the site will be restored to approximate original contour and revegetated to a meadow condition with no proposed impervious surfaces. Waste/borrow sites are not anticipated to be utilized. Waste material not suitable for on-site stockpile or backfill, or excess soil that cannot be used on-site will be disposed of at a WVDEP approved waste disposal facility with an approved E&SCP.

Permanent above ground facilities for compressor stations and interconnect sites will be addressed under a separate SWPPP.

5. Protect Slopes

MVP will employ special construction techniques where the slopes typically exceed 30 to 35 percent. Slopes that of 30 degrees or greater are identified on the attached plan sheets. In addition, MVP has developed details for potential mitigating measures which are included on the plan sheets and described in Attachment 3 – Slip Mitigation Plan.

The E&SC Plan depict placement of erosion control blanket/soil stabilization matting (or approved equivalent such as hydromulching) on all slopes greater than 20-percent. Plan details provide for installation of slope matting according to manufacturer specifications.

Waterbars (ROW Diversions) are depicted on the plans and are placed along the pipeline following spacing specification in the WVDEP BMP Manual. The waterbar discharge will be controlled by outlet protection such filter socks.

6. Convey Stormwater in a Non-Erosive Manner

The pre-construction drainage patterns surrounding the project will be maintained. All disturbed areas within the pipeline LOD will be restored to a meadow in good condition. As a result of restoring the pipeline LOD and associated workspaces to a meadow in good condition and maintaining pre-construction drainage patterns, there will be no increase in stormwater runoff rate or volume.

Permanent above ground facilities for compressor stations and interconnect sites will be addressed under a separate SWPPP.

7. Control Other Pollutants

The operator will remove from the site, recycle, or dispose of all building materials and wastes in accordance with the WVDEP BMP Manual. The contractor will not illegally bury, dump, or discharge building material or wastes at the site. Sediment removed from BMPs will either be spread in a protected area to dry and then recycled as fill material or disposed of off-site. In cases where disposal is necessary, waste materials are to be disposed of at an approved WVDEP waste disposal facility in accordance with state and federal regulations.

8. Control Dewatering

Localized trench dewatering will be in accordance with the WVDEP BMP manual and recommendations. Dewatering will occur with a dewatering filter bag and will outfall to a well-vegetated area or through a filter sock outlet protection. Trench plugs will be used to prevent the excavation from draining or changing the hydrology of water resources. Discharges from upland dewatering should not occur within wetlands or on streambanks.

9. Maintain BMPs

Temporary and permanent E&S control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with West Virginia DEP, Division of Water and Waste Management, Erosion and Sediment Control Best Management Practice Manual, 2006.

E&SCs on the site will be inspected at least once every seven calendar days and within 24 hours after any storm event equal to or greater than 0.5 inches of rain per 24-hour period.

Repairs or maintenance shall be performed immediately to BMPs.

All public and private roads adjacent to a construction entrance must be inspected and cleaned of debris originated from the construction site as necessary.

Specific maintenance will include:

Rock Construction Entrance – thickness of the stabilized construction entrance will be constantly maintained to the specific dimensions by adding rock as needed. The entrance will be cleaned and redressed when voids become choked with mud and sediment.

Compost filter sock/silt fence - accumulated sediment will be removed as required, and in all cases where uniform accumulations are $\frac{1}{2}$ the above ground height of the filter sock/fence. Any accumulated earth behind the filter sock/fence will be disposed of by the Contractor in such a manner that the removed earth will not be excessively eroded and transported into a waterbody or wetland.

The filter sock/fence installation should be inspected weekly and within 24 hours after any storm event greater than or equal to 0.5 inches of rain per 24-hr period. Loosened support stakes will be removed and new stakes driven. Filter socks/fence will be maintained and repaired as per manufacturer specifications.

Cross drain culverts with outlet protection – cross drain culverts with outlet protection should be inspected weekly and within 24 hours after any storm event greater than or equal to 0.5 inches of rain per 24-hr period. They should be maintained to ensure that the culvert inlet is free of debris so as to allow for proper flow. Damaged culverts and/or outlet protection should be repaired or replaced immediately.

Erosion Control Blanket – the erosion control blanket will be checked for torn or loose stapled areas.

Vegetative Stabilization – vegetative stabilization will be periodically inspected for proper growth. Any areas not responding will be promptly reseeded. Areas which show signs of erosion prior to stabilization will be re-graded, re-seeded and re-mulched as soon as possible.

Waterbars— waterbars should be inspected weekly and after all rainfall events. They should be maintained to ensure that the specified design dimensions and protective lining are available at all times. Damaged waterbars should be repaired or replaced immediately.

10. Manage the Project

A copy of the E&SC Plans and appropriate inspection/maintenance logs are to be kept on site at all times during active construction. A copy of the Groundwater Protection Plan will be kept onsite during construction.

The project will be generally maintained in accordance with the following:

- Coordination with Utilities – Notify Miss Utility of WV by calling 811 or 1-800-245-4848 at least 3 days prior to construction.
- Inspection and Monitoring – E&SC BMPs will be inspected at least once every seven calendar days and within 24 hours after any storm event greater than or equal to 0.5 inches per 24 hour period. Temporary and permanent E&S BMPs will be maintained and repaired as needed.
- Reporting – The E&S plan holder will notify the WVDEP of any spill/discharge of pollutants within 24 hours.
- Equipment Maintenance – Maintenance of equipment will be performed using generally accepted practices, including plastic mats, drip pans, etc.

11. Stabilization

11.1 Seedbed preparation

The seedbed must be loose at the time of seeding. The seedbed must be loosened by disking on the contour, or by bulldozer tracking up and down the slope. Backblading is acceptable on gentle slopes or road bed.

11.2 Permanent and Temporary Seeding

Temporary vegetative cover must be established where runoff will go directly into a stream. Stabilization measures will be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than seven days after the construction activity in that portion of the site has permanently ceased.

Where the initiation of stabilization measures by the seventh day after construction activity temporarily or permanently ceases is precluded by natural causes, stabilization measures will be initiated as soon as conditions allow.

Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g., the total time period that construction activity is temporarily halted is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the seventh day after construction activities have temporarily ceased.

Planting of permanent vegetative cover will be performed on all disturbed areas. Lime and fertilizer rates will be applied to all permanent seeding at the time of seedbed preparation.

Inspection shall be requested once there is uniform, perennial 70 percent vegetative coverage established. Temporary BMPs will be removed upon achieving vegetative stabilization. The 70 percent requirement refers to the total area vegetated and not a percent of the site. Disturbed areas not attaining a uniform, perennial 70 percent vegetative coverage shall be re-seeded as needed until uniform, perennial 70 percent vegetative coverage is established.

Revegetation in non-agricultural areas shall be considered successful if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands. In agriculture areas, revegetation shall be considered successful when upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field, unless the easement agreement specifies otherwise.

Restoration will be considered successful if the disturbed surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless requested otherwise by the landowner or land managing agency), revegetation is successful, proper drainage has been restored, and the appropriate federal and state agencies approve.

Wetlands along the proposed pipeline are expected to exhibit varying degrees of saturation and water elevation, requiring a variety of plant species to be re-established. In unsaturated wetlands, most vegetation will be replaced by seeding. Saturated wetlands will typically be allowed to re-vegetate naturally. Wetland revegetation will be considered successful when the cover of herbaceous and/or woody species is at least 80 percent of the type, density, and distribution of the vegetation in adjacent wetland areas that were not disturbed by construction. Revegetation efforts will continue until wetland revegetation is successful.

Recommended Permanent and Temporary Seed Mixtures and Fertilizer/Mulch for Revegetation of Upland Areas

Item	Uplands	
Permanent Seed and Mulch Application Rates		
Seed ¹	Kentucky 31 tall fescue	65 pounds per acre
Seed ¹	Empire Birdsfoot Trefoil (1/2 Empire, 1/2 Viking)	5 pounds per acre of inoculated seed
Seed ¹	Redfescue	20 pounds per acre

Lime	Agricultural Grade (Pellet Form)	2 Tons per acre without a soil test
Fertilizer	10-20-20	1/2 ton per acre
Mulch	Cereal Straw	3 tons per acre
Temporary Seed and Mulch Application Rates		
Seed ¹	Annual Ryegrass	40 pounds per acre
Mulch	Cereal Straw	3 tons per acre

Notes

1 – all seed is pure live seed

2 – unless otherwise requested by landowner in ROW

Revegetation of Wetland Areas

Item	Wetlands ²	
Seed ¹	Annual Ryegrass	48 pounds per acre

Notes

1 – all seed is pure live seed

2 – do not apply mulch, fertilizer, or lime in wetland areas

Alternate Permanent Seed Mixtures

Item	Alternate No. 1	
Permanent Seed and Mulch Application Rates		
Seed ¹	Alfalfa	18 pounds per acre
Seed ¹	Clover	5 pounds per acre

Item	Alternate No. 2	
Permanent Seed Application Rates		
Seed ¹	Orchard Grass	30 pounds per acre
Seed ¹	Clover	5 pounds per acre

Item	Alternate No. 3 - Wildlife Seed Mix	
Permanent Seed Application Rates		
Seed ¹	ERNMX - 260 PA Piedmont Province UPL Mix: 26% Indiangrass 26% Little Bluestem 20% Virginia Wildrye 10% Big Bluestem 7% Purpletop 5% Switchgrass 4% Deertongue 2% Purple Lovegrass	20 pounds per acre

Notes

- 1 – all seed is pure live seed
- 2 – contractor to use alternate seed mixtures if specified per landowner request

4.0 Construction Schedule/Phasing

Clearing is expected to commence in October 2017 and pipeline construction is anticipated to begin March 2018 with a target full in-service date for the Project of November 2018. The order in which each facility will be constructed may vary, depending upon numerous factors, including the receipt of necessary authorizations, the capabilities of each contractor, available work force, and optimized logistics.

4.1 Construction Schedule

Construction Schedule for Major Components of the Project		
Component	Commence Activity	Complete Activity
Establish construction access, install site control BMPs, clear ROW and workspace	October 2017	March 2018
Pipeline Construction	March 2018	October 2018
Compressor Stations	October 2017	November 2018
Final Restoration	On-going per spread	November 2018
Hydrostatic Testing	October 2018	November 2018

MVP will utilize 8 construction spreads to construct the pipeline in WV. The table below provides spread by beginning and ending MP, length and construction year.

Proposed Spreads for Pipeline Construction					
Spread	Begin MP	Ending MP	Mainline Length (Miles)	Construction Year	Spread Length (Miles)
1	0	25.9	25.9	2018	25.9
2	25.9	48.05	22.15	2018	22.15
3	48.05	77.6	29.55	2018	29.55
4	77.6	104.7	26.65	2018	26.65
5	104.7	127.9	23.65	2018	23.65
6	127.9	154.2	26.3	2018	26.3
7	154.2	181.8	27.6	2018	27.6
8	181.8	End of WV section	22.95	2018	22.95

Erosion and Sediment Control Plan Mountain Valley Pipeline Project

Permanent Above-Ground Facilities

Wetzel, Harrison, Braxton, and Fayette Counties,
West Virginia

Prepared By:
Tetra Tech, Inc.
For



February 2016
Revised November 2016



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Attachments

- 1 Project Location Map
- 2 Soils Report
- 3 E&S Plan Sheets

1.0 Introduction

Tetra Tech, Inc. (Tt) has prepared this Erosion & Sediment Control Plan (E&SCP) as part of the Stormwater Pollution Prevention Plan (SWPPP) for Mountain Valley Pipeline, LLC (MVP). The Plan addresses activities associated with the Mountain Valley Pipeline Project H600 (Project) installation. The proposed pipeline will extend from the existing Equitrans, L.P. transmission system and other natural gas facilities in Wetzel County, West Virginia to Transcontinental Gas Pipe Line Company, LLC's (Transco) Zone 5 Compressor Station 165 in Pittsylvania County, Virginia. In addition to the pipeline, the Project will include approximately 171,600 horsepower (hp) of compression at three compressor stations currently planned along the route, as well as measurement, regulation, and other ancillary facilities required for the safe and reliable operation of the pipeline. The pipeline is designed to transport up to 2.0 million dekatherms per day of natural gas.

A site location map is provided in Attachment 1. This E&SCP, if properly implemented, will provide for effective E&SCs throughout construction.

Project Name:	Mountain Valley Pipeline Project
Project Start:	Lat: 39.5625N, Long: -80.5430W
Project End (in WV):	Lat: 37.4030N, Long: -80.6891W
Counties:	Wetzel, Harrison, Doddridge, Lewis, Braxton, Webster, Nicholas, Greenbrier, Fayette, Summers, and Monroe

1.1 Project Description

This SWPPP specifically addresses permanent above ground facilities as part of the MVP Project. The MVP Project will require three compressor stations to move gas from the beginning of the pipeline at the existing Equitrans transmission system in Wetzel County, West Virginia to the terminus at the Transco Station 165 in Pittsylvania County, Virginia. Additionally, three interconnect meter stations will be installed at interconnection points consistent with various receipts and deliveries, one with existing Equitrans facilities (H-302), and two with foreign facilities (MarkWest and Columbia). New permanent access roads will be constructed for each of the permanent above-ground facilities.

Bradshaw Compressor Station will be constructed at approximately milepost (MP) 2.8 in Wetzel County, West Virginia and will pull gas from the origination point, near Mobley, West Virginia for relay to Harris Compressor Station. Harris Compressor Station will be constructed at approximately MP 77.5 in Braxton County, West Virginia and will pull gas from Bradshaw Compressor Station for relay delivery to Stallworth Compressor Station. Stallworth Compressor Station will be constructed at approximately MP 154.2 in Fayette County, West Virginia and will pull gas from Harris Compressor Station, for relay delivery to Transco Station 165.

Facility	Latitude	Longitude	County	Nearest Town	Access from	Precipitation Zone	Limits of Disturbance (ac)	Approx. Pad Size (sq.yds)
Mobley Interconnect	39° 33' 45"	-80° 32' 34"	Wetzel	Big Run	Rt 15/3 - Mobley Run	1	3.3	5,125
Bradshaw Compressor Station	39° 31' 58"	-80° 31' 58"	Wetzel	Smithfield	Rt 21/1 Bear Run Rd	1	49.4	30,272
Sherwood Interconnect	39° 18' 49"	-80° 32' 06"	Harrison	East Salem	Rt 50/4 Indian Run	1	12	5,270
Harris Compressor Station	38° 43' 20"	-80° 30' 11"	Braxton	Milroy	Rt 24/5 Milroy Rd	3	16.8	27,111
WB Interconnect	38° 43' 27"	-80° 30' 06"	Braxton	Milroy	Rt 24/5 Milroy Rd	3	9.1	5,784
Stallworth Compressor Station	37° 52' 07"	-80° 45' 27"	Fayette	Spring Dale	Rt 29 Dawson-Springdale	1	27.7	34,940

Precipitation Zones:

1 – Western Plateau, 43.7 inches/year

3 – Mountains, 52.7 inches/year

Construction activities will consist of clearing and grubbing, installation new access roads, construction of pads, and site restoration activities. In addition, the Bradshaw and Harris Compressor Stations will include tie-in pipe installation.

This E&SCP has been prepared in accordance with the 2006 West Virginia Department of Environmental Protection (WVDEP) Best Management Protection (BMP) Manual. For more information on the project refer to the E&SCP and Project Location Mapping provided in this report, Attachment 1 and 3. All required State and Federal Permits, including USACE clearances, will be acquired prior to construction.

1.2 Existing and Adjacent Site Conditions

Relevant topographic features including streams, streets, pipelines, structures, utility lines, fences, paving and other significant items are indicated on the plans and U.S. Geological Survey (USGS) Maps (Attachment 1). The E&S Plan Sheets per each station are provided in Attachment 3 and provide information regarding the typical controls and construction sequence to be followed.

Past and present land use of the project area and surrounding area for all sites is pasture/hay, open space/grassland and forested land. Future land use will be a gravel pad and access road, maintained vegetated natural gas pipeline ROW, and surrounding disturbed areas restored to meadow condition.

1.3 Critical Areas

Waterbodies

Refer to the table below for a listing of watershed and stream and wetland impacts per permanent above-ground facility. MVP will obtain all necessary local, state, and federal permits. MVP will obtain necessary clearance from county floodplain coordinators for temporary impacts within 100-year FEMA floodplains.

Facility	Receiving Waters	Watershed	Stream/Wetland Impacts	Temporary, Linear Feet	Permanent, Linear Feet
Mobley Interconnect	UNT to Mobley Run	Middle Ohio North	S-ST10 (INT): replace/extend existing culvert	20	158 total (54 minus existing culvert length)
			S-ST13 (INT): replace/extend existing culvert	27	152 total (111 minus existing culvert)
			S-ST14 (EPH): adjust stream channel	79	102
			S-J63 (INT): maintain existing culvert	100	-
Bradshaw Compressor Station	UNT to Fallen Timber Run, UNT to Buck Run	Middle Ohio North	Wetland W-YZ8: construction of stockpile	0.01 ac	-
Sherwood Interconnect	UNT to Cherrycamp Run, UNT to Salem Fork	West Fork	None	-	-
Harris Compressor Station	UNT to Laurel Run	Little Kanawha River	S-AA15 (INT): replace/extend culvert/channel	54	94
			S-A12 (EPH): construction of fill slope	31	-
WB Interconnect	UNT to Laurel Run	Little Kanawha River	None	-	-
Stallworth Compressor Station	UNT to Buffalo Creek	Gauley	S-A104 (EPH): filling for new access road	115	215
			S-QR4 (INT): new culvert for road crossing	54	147
			Wetlands W-EE7 and W-EE6: construction of access road	-	0.004, 0.002 ac

It is anticipated that waterbody impacts will not result in an adverse impact to water quality, physical or biological habitat, or aquatic species within the Project area due to the temporary stream crossing construction activities and implementing the Erosion and Sedimentation Control Plan's best management practices. The methods used include but are not limited to silt fence, compost filter sock, cross-drain culverts, outlet protection, road sloping/ crowning, reinforced filtration devices, and permanent reseeding along disturbed areas and permanent vegetative cover.

Steep Terrain

Existing slopes at permanent above-ground facilities do contain areas that exceed 30° (steeper than 2:1). Precaution for steep terrain has been considered in the project and subsurface investigations were performed at each permanent above-ground facility to evaluate subsurface conditions for design and construction standards and factors of safety based on modelling for slope stability. Fill slopes are designed to be 2:1 (26.6°) or flatter except where alternative designs are used. In a few select areas, cut slopes will be at 1:1 where competent rock was noted in the subsurface exploration. Cut slopes not in competent rock are designed to be 2:1 or alternative designs are used. Compaction, benching, toe keys, and slope drains will provide good bonding of material and water control for long-term stability of all fill slopes at each site. Rapid vegetation procedures are to be followed which include a combination of installing a 6 to 12 inch layer of topsoil and erosion control blanket, flexterra, hydroseeding or equivalent to provide controls on all disturbed slopes 3:1 (18°) or steeper, including stockpiles, to provide permanent controls for post construction stormwater management. New access roads to permanent facilities will have grades of 16% or less with rock lined channels, cross drains and outlet protection.

Modified toe keys were designed in areas of the Harris Station for the proposed 2:1 slopes to meet existing grade and includes a 3 to 6 foot high gabion basket wall and 20-foot high rock toe key adjacent to stream S-AA12. Detailed geotechnical designs for soldier pile walls, Redi-Rock retaining walls, or reinforced soil slopes at Stallworth, Mobley, and Bradshaw stations will be included in contractor construction plans.

Karst

None of the permanent above-ground stations are located in known karst areas.

1.4 Soils

Project soils information was obtained from the Natural Resources Conservation Service (NRCS) Mapping Web Site, which utilizes data from the NRCS Soil Survey. The soils are shown in the attached soils report which lists the soils included within the project limits along with the limitations of each soil type.

2.0 Construction Sequence

Refer to the E&SC Plan drawings for the location of the proposed work and the associated BMPs. A generalized construction sequence is provided below, refer to individual station plans for a sequence that is specific to each station. The construction sequence is intended to provide a general course of action in order to conform to the applicable regulatory agency requirements for temporary and permanent soil E&SCs. Necessary parts for proper and complete execution of work pertaining to this plan, whether specifically mentioned or not, are to be performed by the contractor. It is not intended that the drawings and this report show every detailed piece of material or equipment. The contractor will comply with all requirements listed in this section. The contractor may be required to alter controls based on

effectiveness of controls or differing conditions encountered in the field. A copy of the SWPPP must be available at the Project site at all times.

1. At least 3 days prior to starting any earth disturbance activities, all contractors involved will notify Miss Utility of WV by calling 811 or 1-800-245-4848.
2. Install temporary erosion and sediment (E&S) controls prior to earth disturbance. Refer to best management practices (BMP) on the plan and detail sheets. Appropriate BMPs should be placed around sensitive areas where shown prior to earth disturbance. Stone construction entrances are to be provided at all locations where temporary access roads will be accessing a public roadway and until permanent access drives are completed. Hand clearing is permissible prior to E&S control installation.
3. General clearing and grubbing of the trees and brush may commence area as necessary for access road and pad construction within the Limits of Disturbance or as directed by an MVP designee, whichever is less. Smaller debris such as shrubs and limbs can be chipped and utilized on-site as part of the soil stabilization. Unless otherwise directed by the landowner, logs will be either hauled off-site or given to the landowner upon their request; stumps and/or logs will be ground, chipped, windrowed, or hauled off-site.
4. Install upslope earthen diversion berms and channels immediately following clearing and grubbing. Strip topsoil as necessary for installation of the berm with channel and install per the EARTHEN DIVERSION BERM detail.
5. It is contractor's responsibility to remove and dispose to an approved WVDEP waste disposal site all existing structures within the LOD as directed by an MVP designee.
5. Strip topsoil and construct proposed access road with roadside ditches. Install cross drain culverts with outlet protection as shown on the plan sheets.
6. Strip and stockpile topsoil within the limits of disturbance the areas needed to construct pad and stockpile areas.
8. Minimize total area of disturbance to the extent practical. Maintain temporary topsoil stockpiles within existing soil erosion and sediment controls.
9. Construct pad as shown on each station plan sheets. Refer to more detailed construction sequence in each station package.
10. Stabilize exposed and unworked soils and stockpiles by application of effective BMPs that protect the soil from the erosive forces of raindrops, flowing water, and wind. Areas at final grade should be seeded and mulched or otherwise stabilized within 7 days and areas that will not be worked again for 21 days (including stockpiles) or more must be seeded and mulched or otherwise stabilized within 7 days.
11. Revegetate disturbed area per seeding chart or per landowner request. For 3:1 or steeper slopes the disturbed area will have erosion control fabric (blanketing, flexterra, or equivalent) installed as shown on the detail sheet.
12. Final aggregate on pad and pad underdrain system to be installed during top dressing (by mechanical contractor).
13. Inspection of all erosion and sedimentation controls within disturbed areas will be, at a minimum, performed once every seven calendar days and within 24 hours after any storm event greater

- than or equal to 0.5 inches per 24 hours period. Repairs or maintenance shall be performed immediately to BMPs. A final inspection shall be requested once there is uniform, perennial 70 percent vegetative stabilization. The 70 percent requirement refers to the total area vegetated. Disturbed areas not attaining a uniform, perennial 70 percent vegetative coverage shall be re-seeded as needed until uniform, perennial 70 percent vegetative coverage is established.
14. All pollutants, including waste materials and demolition debris that occur on site during construction shall be handled and legally disposed of in accordance with state and federal regulations. Woody debris may be chopped and spread on-site.

3.0 Erosion and Sediment Control Measures

General stabilization and structural controls will be used in sediment and erosion control practices to 1) divert stormwater flows away from exposed areas, 2) convey runoff, 3) prevent sediments from moving off-site, and 4) reduce the erosive forces of runoff waters.

1. Mark Clearing Limits

Clearing limits will be staked and visibly flagged prior to construction. Adjacent sensitive areas and no-access roads will utilize signage and/or orange construction fence.

2. Establish construction access

Access to each site will be from new permanent access roads. Access roads will include the installation of a stabilized rock construction entrance to remove sediment prior to exiting the site. Stabilized construction entrances will follow the WVDEP standard detail provided in the BMP manual.

3. Install sediment controls

The E&SC Plan utilizes several best management practices throughout the project area to prevent sediment from leaving the site. As depicted on the plans, controls will be placed along the boundary of sensitive areas, along stream and wetlands, downslope of all disturbed area and stockpiles, and where the potential exists for off-site sediment transport. The BMPs to be used throughout this project include:

- Rock Construction Entrance
- Outlet protection
- Silt Fence, Super Silt Fence and Belted Silt Retention Fence
- Compost Filter Sock
- Rock check dams
- Channels with permanent lining
- Pumped Water Filter Bag
- Erosion Control Blanket/Flexterra/or equivalent
- Vegetative Stabilization

3.1 Instream BMPs

If a stream crossing or encroachment is required, work will be in accordance with state and federal permits. Refer to E&SC detail sheets for stream crossing details. Procedures that will be followed at stream crossing locations include the following:

- Minimize clearing and grubbing of vegetation up to streams, as much as possible.
- Only that area which is required shall be disturbed within the proposed LOD at stream crossings;
- Locating staging areas 50 feet away from the stream, where possible;
- Storing chemicals, storing equipment, washing equipment, or refueling equipment must be done in areas that are greater than 100 feet away from stream;
- Spoil placement and BMPs will be monitored at all times during stream crossing procedures; once work within a stream area is started, it will be conducted continuously to completion, emphasis will be placed on minimizing time of disturbance
- Spoils from stream crossings must be placed at least 10 feet from the water's edge; and
- Construction equipment will not be allowed in the stream channel when excavation can be done from either side or a temporary crossing while working at the stream crossing.

Stream Bank Stabilization

Permanent stabilization shall occur immediately upon installation, backfilling, and grading at each stream crossing.

Stream Crossings

Temporary stream crossings, consisting of bridges of timber mats or clean rock fill and flume(s), will be installed to cross minor or intermediate streams. Timber mats shall be used to cross smaller streams where the span of the mat will stretch from bank to bank. Clean rock fill and flumed crossings will be utilized where it is not feasible to utilize timber mats. As an alternative, portable bridges may be used instead for small crossings. Equipment will not be allowed to ford flowing streams during construction activities. Temporary road crossings of streams must maintain adequate flow downstream.

Permanent stream crossing with the use of culverts have been designed and sized based on the 10-year storm for streams at Harris CS and Stallworth CS. New culverts for streams at Mobley IC have been designed and sized based on the 100-year storm. The schedule size for channels and culverts are included with the details for each station.

The sequence for permanent culverting and channelization of streams is as follows:

1. Prior to the stream crossing, install E&S BMP controls and have all necessary materials and containment units available at the stream crossing.
2. Minimize clearing and grubbing of vegetation up to streams, as much as possible.
3. Install bypass hose, pump, and dam (sand bags or cofferdam). Use a pump or pumps sufficiently large to pump the entire stream flow around the site so that work can be conducted **in the dry** per the TYPICAL STREAM CROSSING ACCESS ROAD PUMP DIVERSION detail.
4. Install channel or culvert as indicated on the plan sheets.

-
- a. Filter cloth shall be placed on the streambed prior to the placement of the pipe culverts. Install clean coarse aggregate as bedding, install new culvert as indicated in the plan sheets and the culvert sizing chart provided with the DITCH RELIEF CULVERT detail. The culvert shall extend a minimum of five inches beyond the upstream and downstream toe of the aggregate placed around the culvert.
 - b. Install channel per the CHANNEL DETAIL.
 5. Water from the excavation area shall be pumped to a sediment filter bag.
 6. Stabilize the channel excavation, newly constructed fill slopes, and stream banks prior to removing pump and dam and redirecting stream flow.
 7. Immediately stabilize disturbed area within 50 feet of the stream.

4. Stabilize Soils

To prevent mixing of the soil horizons or incorporation of additional rock into the topsoil, topsoil segregation (topsoil set in a separate pile) will be performed in non-saturated wetlands, pastures, hayfields, and in areas requested by the landowner. Implementing proper topsoil segregation will help ensure post-construction revegetation success, thereby minimizing the potential for long-term erosion problems. Up to 12 inches of topsoil will be removed from the ground surface, segregated, as appropriate, from all subsoil and replaced in the proper order during backfilling and final grading. Where topsoil is less than 12 inches deep, the actual depth of the topsoil will be removed and segregated. Topsoil segregation may not be practical in saturated wetlands with standing water.

The plans specify the utilization of temporary and permanent seed mixes, mulching and lime in accordance with the WVDEP BMP Manual (refer to Section 11.0). Given the nature of the existing soils at the site, it is recommended that prior to placement of seed, all disturbed areas that are to be returned to meadow conditions shall have a minimum of 6 inches of topsoil installed at final grade in order to ensure best possible conditions to allow for seed germination.

5. Protect Slopes

The E&SC Plan depict placement of erosion control blanket/soil stabilization matting (or approved equivalent such as flexterra or hydromulching) on all slopes greater than 20-percent. Plan details provide for installation of slope matting according to manufacturer specifications. Compaction, benching, toe keys, and slope drains will provide good bonding of material and water control for long-term stability of each site. Upslope earthen diversion berms/channels are depicted on site plans to protect cut slopes with larger upslope drainage areas.

6. Convey Stormwater in a Non-Erosive Manner

The pre-construction drainage patterns surrounding the Project will be maintained. All disturbed areas within the limit of disturbance will be restored to meadow in good condition, except for gravel permanent pad and permanent gravel access road. The permanent gravel pads be installed with an underdrain

system at the downslope perimeter of the pad to divert stormwater to riprap aprons and/or channels. The permanent gravel access roads to each site will be installed with a riprap or turf-reinforced matting channel with cross drain culverts, rock check dams, and riprap aprons sized and spaced appropriately as shown on the plan sheets according to WV DEP BMP Manual. As a result of restoring the site to meadow in good condition, providing riprap channel outfalls, and maintaining pre-construction drainage patterns, there will be negligible increase in stormwater runoff rate or volume.

7. Control Other Pollutants

The operator will remove from the site, recycle, or dispose of all building materials and wastes in accordance with the WVDEP BMP Manual. The contractor will not illegally bury, dump, or discharge building material or wastes at the site. Sediment removed from BMPs will either be spread in a protected area to dry and then recycled as fill material or disposed of off-site. In cases where disposal is necessary, waste materials are to be disposed of at an approved WVDEP waste disposal facility.

8. Control Dewatering

Subsurface bench drains shall be provided on fill slopes on both the pad and access road fill slopes of 20 feet or greater as shown in the typical fill embankment benching detail on the plan detail sheet. Subsurface bench drains will provide a way for water to drain away from the fill slopes.

Localized excavation dewatering will be in accordance with the WVDEP BMP manual. Dewatering will occur with a dewatering filter bag and will outfall to a well-vegetated area or through a filter sock outlet protection. Discharges from upland dewatering should not occur within wetlands or on streambanks.

9. Maintain BMPs

Temporary and permanent E&S control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with West Virginia DEP, Division of Water and Waste Management, Erosion and Sediment Control Best Management Practice Manual, 2006.

E&SCs on the site will be inspected at least once every seven calendar days and within 24 hours after any storm event equal to or greater than 0.5 inches of rain per 24-hour period.

Repairs or maintenance shall be performed immediately to BMPs.

All public and private roads adjacent to a construction entrance must be inspected and cleaned of debris originated from the construction site as necessary.

Specific maintenance will include:

Rock Construction Entrance – thickness of the stabilized construction entrance will be constantly maintained to the specific dimensions by adding rock as needed. The entrance will be cleaned and redressed when voids become choked with mud and sediment.

Compost filter sock/silt fence - accumulated sediment will be removed as required, and in all cases where uniform accumulations are $\frac{1}{2}$ the above ground height of the filter sock/fence. Any accumulated earth behind the filter sock/fence will be disposed of by the Contractor in such a manner that the removed earth will not be excessively eroded and transported into a waterbody or wetland.

The filter sock/fence installation should be inspected weekly and within 24 hours after any storm event greater than or equal to 0.5 inches of rain per 24-hr period. Loosened support stakes will be removed and new stakes driven. Filter socks/fence will be maintained and repaired as per manufacturer specifications.

Erosion Control Blanket – the erosion control blanket will be checked for torn or loose stapled areas.

Vegetative Stabilization – vegetative stabilization will be inspected for proper growth. Any areas not responding will be promptly reseeded. Areas which show signs of erosion prior to stabilization will be re-graded, re-seeded and re-mulched as soon as possible.

Roadside Channel - Inspect channel weekly. Remove any flow obstructions and make the necessary repairs immediately.

Cross Drain Culverts with Outlet Protection – cross drain culverts with outlet protection should be inspected weekly and within 24 hours after any storm event greater than or equal to 0.5 inches of rain per 24-hr period. They should be maintained to ensure that the culvert inlet is free of debris so as to allow for proper flow. Specified design dimensions including the width and depth of specified stone as shown on the plan sheets and details shall be maintained. Damaged culverts and / or outlet protection should be repaired or replaced immediately.

Waterbars– waterbars should be inspected weekly and after all rainfall events. They should be maintained to ensure that the specified design dimensions and protective lining are available at all times. Damaged waterbars should be repaired or replaced immediately.

10. Manage the Project

A copy of the E&SC Plans and appropriate inspection/maintenance logs are to be kept on site at all times during active construction. A copy of the Groundwater Protection Plan will be kept onsite during construction.

The project will be generally maintained in accordance with the following:

- Coordination with Utilities – Notify Miss Utility of WV by calling 811 or 1-800-245-4848 at least 3 days prior to construction.

- Inspection and Monitoring – E&SC BMPs will be inspected at least once every seven calendar days and within 24 hours after any storm event greater than 0.5 inches per 24 hour period. Temporary and permanent E&S BMPs will be maintained and repaired as needed.
- Reporting – The E&S plan holder will notify the WVDEP of any spill/discharge of pollutants within 24 hours.
- Equipment Maintenance – Maintenance of equipment will be performed using generally accepted practices, including plastic mats, drip pans, etc.

11. Stabilization

11.1 Seedbed preparation

The seedbed must be loose at the time of seeding. The seedbed must be loosened by disking on the contour, or by bulldozer tracking up and down the slope. Backblading is acceptable on gentle slopes or road bed.

11.2 Permanent and Temporary Seeding

Temporary vegetative cover must be established where runoff will go directly into a stream. Stabilization measures will be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than seven days after the construction activity in that portion of the site has permanently ceased.

Where the initiation of stabilization measures by the seventh day after construction activity temporarily or permanently ceases is precluded by natural causes, stabilization measures will be initiated as soon as conditions allow.

Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g., the total time period that construction activity is temporarily halted is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the seventh day after construction activities have temporarily ceased.

Planting of permanent vegetative cover will be performed on all disturbed areas. Lime and fertilizer rates will be applied to all permanent seeding at the time of seedbed preparation.

Inspection shall be requested once there is uniform, perennial 70 percent vegetative coverage established. Temporary BMPs will be removed upon achieving vegetative stabilization. The 70 percent requirement refers to the total area vegetated and not a percent of the site. Disturbed areas not attaining a uniform, perennial 70 percent vegetative coverage shall be re-seeded as needed until uniform, perennial 70 percent vegetative coverage is established.

Revegetation in non-agricultural areas shall be considered successful if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands. In

agriculture areas, revegetation shall be considered successful when upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field, unless the easement agreement specifies otherwise.

Restoration will be considered successful if the disturbed surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless requested otherwise by the landowner or land managing agency), revegetation is successful, proper drainage has been restored, and the appropriate federal and state agencies approve.

Wetlands along the proposed pipeline are expected to exhibit varying degrees of saturation and water elevation, requiring a variety of plant species to be re-established. In unsaturated wetlands, most vegetation will be replaced by seeding. Saturated wetlands will typically be allowed to re-vegetate naturally. Wetland revegetation will be considered successful when the cover of herbaceous and/or woody species is at least 80 percent of the type, density, and distribution of the vegetation in adjacent wetland areas that were not disturbed by construction. Revegetation efforts will continue until wetland revegetation is successful.

Recommended Permanent and Temporary Seed Mixtures and Fertilizer/Mulch for Revegetation of Upland Areas

Item	Uplands	
Permanent Seed and Mulch Application Rates		
Seed ¹	Kentucky 31 tall fescue	65 pounds per acre
Seed ¹	Empire Birdsfoot Trefoil (1/2 Empire, 1/2 Viking)	5 pounds per acre of inoculated seed
Seed ¹	Redfescue	20 pounds per acre
Lime	Agricultural Grade (Pellet Form)	2 Tons per acre without a soil test
Fertilizer	10-20-20	1/2 ton per acre
Mulch	Cereal Straw	3 tons per acre
Temporary Seed and Mulch Application Rates		
Seed ¹	Annual Ryegrass	40 pounds per acre
Mulch	Cereal Straw	3 tons per acre

Notes

1 – all seed is pure live seed

2 – unless otherwise requested by landowner in ROW

Revegetation of Wetland Areas

Item	Wetlands ²	
Seed ¹	Annual Ryegrass	48 pounds per acre

Notes

1 – all seed is pure live seed

2 – do not apply mulch, fertilizer, or lime in wetland areas

Alternate Permanent Seed Mixtures

Item	Alternate No. 1	
Permanent Seed and Mulch Application Rates		
Seed ¹	Alfalfa	18 pounds per acre
Seed ¹	Clover	5 pounds per acre

Item	Alternate No. 2	
Permanent Seed Application Rates		
Seed ¹	Orchard Grass	30 pounds per acre
Seed ¹	Clover	5 pounds per acre

Item	Alternate No. 3 - Wildlife Seed Mix	
Permanent Seed Application Rates		
Seed ¹	ERNMX - 260 PA Piedmont Province UPL Mix:	
	26% Indiangrass	26% Little Bluestem
	20% Virginia Wildrye	10% Big Bluestem
	7% Purpletop	5% Switchgrass
	4% Deertongue	2% Purple Lovegrass
	20 pounds per acre	

Notes

1 – all seed is pure live seed

2 – contractor to use alternate seed mixtures per landowner request

4.0 Construction Schedule/Phasing

Clearing is expected to commence in October 2017 and site build construction is anticipated to begin October/November 2017 with a target full in-service date for the Project of November 2018. The order in which each facility will be constructed may vary, depending upon numerous factors, including the receipt of necessary authorizations, the capabilities of each contractor, available work force, and optimized logistics.

4.1 Construction Schedule

Each station will follow a similar schedule:

1. Establish construction access and install site control BMPs (week 1-8)
2. Clear necessary LOD area and stockpile topsoil (week 1-8)
3. Build access road and compressor pad (week 4-12)
4. Re-establish grade (including restoration - seed & mulch, controls, etc.) (week 10-16)
5. Upon stabilization, remove temporary controls and perform final restoration (week 10-18)

ATTACHMENT 1

Project Location Map

(Refer to the cover sheet for each station package)

ATTACHMENT 2

Soils Report

Soil Types at Permanent Above-Ground Facilities

Station	Map Unit Symbol	Map Unit Name	Farm Class	% of Soil Type
Mobley Interconnect	GpF	Gilpin-Peabody complex, 35 to 70 percent slopes	Not prime farmland	24%
	Sk	Skidmore gravelly loam	Farmland of statewide importance	76%
Bradshaw Compressor Station	GpD	Gilpin-Peabody complex, 15 to 25 percent slopes	Farmland of statewide importance	51%
	GpE	Gilpin-Peabody complex, 25 to 35 percent slopes	Farmland of local importance	40%
	GpF	Gilpin-Peabody complex, 35 to 70 percent slopes	Not prime farmland	8%
	VaD	Vandalia silty clay loam, 15 to 25 percent slopes	Farmland of statewide importance	1%
Harris Compressor Station and WB Interconnect	BuE	Buchanan channery loam, 15 to 35 percent slopes, extremely stony	Not prime farmland	5%
	GaF	Gilpin silt loam, 35 to 70 percent slopes, very stony	Not prime farmland	36%
	GID	Gilpin-Lily complex, 15 to 25 percent slopes	Farmland of statewide importance	32%
	GIE	Gilpin-Lily complex, 25 to 35 percent slopes	Farmland of local importance	27%
Stallworth Compressor Station	CaC	Cateache channery silt loam, 8 to 15 percent slopes	Farmland of statewide importance	20%
	CcG	Cateache-Pipestem complex, 35 to 80 percent slopes, very stony	Not prime farmland	71%
	CgF	Cateache silt loam, 35 to 55 percent slopes, very stony	Not prime farmland	2%
	MI	Melvin-Lindside complex	Farmland of local importance	3%
	MIA	Melvin-Lindside complex, 0 to 3 percent slopes, frequently flooded	Farmland of local importance	4%

Wetzel County, West Virginia

GpF—Gilpin-Peabody complex, 35 to 70 percent slopes

Map Unit Setting

National map unit symbol: k7k9
Mean annual precipitation: 36 to 45 inches
Mean annual air temperature: 41 to 64 degrees F
Frost-free period: 134 to 167 days
Farmland classification: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 50 percent
Peabody and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, footslope, shoulder
Landform position (three-dimensional): Side slope, head slope, nose slope
Down-slope shape: Convex, concave
Across-slope shape: Convex
Parent material: Fine-loamy residuum weathered from sandstone and siltstone

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 4 inches: silt loam
Bt1+Bt2 - 4 to 28 inches: channery silty clay loam
Bt3 - 28 to 34 inches: very channery silt loam
Cr - 34 to 38 inches: unweathered bedrock

Properties and qualities

Slope: 35 to 70 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Other vegetative classification: Acid Hills (AH3)

Description of Peabody

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder, footslope

Custom Soil Resource Report

Landform position (three-dimensional): Side slope, head slope, nose slope

Down-slope shape: Convex, concave

Across-slope shape: Convex

Parent material: Residuum weathered from shale and siltstone

Typical profile

A - 0 to 2 inches: silty clay loam

Bt - 2 to 22 inches: silty clay

C - 22 to 27 inches: channery silty clay

Cr - 27 to 31 inches: weathered bedrock

Properties and qualities

Slope: 35 to 70 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Minor Components

Other soils

Percent of map unit: 20 percent

Sk—Skidmore gravelly loam

Map Unit Setting

National map unit symbol: k7kj

Elevation: 100 to 290 feet

Mean annual precipitation: 36 to 45 inches

Mean annual air temperature: 41 to 64 degrees F

Frost-free period: 134 to 167 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Skidmore and similar soils: 75 percent

Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Skidmore

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Gravelly alluvium

Typical profile

Ap+Bw - 0 to 15 inches: gravelly loam
C - 15 to 65 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 36 to 48 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Other vegetative classification: Fertile Loams (FL3)

Minor Components

Other soils

Percent of map unit: 22 percent

Melvin

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave

Wetzel County, West Virginia

GpD—Gilpin-Peabody complex, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: k7k7

Mean annual precipitation: 36 to 45 inches

Mean annual air temperature: 41 to 64 degrees F

Frost-free period: 134 to 167 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Gilpin and similar soils: 40 percent

Peabody and similar soils: 30 percent

Minor components: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder, backslope, footslope

Landform position (three-dimensional): Side slope, crest, nose slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Fine-loamy residuum weathered from sandstone and siltstone

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material

A - 1 to 4 inches: silt loam

Bt1+Bt2 - 4 to 28 inches: channery silty clay loam

Bt3 - 28 to 34 inches: very channery silt loam

Cr - 34 to 38 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 25 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Other vegetative classification: Acid Loams (AL3)

Description of Peabody

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder, backslope, footslope

Custom Soil Resource Report

Landform position (three-dimensional): Side slope, crest, nose slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from shale and siltstone

Typical profile

A - 0 to 2 inches: silty clay loam

Bt - 2 to 22 inches: silty clay

C - 22 to 27 inches: channery silty clay

Cr - 27 to 31 inches: weathered bedrock

Properties and qualities

Slope: 15 to 25 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Minor Components

Other soils

Percent of map unit: 30 percent

GpE—Gilpin-Peabody complex, 25 to 35 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2vyz1

Elevation: 700 to 1,650 feet

Mean annual precipitation: 42 to 48 inches

Mean annual air temperature: 50 to 53 degrees F

Frost-free period: 134 to 167 days

Farmland classification: Farmland of local importance

Map Unit Composition

Gilpin and similar soils: 45 percent

Peabody and similar soils: 35 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Ridges, hillslopes

Landform position (two-dimensional): Shoulder, summit, backslope

Landform position (three-dimensional): Interfluve, crest, side slope, nose slope, head slope

Down-slope shape: Convex, linear

Across-slope shape: Linear, convex

Parent material: Residuum weathered from sandstone and siltstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

A - 1 to 4 inches: silt loam

BA - 4 to 5 inches: silt loam

Bt - 5 to 30 inches: channery silty clay loam

Cr - 30 to 40 inches: bedrock

Properties and qualities

Slope: 25 to 35 percent

Depth to restrictive feature: 25 to 37 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Description of Peabody

Setting

Landform: Ridges, hillslopes

Landform position (two-dimensional): Shoulder, summit, backslope

Landform position (three-dimensional): Interfluve, side slope, nose slope, head slope

Down-slope shape: Convex, linear

Across-slope shape: Linear, convex

Parent material: Residuum weathered from shale and siltstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

A - 1 to 3 inches: silty clay loam

Bt - 3 to 23 inches: silty clay

C - 23 to 28 inches: parachannery silty clay

Cr - 28 to 38 inches: bedrock

Properties and qualities

Slope: 25 to 35 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Minor Components

Weikert

Percent of map unit: 10 percent

Landform: Ridges, hillslopes

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Crest, side slope, nose slope

Down-slope shape: Convex, linear

Across-slope shape: Convex, linear

Otwell

Percent of map unit: 10 percent

Landform: Stream terraces

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Fertile Loams (FL3)

Rock outcrop

Percent of map unit: 0 percent

GpF—Gilpin-Peabody complex, 35 to 70 percent slopes

Map Unit Setting

National map unit symbol: k7k9

Mean annual precipitation: 36 to 45 inches

Mean annual air temperature: 41 to 64 degrees F

Frost-free period: 134 to 167 days

Farmland classification: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 50 percent

Peabody and similar soils: 30 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope, footslope, shoulder

Landform position (three-dimensional): Side slope, head slope, nose slope

Down-slope shape: Convex, concave

Across-slope shape: Convex

Parent material: Fine-loamy residuum weathered from sandstone and siltstone

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material

A - 1 to 4 inches: silt loam

Bt1+Bt2 - 4 to 28 inches: channery silty clay loam

Bt3 - 28 to 34 inches: very channery silt loam

Cr - 34 to 38 inches: unweathered bedrock

Properties and qualities

Slope: 35 to 70 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: Acid Hills (AH3)

Description of Peabody

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope, shoulder, footslope

Landform position (three-dimensional): Side slope, head slope, nose slope

Down-slope shape: Convex, concave

Across-slope shape: Convex

Parent material: Residuum weathered from shale and siltstone

Typical profile

A - 0 to 2 inches: silty clay loam

Bt - 2 to 22 inches: silty clay

C - 22 to 27 inches: channery silty clay

Cr - 27 to 31 inches: weathered bedrock

Properties and qualities

Slope: 35 to 70 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Custom Soil Resource Report

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 20 percent

Hydric soil rating: No

VaD—Vandalia silty clay loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2t31g

Elevation: 600 to 1,490 feet

Mean annual precipitation: 41 to 49 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 175 to 192 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Vandalia and similar soils: 75 percent

Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vandalia

Setting

Landform: Hillslopes

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave, convex

Across-slope shape: Concave

Parent material: Clayey colluvium derived from sedimentary rock

Typical profile

Ap - 0 to 7 inches: silty clay loam

Bt1 - 7 to 14 inches: silty clay loam

Bt2 - 14 to 29 inches: silty clay loam

Bt3 - 29 to 50 inches: silty clay loam

Custom Soil Resource Report

Bt4 - 50 to 65 inches: channery silty clay loam

Properties and qualities

Slope: 15 to 25 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Other vegetative classification: Fertile Loams (FL3)

Hydric soil rating: No

Minor Components

Gilpin

Percent of map unit: 10 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, nose slope

Down-slope shape: Convex

Across-slope shape: Convex, linear

Hydric soil rating: No

Upshur

Percent of map unit: 10 percent

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Crest, nose slope, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Peabody

Percent of map unit: 5 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope, summit, shoulder

Landform position (three-dimensional): Crest, nose slope, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Other vegetative classification: Fertile Loams (FL3)

Hydric soil rating: No

Harrison and Taylor Counties, West Virginia

GuE3—Gilpin-Upshur complex, 25 to 35 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: k9r2

Mean annual precipitation: 38 to 50 inches

Mean annual air temperature: 49 to 55 degrees F

Frost-free period: 158 to 181 days

Farmland classification: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 70 percent

Upshur and similar soils: 20 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Benches, ridges, hillslopes

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Side slope, interfluve

Down-slope shape: Concave, linear, convex

Across-slope shape: Linear, concave

Parent material: Acid fine-loamy residuum weathered from interbedded sedimentary rock

Typical profile

A - 0 to 5 inches: silt loam

Bt - 5 to 22 inches: channery silty clay loam

C - 22 to 32 inches: very channery silt loam

R - 32 to 36 inches: bedrock

Properties and qualities

Slope: 25 to 35 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: Acid Hills (AH3)

Description of Upshur

Setting

Landform: Benches, ridges

Landform position (two-dimensional): Shoulder, summit

Custom Soil Resource Report

Landform position (three-dimensional): Side slope, interfluve

Down-slope shape: Linear, convex

Across-slope shape: Linear

Parent material: Limy-influenced red clayey residuum weathered from shale

Typical profile

Ap - 0 to 4 inches: silty clay loam

Bt+B3 - 4 to 32 inches: clay

C - 32 to 38 inches: extremely channery silty clay loam

Cr - 38 to 42 inches: bedrock

Properties and qualities

Slope: 25 to 35 percent

Depth to restrictive feature: 38 to 60 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.02 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Other vegetative classification: Fertile Hills (FH3)

Minor Components

Other soils

Percent of map unit: 10 percent

GuF3—Gilpin-Upshur complex, 35 to 70 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: k9r3

Mean annual precipitation: 38 to 50 inches

Mean annual air temperature: 49 to 55 degrees F

Frost-free period: 158 to 181 days

Farmland classification: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 70 percent

Upshur and similar soils: 20 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Benches, ridges

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Side slope, interfluve

Down-slope shape: Linear, concave, convex

Across-slope shape: Concave, linear

Parent material: Acid fine-loamy residuum weathered from interbedded sedimentary rock

Typical profile

A - 0 to 5 inches: silt loam

Bt - 5 to 22 inches: channery silty clay loam

C - 22 to 32 inches: very channery silt loam

R - 32 to 36 inches: bedrock

Properties and qualities

Slope: 35 to 70 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: Acid Hills (AH3)

Description of Upshur

Setting

Landform: Benches, ridges

Landform position (two-dimensional): Shoulder, summit

Landform position (three-dimensional): Side slope, interfluve

Down-slope shape: Linear, convex

Across-slope shape: Linear

Parent material: Limy-influenced red clayey residuum weathered from shale

Typical profile

Ap - 0 to 4 inches: silty clay loam

Bt+B3 - 4 to 32 inches: clay

C - 32 to 38 inches: extremely channery silty clay loam

Cr - 38 to 42 inches: bedrock

Properties and qualities

Slope: 35 to 70 percent

Depth to restrictive feature: 38 to 60 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.02 in/hr)

Depth to water table: More than 80 inches

Custom Soil Resource Report

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Other vegetative classification: Fertile Hills (FH3)

Minor Components

Other soils

Percent of map unit: 10 percent

Uhd3—Upshur silty clay, 15 to 25 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: k9rq

Mean annual precipitation: 38 to 50 inches

Mean annual air temperature: 49 to 55 degrees F

Frost-free period: 158 to 181 days

Farmland classification: Not prime farmland

Map Unit Composition

Upshur and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Upshur

Setting

Landform: Benches, ridges

Landform position (two-dimensional): Shoulder, summit

Landform position (three-dimensional): Side slope, interfluvium

Down-slope shape: Linear, convex

Across-slope shape: Linear

Parent material: Limy-influenced red clayey residuum weathered from shale

Typical profile

Ap - 0 to 4 inches: silty clay loam

Bt+B3 - 4 to 32 inches: clay

C - 32 to 38 inches: extremely channery silty clay loam

Cr - 38 to 42 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent

Depth to restrictive feature: 38 to 60 inches to paralithic bedrock

Natural drainage class: Well drained

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.02 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Other vegetative classification: Fertile Loams (FL3)

Minor Components

Other soils

Percent of map unit: 20 percent

Braxton County, West Virginia

BuE—Buchanan channery loam, 15 to 35 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: k6vx

Elevation: 180 to 730 feet

Mean annual precipitation: 39 to 51 inches

Mean annual air temperature: 42 to 67 degrees F

Frost-free period: 155 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Buchanan and similar soils: 75 percent

Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Buchanan

Setting

Landform: Hillslopes

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave

Across-slope shape: Convex

Parent material: Colluvium derived from sandstone and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A+E - 1 to 5 inches: channery loam

BE+Bt1+Bt2 - 5 to 26 inches: channery clay loam

Btx1+Btx2 - 26 to 59 inches: very channery sandy loam

C - 59 to 65 inches: very channery sandy loam

Properties and qualities

Slope: 15 to 35 percent

Percent of area covered with surface fragments: 9.0 percent

Depth to restrictive feature: 26 to 35 inches to fragipan

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Other vegetative classification: Very Rocky, Acid Soils (RA3)

Minor Components

Other soils

Percent of map unit: 25 percent

GaF—Gilpin silt loam, 35 to 70 percent slopes, very stony

Map Unit Setting

National map unit symbol: k6w3
Mean annual precipitation: 39 to 51 inches
Mean annual air temperature: 42 to 67 degrees F
Frost-free period: 155 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and siltstone

Typical profile

Oe - 0 to 4 inches: moderately decomposed plant material
A+E - 4 to 7 inches: silt loam
BE+Bt - 7 to 28 inches: channery silty clay loam
C - 28 to 35 inches: channery silt loam
R - 35 to 39 inches: bedrock

Properties and qualities

Slope: 35 to 70 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 32 to 36 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Other vegetative classification: Not Suited (NS)

Minor Components

Other soils

Percent of map unit: 25 percent

GID—Gilpin-Lily complex, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: k6w5

Mean annual precipitation: 39 to 51 inches

Mean annual air temperature: 42 to 67 degrees F

Frost-free period: 155 to 180 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Gilpin and similar soils: 50 percent

Lily and similar soils: 30 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, backslope

Landform position (three-dimensional): Crest, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from sandstone and siltstone

Typical profile

Oe - 0 to 4 inches: moderately decomposed plant material

A+E - 4 to 7 inches: silt loam

BE+Bt - 7 to 28 inches: channery silty clay loam

C - 28 to 35 inches: channery silt loam

R - 35 to 39 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Custom Soil Resource Report

Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Other vegetative classification: Acid Loams (AL3)

Description of Lily

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone

Typical profile

Ap - 0 to 6 inches: loam
BA+Bt1+Bt2 - 6 to 23 inches: clay loam
C - 23 to 27 inches: channery clay loam
R - 27 to 31 inches: bedrock

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Other vegetative classification: Acid Loams (AL3)

Minor Components

Other soils

Percent of map unit: 20 percent

GIE—Gilpin-Lily complex, 25 to 35 percent slopes

Map Unit Setting

National map unit symbol: k6w6
Mean annual precipitation: 39 to 51 inches
Mean annual air temperature: 42 to 67 degrees F
Frost-free period: 155 to 180 days
Farmland classification: Farmland of local importance

Map Unit Composition

Gilpin and similar soils: 60 percent

Lily and similar soils: 20 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from sandstone and siltstone

Typical profile

Oe - 0 to 4 inches: moderately decomposed plant material

A+E - 4 to 7 inches: silt loam

BE+Bt - 7 to 28 inches: channery silty clay loam

C - 28 to 35 inches: channery silt loam

R - 35 to 39 inches: bedrock

Properties and qualities

Slope: 25 to 35 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Other vegetative classification: Acid Hills (AH3)

Description of Lily

Setting

Landform: Ridges

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Crest

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from sandstone

Typical profile

Ap - 0 to 6 inches: loam

BA+Bt1+Bt2 - 6 to 23 inches: clay loam

C - 23 to 27 inches: channery clay loam

R - 27 to 31 inches: bedrock

Custom Soil Resource Report

Properties and qualities

Slope: 25 to 35 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Other vegetative classification: Acid Hills (AH3)

Minor Components

Other soils

Percent of map unit: 20 percent

Fayette and Raleigh Counties Area, West Virginia

CaC—Cateache channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2nbt6

Mean annual precipitation: 37 to 47 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 140 to 170 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Cateache and similar soils: 60 percent

Minor components: 40 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cateache

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Interfluvium

Down-slope shape: Linear

Across-slope shape: Convex

Parent material: Non-acid fine-loamy residuum weathered from shale and siltstone

Typical profile

A - 0 to 4 inches: channery silt loam

Bt (upper) - 4 to 30 inches: channery silty clay loam

Bt (lower) - 30 to 36 inches: channery silty clay loam

Cr - 36 to 40 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C

Other vegetative classification: Limy Uplands (LU3)

Minor Components

Pipestem

Percent of map unit: 20 percent

Landform: Mountain slopes

Landform position (two-dimensional): Backslope

Custom Soil Resource Report

Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Concave
Other vegetative classification: Very Rocky, Limy Soils (RL3)

Berks

Percent of map unit: 10 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Mountainflank, mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Dry Uplands (DU3)

Fenwick

Percent of map unit: 5 percent
Landform: Ridges
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Acid Loams (AL3)

Clifftop

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Acid Loams (AL3)

CcG—Cateache-Pipestem complex, 35 to 80 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2qdp3
Elevation: 180 to 850 feet
Mean annual precipitation: 37 to 47 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 140 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Cateache and similar soils: 40 percent
Pipestem and similar soils: 40 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pipestem

Setting

Landform: Mountain slopes

Custom Soil Resource Report

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank

Down-slope shape: Linear

Across-slope shape: Concave

Parent material: Reddish brown silty and clayey colluvium derived from interbedded sedimentary rock

Typical profile

A - 0 to 4 inches: channery silty clay loam

BA+Bw - 4 to 54 inches: stony silty clay loam

BC - 54 to 79 inches: very stony silty clay loam

Properties and qualities

Slope: 35 to 80 percent

Percent of area covered with surface fragments: 1.5 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: B

Other vegetative classification: Not Suited (NS)

Description of Cateache

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank

Down-slope shape: Linear

Across-slope shape: Convex

Parent material: Non-acid fine-loamy residuum weathered from shale and siltstone

Typical profile

A - 0 to 4 inches: channery silt loam

Bt (upper) - 4 to 30 inches: channery silty clay loam

Bt (lower) - 30 to 36 inches: channery silty clay loam

Cr - 36 to 40 inches: bedrock

Properties and qualities

Slope: 35 to 80 percent

Percent of area covered with surface fragments: 1.5 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Custom Soil Resource Report

Frequency of ponding: None

Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Other vegetative classification: Not Suited (NS)

Minor Components

Highsplint

Percent of map unit: 7 percent

Landform: Mountain slopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank

Down-slope shape: Linear

Across-slope shape: Concave

Other vegetative classification: Not Suited (NS)

Meckesville

Percent of map unit: 7 percent

Landform: Coves, mountainsides

Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Upper third of mountainflank, mountainbase

Down-slope shape: Concave

Across-slope shape: Concave, linear

Other vegetative classification: Very Rocky, Acid Soils (RA3)

Rock outcrop

Percent of map unit: 3 percent

Landform: Escarpments

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank

Laidig

Percent of map unit: 3 percent

Landform: Mountain slopes

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Mountainflank, mountainbase

Down-slope shape: Linear, concave

Across-slope shape: Concave, linear

MIA—Melvin-Lindside complex, 0 to 3 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2ndqx

Elevation: 10 to 30 feet

Mean annual precipitation: 31 to 47 inches

Mean annual air temperature: 48 to 55 degrees F

Custom Soil Resource Report

Frost-free period: 117 to 158 days

Farmland classification: Farmland of local importance

Map Unit Composition

Melvin and similar soils: 50 percent

Lindside and similar soils: 35 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Melvin

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Fine-silty alluvium derived from limestone, sandstone, and shale

Typical profile

Ap - 0 to 10 inches: silt loam

Bg+BCg - 10 to 58 inches: silt loam

Cg - 58 to 65 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Poorly drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 1.98 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: Frequent

Frequency of ponding: None

Available water storage in profile: Very high (about 12.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: B/D

Other vegetative classification: Wetlands (W3)

Description of Lindside

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Fine-silty alluvium derived from limestone, sandstone, and shale

Typical profile

Ap - 0 to 9 inches: silt loam

BA+Bw+BC - 9 to 60 inches: silt loam

C - 60 to 65 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Very high (about 12.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Other vegetative classification: Moist Loams (ML3)

Minor Components

Other soils

Percent of map unit: 15 percent

PmE—Pipestem channery silty clay loam, 15 to 35 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2nbtd
Elevation: 240 to 460 feet
Mean annual precipitation: 37 to 47 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 140 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Pipestem and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pipestem

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Concave

Custom Soil Resource Report

Parent material: Reddish brown silty and clayey colluvium derived from interbedded sedimentary rock

Typical profile

A - 0 to 4 inches: channery silty clay loam
BA+Bw - 4 to 54 inches: stony silty clay loam
BC - 54 to 79 inches: very stony silty clay loam

Properties and qualities

Slope: 15 to 35 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Other vegetative classification: Very Rocky, Limy Soils (RL3)

Minor Components

Cateache

Percent of map unit: 10 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Other vegetative classification: Limy Uplands (LU3)

Albrights

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainbase
Down-slope shape: Concave
Across-slope shape: Concave

Jefferson

Percent of map unit: 2 percent
Landform: Drainageways, mountain slopes
Landform position (two-dimensional): Backslope, footslope, toeslope
Landform position (three-dimensional): Mountainbase, mountainflank
Down-slope shape: Linear, concave, convex
Across-slope shape: Concave, convex
Other vegetative classification: Very Rocky, Acid Soils (RA2)

Greenbrier County, West Virginia

CgF—Cateache silt loam, 35 to 55 percent slopes, very stony

Map Unit Setting

National map unit symbol: lkh3
Mean annual precipitation: 31 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 117 to 158 days
Farmland classification: Not prime farmland

Map Unit Composition

Cateache and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cateache

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Fine-loamy residuum weathered from shale and siltstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A + BA - 1 to 12 inches: silt loam
Bt - 12 to 29 inches: very channery silty clay loam
C - 29 to 36 inches: extremely channery silty clay loam
Cr - 36 to 40 inches: bedrock

Properties and qualities

Slope: 35 to 55 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 36 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Other vegetative classification: Not Suited (NS)

Minor Components

Other soils

Percent of map unit: 15 percent

MI—Melvin-Lindside complex

Map Unit Setting

National map unit symbol: lkkb

Elevation: 10 to 30 feet

Mean annual precipitation: 31 to 47 inches

Mean annual air temperature: 48 to 55 degrees F

Frost-free period: 117 to 158 days

Farmland classification: Farmland of local importance

Map Unit Composition

Melvin and similar soils: 50 percent

Lindside and similar soils: 35 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Melvin

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Fine-silty alluvium derived from limestone, sandstone, and shale

Typical profile

Ap - 0 to 10 inches: silt loam

Bg+BCg - 10 to 58 inches: silt loam

Cg - 58 to 65 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Poorly drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 1.98 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: Frequent

Frequency of ponding: None

Available water storage in profile: Very high (about 12.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: B/D

Other vegetative classification: Wetlands (W3)

Description of Lindside

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Fine-silty alluvium derived from limestone, sandstone, and shale

Typical profile

Ap - 0 to 9 inches: silt loam

BA+Bw+BC - 9 to 60 inches: silt loam

C - 60 to 65 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Moderately well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 1.98 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: Occasional

Frequency of ponding: None

Available water storage in profile: Very high (about 12.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: C

Other vegetative classification: Moist Loams (ML3)

Minor Components

Other soils

Percent of map unit: 15 percent

ATTACHMENT 3

E&S Plan Sheets

Erosion and Sediment Control Plan Mountain Valley Pipeline Project

Wetzel, Harrison, Doddridge, Lewis, Braxton, Webster,
Nicholas, Greenbrier, Fayette, Summers, and Monroe
Counties, West Virginia

Prepared By:
Tetra Tech, Inc.
For



February 2016
Revised November 2016



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Attachments

- 1 Project Location Map
- 2 Special Protected Waters Crossed by MVP
- 3 Slip Mitigation Plan
- 4 Soils Report
- 5 E&S Plan Sheets

1.0 Introduction

Tetra Tech, Inc. (Tt) has prepared this Erosion & Sediment Control Plan (E&SCP) as part of the Stormwater Pollution Prevention Plan (SWPPP) for Mountain Valley Pipeline, LLC (MVP). The Plan addresses activities associated with the Mountain Valley Pipeline Project H-600 (Project) installation. The proposed pipeline will extend from the existing Equitrans, L.P. transmission system and other natural gas facilities in Wetzel County, West Virginia to Transcontinental Gas Pipe Line Company, LLC's (Transco) Zone 5 Compressor Station 165 in Pittsylvania County, Virginia. In addition to the pipeline, the Project will include approximately 171,600 horsepower (hp) of compression at three compressor stations currently planned along the route, as well as measurement, regulation, and other ancillary facilities required for the safe and reliable operation of the pipeline. The pipeline is designed to transport up to 2.0 million dekatherms per day of natural gas.

A site location map is provided in Attachment 1. This E&SCP, if properly implemented, will provide for effective E&SCs throughout construction.

Project Name: Mountain Valley Pipeline Project
Project Start: Lat: 39° 33' 45", Long: -80° 32' 34"
Project End (in WV): Lat: 37° 24' 10", Long: -80° 41' 21"
Counties: Wetzel, Harrison, Doddridge, Lewis, Braxton, Webster, Nicholas, Greenbrier, Fayette, Summers, and Monroe

1.1 Project Description

The pipeline will extend from an interconnection with Equitrans' existing H-302 pipeline near the MarkWest Liberty Midstream & Resources, L.L.C. (MarkWest) Mobley processing facility in Wetzel County, West Virginia and traverse south-southeast to the Virginia border near the town of Lindside. The pipeline then heads in a general southeast direction following the terrain until it terminates at Station 165, near Transco Village, in Pittsylvania County, Virginia. The Project route avoids the U.S. Forest Service Ownership Boundary for the Monongahela National Forest. The pipeline then crosses the Jefferson National Forest (MP 195.3 to 196.9) including the Appalachian National Scenic Trail (between MP 195.4 and 195.5) northwest of the town of Goldbond, Giles County, Virginia.

MVP Proposed Pipeline by County		
Approximate Milepost	County, State	Length (Miles)
0.0-9.6	Wetzel, WV	9.6
9.6-31.5, 32.6-33.6, 37.4-38	Harrison, WV	23.7
31.5-32.6, 33.7-37.3	Doddridge, WV	4.8

MVP Proposed Pipeline by County		
Approximate Milepost	County, State	Length (Miles)
38-65.4	Lewis, WV	27.5
65.5-80.3	Braxton, WV	14.7
80.3-109.8, 110-110.9	Webster, WV	30.0
109.8-110, 110.9-135.4	Nicholas, WV	24.7
135.4-154.2, 154.7-157.2	Greenbrier, WV	21.2
154.2-154.7	Fayette, WV	0.5
157.2-174.3	Summers, WV	16.7
174.3-196.4	Monroe, WV	22.0
Total		196.4

Fifty feet will be maintained as permanent right-of-way (ROW). In general, the construction LOD will be 125 feet, which is needed to provide a safe, non-congested working area. The additional temporary right-of-way will be necessary for the safe travel of construction and maintenance vehicles and equipment as well as stockpiling any additional material that may be encountered during trenching. Given the ruggedness of the terrain and steep slopes, the full 125-foot construction right-of-way will be necessary in forested areas for the safe construction of the Project. At a majority of the wetland and stream crossings, the LOD has been reduced to 75 feet in an effort to reduce impacts to these aquatic resources. Additional Temporary Workspaces (ATWS) are also provided within the limits of disturbance (LOD) to provide areas for vehicle parking, material storage, turning radius along access roads, staging areas, and support areas for stream and wetland crossings. Pipeyards identified for this project will not require any grading other than minor blading to level the surface and provide a base for gravel or matting. MVP will employ special construction techniques where the slopes typically exceed 30 to 35 percent, which may also require expanded workspace areas.

Pipeline construction activities will involve tree removal, clearing and grubbing within the ROW, trenching, pipe installation, and site restoration. All required State and Federal Permits, including USFWS and USACE clearances, will be acquired prior to construction.

There will be three compressor stations and three meter (interconnect) stations for receipt or delivery with other pipelines, these permanent above ground facilities are addressed under a separate SWPPP. Additional ancillary aboveground facilities will include pig launcher and receiver sites at the compressor stations and the beginning and end of the pipeline and meter stations, along with mainline block valve (MLV) sites within the pipeline right-of-way.

stations and the beginning and end of the pipeline and meter stations, along with mainline block valve (MLV) sites within the pipeline right-of-way.

Field investigations identified the availability of previously used roads and other existing roads should be sufficient to provide access to most work areas for the pipeline. Temporary and permanent access roads will be necessary for the safe construction and future operation/maintenance of the Pipeline. In most instances, temporary access roads are already in existence and would only be used during the construction phase of the project. Once construction is complete, the use and ownership of the temporary access roads will be returned to the private landowner. The permanent access roads are necessary for safe operation/maintenance of the pipeline. Through landowner agreements, MVP will be responsible for permanent access road maintenance. The attached Erosion and Sediment Control Plans Construction Sheets identify both the permanent and temporary access roads as either being “Maintained” or “Graded and Maintained”. A “Maintained” access road will only require crushed stone placement and appropriate smoothing if rutting or roadway degradation occurs – widening or significant grading is not anticipated. The sheet flow along the “Maintained” roadway will be controlled using the existing drainage infrastructure. Additional BMPs would be installed as necessary to prevent any off-site movement of sediments. A “Graded and Maintained” roadway may require widening, grading, and/or crushed stone placement. The sheet flow along these roadways will be controlled with drainage channels, broad based dips, and waterbars. Additional BMPs would be installed as necessary to prevent any off-site movement of sediments. New access roads are proposed in limited areas, including to the permanent above-ground facilities. Streams, wetlands, or other aquatic features along the existing access roads will be crossed according to the appropriate detail on the Plan Sheets. Access roads will utilize culverts where they exist and all other streams will be crossed utilizing timber mats, temporary bridging or culverts as dictated by field conditions during construction. Culverts to be replaced were sized using the Rational Formula for a 24-hr 10-year storm and Manning’s Equation. In areas with unexpected drainage, culverts will be appropriately installed and sized according to the Culvert Sizing Chart from the 2006 WVDEP Erosion and Sediment Control Best Management Practice Manual.

This E&SCP has been prepared in accordance with the 2006 West Virginia Department of Environmental Protection (WVDEP) Best Management Protection (BMP) Manual. For more information on the project refer to the E&SCP and Project Location Mapping provided in this report, Attachment 1 and 5.

1.2 Existing Site Conditions and Adjacent Areas

The WV portion of the Project crosses Wetzel, Harrison, Doddridge, Lewis, Braxton, Webster, Nicholas, Greenbrier, Fayette, Summers, and Monroe Counties. Relevant topographic features including streams, streets, pipelines, structures, utility lines, fences, paving and other significant items along the gas line alignment are indicated on the plans and U.S. Geological Survey (USGS) Maps (Attachment 1). The E&S Plan Sheets are provided in Attachment 5 and provide information regarding the typical controls and construction sequence to be followed.

To the extent practicable, the pipeline has been aligned parallel to existing corridors. As currently proposed, the pipeline is aligned parallel to existing utility corridors, trails, and roads for approximately 53 miles to limit additional clearing. Past and present land use of the project area and surrounding area is agricultural, pasture/hay, open space/grassland and forested land. Future land use will be a maintained vegetated natural gas pipeline ROW.

The table below lists the watersheds crossed by this Project. The rainfall zones crossed by this project are 1-Western Plateau, with an annual median rainfall total of 43.7 inches/year and 3-Mountains, with an annual median rainfall total of 52.7 inches/year.

Watersheds Crossed by the MVP Project			
Major Region (2-digit HUC)	Sub-basin (8-digit HUC)	Watershed (10-digit HUC)	County
West Virginia			
Ohio Region (05)	Little Muskingum-Middle Island (05030201) (Mid-Ohio North)	Fishing Creek (0503020102)	Wetzel, Harrison
	West Fork (05020002)	Tenmile Creek (0502000205)	Doddridge, Harrison
	Little Muskingum-Middle Island (05030201)	Headwaters Middle Island Creek (0503020104)	Doddridge, Harrison
	West Fork (05020002)	Middle West Fork River (0502000203)	Doddridge, Harrison
	Little Kanawha (05030203)	Leading Creek (0503020302)	Lewis
	West Fork (05020002)	Upper West Fork River (0502000201)	Lewis
	Little Kanawha (05030203)	Sand Fork (0503020301)	Lewis
	Little Kanawha (05030203)	Upper Little Kanawha River (0503020303)	Braxton, Lewis
	Elk (05050007)	Holly River (0505000703)	Braxton, Webster
	Elk (05050007)	Middle Elk River (0505000706)	Braxton, Webster
	Elk (05050007)	Laurel Creek (0505000702)	Webster
	Elk (05050007)	Birch River (0505000704)	Nicholas, Webster
	Gauley (05050005)	Headwaters Gauley River (0505000503)	Nicholas, Webster
	Gauley (05050005)	Outlet Gauley River (0505000508)	Nicholas
	Gauley (05050005)	Hominy Creek (0505000505)	Greenbrier, Nicholas

Watersheds Crossed by the MVP Project			
Major Region (2-digit HUC)	Sub-basin (8-digit HUC)	Watershed (10-digit HUC)	County
	Gauley (05050005)	Meadow River (0505000506)	Fayette, Greenbrier, Nicholas, Summers
	Lower New (05050004)	Glade Creek-New River (0505000402)	Greenbrier, Summers
	Greenbrier (05050003)	Wolf Creek-Greenbrier River (0505000309)	Monroe, Summers
	Middle New (05050002)	Indian Creek (0505000207)	Monroe
	Middle New (05050002)	East River-New River (0505000206)	Monroe

MVP has reviewed Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for areas crossed by the Project and recorded the location of 100-year flood zones. A summary of 100-year flood zones is listed in the table below.

FEMA-100 year Flood Zones crossed by the MVP Project			
County	Floodplain Waterbody	Flood Zone	Milepost
Wetzel	North Fork Fishing Creek	A	0.7
Wetzel	Price Run	A	5
Harrison	Little Tenmile Creek	AE	15.4
Harrison	Rockcamp Run	A	18.8
Harrison	Indian Run	A	23
Harrison	Salem Fork	A	25.9
Doddridge	Laurel Run	AE	34.8
Lewis	Right Fork Freemans Creek	A	42.5
Lewis	Left Fork Freemans Creek	A	45.8
Lewis	Sand Fork	A	55.1
Lewis	Indian Fork	A	58.5
Lewis	Oil Creek	A	62.2
Braxton	Falls Run	A	72.4
Braxton	Little Kanawha River	A	74.9
Webster	Left Fork Holly River	A	81.6
Webster	Oldlick Creek	A	82.3

Webster	Right Fork Holly River	A	84.1
Webster	Elk River	A	87.3
Webster	Camp Creek	A	93.1
Webster	Amos Run	A	97.6
Webster	Lost Run	AE	98.6
Webster	Laurel Creek	AE	98.9
Webster	Strouds Creek	AE	110.1
Nicholas	Big Beaver Creek	A	114.3
Nicholas	Big Beaver Creek	A	116.2
Nicholas	Gauley River	A	118.9
Nicholas	Hominy Creek	A	126.9
Greenbrier	Meadow Creek	A	140.4
Greenbrier	Meadow River	AE	144
Greenbrier	Little Sewell Creek	A	147
Greenbrier	Buffalo Creek	A	154.8
Greenbrier	Morris Fork	A	155.8
Summers	Hungard Creek	A	169.9
Summers	Greenbrier River	AE	171.4
Summers	Kelly Creek	AE	171.6
Monroe	Indian Creek	A	182.8
Monroe	Hans Creek	A	187.6
Monroe	Dry Creek	A	192

1.3 Critical Areas

Waterbodies

It is anticipated that all stream and wetland impacts within the pipeline limit-of-disturbance will be temporary, occurring during pipeline construction activities. Wetlands within the LOD but not within the pipeline trench area will be covered with timber mats during construction. Once construction in these areas is complete and the crossings are no longer necessary, the mat(s) will be removed and the resource restored and protected with the appropriate BMPs. These temporary resource impacts will not result in an adverse impact to water quality, physical or biological habitat, or aquatic species within the Project area due to the temporary stream crossing construction activities and implementing the Erosion and Sedimentation Control Plan's best management practices. The methods used includes silt fence, compost filter sock (CFS), and/or reinforced filtration devices and permanent vegetative cover. MVP will obtain all necessary local, state, and federal permits. MVP will obtain necessary clearance from county floodplain coordinators for temporary impacts within 100-year FEMA floodplains. In an effort to reduce permanent impacts, the existing culverts will not be replaced and will be spanned if necessary.

Some of the watersheds crossed by the Project are classified as Tier 3, warm water or trout streams, refer to attached table in Attachment 2. In-stream work in designated warm water streams and their adjacent tributaries is restricted during the fish spawning season of April – June. In-stream work in designated trout waters and their adjacent tributaries is restricted during the spawning season September 15-March 31st. Refer to Table 1 in Attachment 2 for a listing of affected streams. MVP may request a waiver from the West Virginia Division of Natural Resources, Wildlife Resources Section to avoid this restriction. In stream work may occur during the respective spawning season in ephemeral waters without a waiver if all reasonable measures are taken to minimize turbidity and sedimentation downstream associated with the proposed project.

Additional protective measures will be employed at crossings of and in proximity to Tier 3 and trout streams (refer to Table 1 in Attachment 2) such as:

- The use of reinforced filtration devices (defined as belted silt retention fence, triple stacked compost filter sock and/or super silt fence) at all downslope perimeters.
- Stream crossings in these areas will be completed within 72 hours once the crossing has begun.
- Permanent seeding and mulching must be accomplished within 4 days of reaching final grade.
- Temporary seeding and mulching must be accomplished within 4 days when areas will not be disturbed for more than 14 days.
- Disturbance will be limited as much as practicable.

MVP will pay special attention to the crossing of North Fork Fishing Creek (mile post 0.5) as requested by West Virginia Division of Natural Resources, Wildlife Resources Section. In order to limit potential impacts to downstream aquatic life, MVP will reduce the construction ROW to 75 feet and will keep temporary workspace areas 50 feet from this stream. Super silt fence or compost filter sock will be installed to limit sedimentation from leaving the worksite. Other Best Management Practices will be the use of timber mats for temporary vehicle crossing and trench plugs on either side of the stream.

Construction across waterbodies will be performed in a manner that minimizes the amount of time that the pipeline trenches will be left open. Construction methods at waterbody crossings will vary with the characteristics of the waterbody encountered. Typical stream crossing details are provided in the details section of the E&SCPs. Proposed methods for waterbody crossings include: dam and pump, flume, cofferdam and open-cut.

Intermediate waterbodies (between 10 and 100 feet wide at water's edge) and minor waterbodies (less than 10 feet wide at water's edge) will be crossed by the open-cut/conventional lay or dry ditch crossing methods, unless otherwise required. Where a dry-ditch crossing method is not specifically required by the FERC Procedures, the waterbody may be crossed using the open-cut crossing method.

The pipeline will be installed to provide a minimum of four feet of cover from the waterbody bottom to the top of the pipeline, except in consolidated rock, where a minimum of two feet of cover will be required. Trench spoil will be placed on the bank above the high water mark for use as backfill. Major

waterbodies (over 100 feet wide at water's edge) have been assessed on a case by case basis to determine the best crossing method and site specific construction and restoration plans. MVP proposes to use cofferdam construction open cut-dry ditch method to cross the Elk River, Gauley River, Meadow River and Greenbrier River.

Some waterbodies crossed by the Project are directly associated with or adjacent to roads or railroads. Where these roads or railroads are to be crossed using a horizontal boring machine, the waterbody will typically be included within the length of the bore. Currently, due to constructability issues, there are no HDDs planned for MVP.

West Virginia State Land

The Project crosses the Burnsville Lake Wildlife Management Area (WMA) in Braxton County, West Virginia at approximate MP 68.8 for approximately 175 feet. The Burnsville Lake WMA is a 12,579-acre wildlife area that is managed by the West Virginia Division of Natural Resources (WVDNR) and is used for hunting, fishing, and camping (WVDNR 2015). Within the Burnsville Lake WMA, the Weston Gauley Bridge Turnpike is a hiking trail listed on the National Park Service's National Recreation Trail Register and the National Register of Historic Places. This trail is located in Braxton County, West Virginia and would cross the pipeline route at MP 72.9 adjacent to Barbecue Run and Left Fork Knawl Creek. The area is remote and heavily forested. MVP plans to bore the Weston Gauley Bridge Turnpike trail therefore impacts to users of the trail are expected to be temporary and minimal.

The Project passes within 0.3 mile of the Elk River WMA and within 0.4 mile of the Big Ditch WMA. Both of these areas are USACE-owned wildlife areas that are managed by the WVDNR. The Elk River WMA is an 18,225-acre site in Braxton County, West Virginia that is managed for hunting, fishing, and camping. The Big Ditch WMA is a 388-acre site in Webster County, West Virginia that is managed for hunting and fishing (WVDNR 2015). Due to the distance from these WMAs, impacts are not expected due to construction or operation of the Project.

The proposed route is located more than 1.3 miles from the Meadow River WMA; however, a laydown yard would impact 0.3 acre of this WMA during operation. No impacts are expected during operation of the Project.

The North Bend Rail Trail (NBRT), part of the American Discovery Trail, is a 72-mile, multi-use recreational trail operated by the West Virginia State Park system. The pipeline will cross the trail at MP 26.0 where the trail crosses under US Route 50. In addition to the pipeline there will be a temporary construction laydown yard and a temporary work area directly adjacent to the trail. There is a potential that the eastern and northeastern edges of the laydown yard could overlap the trail. Temporary impacts on trail users may also include noise and visual disturbance from construction equipment while in the vicinity of the trail crossing. Users of the trail during operation of the pipeline would not be impacted. Mitigation measures during construction may include flagging of work zones, signage for trail users, and temporary trail re-route. MVP will work with the West Virginia State Park system during final pipeline design to identify site-specific measures if needed to minimize disturbance to users of the North Bend Rail Trail in this vicinity.

Steep Terrain

In mountainous areas where the pipeline will encounter steep side slopes, MVP will employ special construction techniques where the slopes typically exceed 30 to 35 percent. Slopes of 30° or greater are identified on the attached plan sheets. In addition, MVP has developed details for potential mitigating measures which are included on the plan sheets and described in Attachment 3 – Slip Mitigation Plan. However, implementing the specific controls should be reviewed by geotechnical engineer before being installed. The steep terrain construction techniques will require expanded workspace areas. In rugged terrain, temporary sediment barriers, such as silt sock and reinforced silt fences will be installed during clearing to prevent movement of sediment off of the right-of-way. In addition, temporary slope breakers may be installed during grading in accordance with the E&SCP to reduce water runoff or divert water areas away from the disturbed areas. Construction activities on rugged terrain will be similar to the typical construction methods; however, equipment will be tethered via winch lines to other equipment at the top of the slopes to ensure the safety of the construction personnel and surrounding areas.

Karst

MVP has completed a karst hazard assessment and determined that portions of pipeline within Summers County will cross areas with the potential to contain karst features. MVP has made route adjustments to avoid areas containing dense concentrations of features, such as sinkholes, which are indicative of karst development; however, the route may encounter areas of karst geology that are not readily identifiable until construction activity. MVP will have a geotechnical contractor on site daily for construction in karst areas, which is further documented in the Karst Mitigation Plan. The contractor will be able to immediately identify potential problematic features and direct crews to immediately employ mitigation measures as needed. During construction, erosion and sediment controls will be installed along the edge of the construction right-of-way and other work areas upslope of known sinkholes or other karst features with a direct connection to the phreatic zone of the karst (i.e., groundwater).

To minimize the potential for impacts to a karst feature (e.g., sinkhole, cave opening, etc.) or a water resource (e.g., well, spring, stream, pond) from pipeline construction in karst areas, industry-standard ESC practices will be supplemented with enhanced BMPs to accomplish the following objectives:

- Minimize the volume of stormwater and other construction-related surface water run-off;
- Minimize the permanent alteration of land surface characteristics and surface runoff patterns (existing drainage patterns and features should be taken into consideration to minimize changes to the rate that water enters the subsurface through a karst feature);
- Promote broad and shallow surface water flow dispersion with suitable spreading or diversion techniques;
- Prevent uncontrolled release of surface water and sediment to a waterbody or karst feature;
- Prevent artificial routing of storm water to karst features;
- Prevent blockage or filling of karst features;
- Do not construct artificial storm water structures within karst features;
- Prevent disposal of materials into a karst feature that will degrade the quality of water entering the subsurface through karst feature;

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- Install double lines of sediment control fencing upslope of a water body or karst feature;
 - Stock pile excavated material at least 100 feet from a water body so that the material cannot slough back into these areas;
 - Monitor ESC and stormwater management structures periodically during construction, and particularly after precipitation events (stormwater and ESC structures include sediment control fencing, temporary detention basins, diversion berms, or containerization - clean, repair, and replace structures as necessary);
 - Do not discharge hydrostatic test water in karst areas;
 - Establish staging areas for the crew, equipment, hazardous materials, chemicals, fuels, lubricating oils, etc., at least 100 feet from a water body or karst feature;
 - Install ESC and stormwater management structures surrounding staging areas to prevent run-on to, and then run-off and sediment migration from these sites;
 - Store construction waste materials, debris, and excess materials at least 100 feet from a water body or karst features;
 - Refuel and maintain construction equipment at least 100 feet from a water body or karst feature;
 - Limit the removal of riparian vegetation to only when it is necessary;
 - Re-vegetate all disturbed areas as soon as possible after construction using only native plants to reduce soil erosion. Annual species, such as rye or wheat, may initially be planted along with native species in areas subject to immediate soil loss, such as a steep slope, to provide rapid erosion control. Final re-vegetation should use native species only;
 - Replace woody riparian vegetation unavoidably lost using native riparian plants to help prevent the spread of invasive plants;
 - Where possible and practical, leave a minimum of 100-foot wide natural vegetated buffer area around a water body or karst feature. Plant a vegetative buffer of at least 100 feet around a waterbody or karst feature if the vegetation was previously cleared;
 - Apply fertilizers, herbicides, pesticides, or other chemicals no closer than 100 feet of a waterbody or karst feature;
 - Evaluate the establishment of vegetation after project completion and inspect all sediment control structures at one month intervals for at least 3 months. Retain sediment control structures until site stabilization is achieved;
 - Remove and dispose of all debris and excess construction materials properly upon project completion;
 - Remove temporary sediment/erosion control structures upon final site stabilization;
 - Clay dams or breakers should be included in pipeline installation design and constructed at appropriate intervals along the trench excavation to impede subsurface flow along the trench.

If karst features are uncovered, they will be evaluated by Karst Specialists to determine the need for mitigation measures, such as stabilization. A typical mitigation method for a sinkhole would be to excavate the feature to expose its throat, and then plug the throat using graded rock or sand fill to allow drainage and minimize alteration of flow patterns. The restoration of the pipeline and temporary work space LOD to a meadow condition or better. As a result of restoring these areas to a meadow in good condition and

maintaining pre-construction drainage patterns, there will be no increase in stormwater runoff rate or volume to karst features.

1.4 Soils

Project soils information was obtained from the Natural Resources Conservation Service (NRCS) Mapping Web Site, which utilizes data from the NRCS Soil Survey. The soils are listed in Attachment 4 which lists the soils potentially encountered within the project limits along with the limitations of each soil type.

2.0 Construction Sequence

Refer to the E&SC Plan drawings for the location of the proposed work and the associated BMPs. A generalized construction sequence is provided below. The construction sequence is intended to provide a general course of action in order to conform to the applicable regulatory agency requirements for temporary and permanent soil E&SCs. Necessary parts for proper and complete execution of work pertaining to this plan, whether specifically mentioned or not, are to be performed by the contractor. It is not intended that the drawings and this report show every detailed piece of material or equipment. The contractor will comply with all requirements listed in this section. The contractor may be required to alter controls based on effectiveness of controls or differing conditions encountered in the field. A copy of the SWPPP must be available at the Project site at all times.

1. At least 3 days prior to starting any earth disturbance activities, all contractors involved will notify Miss Utility of WV by calling 811 or 1-800-245-4848.
2. Install temporary erosion and sediment (E&S) controls prior to earth disturbance. Refer to best management practices (BMP) install and removal notes sheet. The appropriate BMPs should be placed around sensitive areas prior to earth disturbance. Stone construction entrances are to be provided at all locations where access roads and pipelines will be accessing or crossing a public roadway.
3. Install temporary E&S controls for stream crossings at locations shown on the E&S plans sheets. No earth disturbance activities within 50 feet of stream channels will be performed until materials needed to complete the crossing are at the location.
4. General clearing and grubbing of the trees and brush along the ROW for pipeline trenching may commence to the width specified in the ROW agreements or construction alignment sheets, whichever is less. Smaller debris such as shrubs and limbs are to be chipped and utilized on-site as part of the soil stabilization. Unless otherwise directed by the landowner, logs will be either hauled off-site or given to the landowner upon their request; stumps and/or logs will be ground, chipped, windrowed, or hauled off-site.
5. Install temporary waterbars immediately after initial disturbance of the soil in accordance with the waterbar spacing and sizing requirements shown on the plan and detail sheets. Waterbars will be constructed of soil, and used to reduce runoff velocity and divert water off the pipeline ROW. Waterbars will be installed with compost filter sock at the discharge end.

6. Excavate pipeline trench and begin grading of proposed meter and rectifier anode bed sites. The proposed construction ROW and extra workspaces are to be used as a work area for trench excavation, equipment movement and the temporary storage of soil stockpiles, as needed. Equipment, soil stockpiles and other materials are to remain upslope of BMPs during construction activities. Refer to BMP installation and removal sequence for the BMPs to be used for the protection during trench excavation and around temporary soil stockpiles. Segregation of topsoil and subsoil will be formed where trench excavation takes place in an agricultural, wetland, or residential area.
7. Pipeline sections will be transported to the work area and strung along the working side of the ROW parallel to the trench line. Welding can occur in or out of the trench. The pipeline will be bent to conform to the trench contour and placed on temporary supports alongside the trench. Welds will be visually and radio-graphically inspected and repaired as necessary. The pipe section will be lowered into the trench and placed on padding per MVP construction standards. Any wetness encountered during construction work will be dewatered by using pumps, hoses, and pumped filter (dewatering) bags, and will be discharged to a well vegetated, upland area. No standing water is permitted in the pipe trench, except in wetland areas.
8. Stream pipeline crossing construction methods will be installed at locations shown on the E&S plan sheets and as specific on detail sheet. Stream bank stabilization will be installed immediately following completion of pipeline installation as shown on the attached detail sheet.
9. Install trench breakers at locations shown on the drawings or as directed by MVP or as specified on the detail sheet.
10. The trench will subsequently be backfilled with suitable excavated material. The backfill material will be slightly crowned in upland areas to allow for settlement that may occur. Crowning the soil slightly over the pipeline will help prevent future storm water-related problems from settling of the backfilled area. No crowning of soils will take place in wetlands, streams or floodplains. In areas where topsoil has been segregated, the subsoil will be replaced first, and then the topsoil will be spread over the area from which it was removed. Disturbed areas will be restored to their approximate original topographic contours.
11. Stabilize exposed and unworked soils by application of effective BMPs that protect the soil from the erosive forces of raindrops, flowing water, and wind. Areas at final grade should be seeded and mulched or otherwise stabilized within 7 days and areas that will not be worked again for 21 days or more must be seeded and mulched or otherwise stabilized within 7 days.
12. In the unlikely event that there are excess excavated materials remaining after the trench has been backfilled, the material is to be disposed of within the existing ROW in an upland area outside of the 100-year floodplain. Material will be spread in a thin layer and tied into existing contours to create positive drainage for stormwater runoff.
13. Construct permanent waterbars after completion of grading in accordance with the waterbar spacing and sizing requirements shown on plan and detail sheets. Permanent waterbars are not permitted in agriculture or pasture lands.
14. Revegetated disturbed area per tables in Section 11.0 or per landowner request. For 3:1 or steeper slopes the disturbed area will have erosion control fabric (blanketing, hydroseeding,

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- Flexterra, or approved equal) installed as shown on the detail sheet. Blanketing is not permitted in agriculture or pasture lands.
15. Re-establish appropriate drainage in existing road channels prior to seeding and mulching.
 16. Inspection of all erosion and sedimentation controls within disturbed areas will be, at a minimum, performed once every seven calendar days and within 24 hours after any storm event greater than 0.5 inches per 24 hours period. Repairs or maintenance shall be performed immediately to BMPs. A final inspection shall be requested once there is uniform, perennial 70 percent vegetative stabilization. The 70 percent requirement refers to the total area vegetated. Disturbed areas not attaining a uniform, perennial 70 percent vegetative coverage shall be re-seeded as needed until uniform, perennial 70 percent vegetative coverage is established.
 17. All pollutants, including waste materials and demolition debris that occur on site during construction shall be handled and legally disposed of in accordance with state and federal regulations. Woody debris may be chopped and spread on-site.

For stream crossings, refer to the following steps and Section 3.3.1:

1. Install temporary equipment bridge, bypass hose, flume, pump, or cofferdam as described in Stream Crossing details around the work area.
2. Dewater work area utilizing pump water filter bags. Where possible, excavation will be from the top of the stream bank. Stockpile stream bed material separately from other soils to be used during stream restoration activities.
3. Install trench plugs, pipe, and backfill. Stockpiled stream bed material will be the last material restored in the stream channel.
4. Stabilize channel excavation and stream banks prior to redirecting stream flow.
5. Remove bypass hose, flume, pump, and temporary dam as needed.

Additional protective measures will be employed at crossings of Tier 3 and trout streams (refer to Table 1 in Attachment 2) such as:

- The use of reinforced filtration devices (defined as belted silt retention fence, triple stacked compost filter sock or super silt fence) at all downslope perimeters.
- Stream crossings in these areas will be completed within 72 hours once the crossing has begun.
- Permanent seeding and mulching must be accomplished within 4 days of reaching final grade.
- Temporary seeding and mulching must be accomplished within 4 days when areas will not be disturbed for more than 14 days.
- Disturbance will be limited as much as practicable.

If working within a wetland area, follow the generalized construction sequence below:

1. Install either RFDs or compost filter socks along the perimeters of the site as shown on the construction drawings.

2. Mats, pads, or similar devices will be used during the crossings of wetlands. Original grades through wetlands must be restored after trenching and backfilling. Any excess fill materials must be removed from the wetland and not spread within wetlands.
3. Soil excavated from wetland areas will be carefully removed with the roots intact. This soil should be placed in a separate stockpile to be reused during the wetland surface restitution.
4. Dewater work area utilizing pump water filter bags.
5. Install pipe.
6. Install trench plugs in wetland areas to prevent the trench from draining the wetland or changing its hydrology.
7. Backfill pipe trench. Backfill the top 12-inches of the excavated trench with the stockpiled wetland soil to match original surface grades.
8. Compact backfill and grade the surface of the trench area to allow for positive drainage to soil E&SCs and to prepare disturbed areas for permanent trench restoration.
9. Maintain all E&SCs devices until site work is complete and a uniform 70-percent perennial vegetative cover is established.
10. Remove all soil and E&SC measures upon establishment of a uniform 70-percent vegetative cover over the disturbed area. Re-grade and revegetate areas disturbed during the removal of the soil E&SCs.

3.0 Erosion and Sediment Control Measures

General stabilization and structural controls will be used in sediment and erosion control practices to 1) divert stormwater flows away from exposed areas, 2) convey runoff, 3) prevent sediments from moving off-site, and 4) reduce the erosive forces of runoff waters.

1. Mark Clearing Limits

Clearing limits will be staked and visibly flagged prior to construction. Adjacent sensitive areas and no-access roads will utilize signage and/or orange construction fence.

2. Establish construction access

The majority of access to the site will be via existing access roads. Access roads will include the installation of a stabilized rock construction entrance to remove sediment prior to exiting the site. Stabilized construction entrances will follow the WVDEP standard detail provided in the BMP manual. In instances where there are private residential driveways along the access roads, the stabilized construction entrance has been moved past the residential driveways. This was done to prevent the residences from driving over the rock construction entrances.

3. Install sediment controls

The E&SC Plan utilizes several best management practices throughout the project area to prevent sediment from leaving the site. As depicted on the plans, controls will be placed along the boundary of

sensitive areas, at stream and wetland crossings, downslope of all stockpiles, and where the potential exists for off-site sediment transport. The BMPs to be used throughout this project include:

- Rock Construction Entrance
- Temporary ROW Diversion Berm and Sediment Trap Outlet
- Silt Fence, Super Silt Fence and Belted Silt Retention Fence
- Compost Filter Sock
- Waterbars
- Trench Plugs
- Pumped Water Filter Bag
- Erosion Control Blanket/Flexterra/or equivalent
- Vegetative Stabilization

Instream BMPs

If a stream crossing or encroachment is required, work will be in accordance with state and federal permits. Refer to E&SC detail sheets for stream crossing details. Procedures that will be followed at stream crossing locations include the following:

- Minimize clearing and grubbing of vegetation up to streams, as possible, until the time of pipeline installation.
- Only that area which is required for pipeline installation shall be disturbed within the proposed LOD at stream crossings;
- Locating staging areas 50 feet away from the stream, where possible;
- Storing chemicals, storing equipment, washing equipment, or refueling equipment must be done in areas that are greater than 100 feet away from stream;
- Spoil placement and BMPs will be monitored at all times during stream crossing procedures; once work within a stream area is started, it will be conducted continuously to completion, emphasis will be placed on minimizing time of disturbance
- Construction activities will be scheduled so that the trench is excavated immediately prior to pipe laying activities. The duration of construction within each waterbody will be limited to 24 hours for minor waterbodies (10 feet wide or less) and 48 hours for intermediate waterbodies (greater than 10 feet wide but less than or equal to 100 feet in width).
- Spoils from stream crossings must be placed at least 10 feet from the water's edge; and
- Construction equipment will not be allowed in the stream channel when excavation can be done from either side or a temporary crossing while working at the stream crossing.

Dry Crossing Techniques

These techniques will be used to perform pipeline work in a relatively dry working condition or around the open excavation. These techniques include dam and pump around and flumed crossings, however the process is limited by stream size, flow, and water depth. Larger streams with greater flow or width that require dry working conditions will utilize cofferdam construction.

E&S control measures will be installed prior to any earth disturbance and addressed if necessary immediately after disturbance of the waterbody.

- **Flume Pipe Method.** Please see detail sheets for a detail of the flume method. This procedure involves construction two bulkheads, either sandbags or plastic dams, to direct the stream flow through a flume pipe placed over the trench prior to excavation. The flume shall be aligned as to prevent bank erosion and bed scour. The flume will not be removed during trenching, pipe laying, or backfilling.
- **Pump Around Method.** Please see the detail sheets for a detail of the dam and pump method. This procedure involves construction two bulkheads, either sandbags or plastic dams. The upstream dam will cause the water to pond where it can be pumped around the work area and be discharged behind the downstream bulkhead. Pumps of sufficient size to transmit the flow downstream will be used. Backup pumps must be on-site. Pump intakes must be screened. Pump discharges must not cause scour.
- **Cofferdam –** Please see the detail sheets for a detail of the cofferdam construction method. This procedure involves constructing a cofferdam around a portion of the stream crossing utilizing a combination of, but not necessarily all, sand bags, jersey barriers and stone. Following the installation of the cofferdam the water within the work area is pumped through a discharge filter bag and the construction will proceed with installation of the pipe in the dry open ditch. Following installation of the section of pipe the stream bed is restored, water is re-introduced to the work area and the cofferdam is removed. Then construction moves to the opposite-uncompleted side of the stream and the process is repeated to complete the crossing.
- **Portadam™** - Please see the detail sheets for a detail of the Portadam™ (or equivalent) construction method. This procedure is similar to the Cofferdam procedure and involves installing a Portadam™ (or equivalent) structure. Following the installation of the structure, the water within the work area is pumped through a discharge filter bag. The construction will proceed with installation of the pipe in the dry open ditch. Following installation of the section of pipe the stream bed is restored, water is re-introduced to the work area and the cofferdam is removed. Then construction moves to the opposite-uncompleted side of the stream and the process is repeated to complete the crossing

Stream Bank Stabilization

Permanent stabilization shall occur immediately upon installation, backfilling, and grading at each stream crossing.

Temporary Stream Crossings

Temporary stream crossings, consisting of bridges of timber mats or clean rock fill and flume(s), will be installed to cross minor or intermediate streams. Timber mats shall be used to cross smaller streams

where the span of the mat will stretch from bank to bank. Clean rock fill and flumed crossings will be utilized where it is not feasible to utilize timber mats. As an alternative, portable bridges may be used instead for small crossings. Equipment will not be allowed to ford flowing streams during construction activities. Temporary road crossings of streams must maintain adequate flow downstream.

4. Stabilize Soils

After pipeline installation, previously excavated material will be used to backfill the pipeline trench and restore the grade to pre-excavation conditions. The first 12 inches above the top of the pipe will be clean fill free of rocks from the excavation; where the previously excavated material contains large rocks or other materials that could damage the pipe or coating, clean fill will be used to protect the pipe. If additional fill is required, it will be either flowable fill or topsoil.

To prevent mixing of the soil horizons or incorporation of additional rock into the topsoil, topsoil segregation (topsoil set in a separate pile) will be performed in non-saturated wetlands, croplands, pastures, hayfields, and in areas requested by the landowner. Implementing proper topsoil segregation will help ensure post-construction revegetation success, thereby minimizing loss of crop productivity and the potential for long-term erosion problems. Up to 12 inches of topsoil will be removed from the ground surface, segregated, as appropriate, from all subsoil and replaced in the proper order during backfilling and final grading. Where topsoil is less than 12 inches deep, the actual depth of the topsoil will be removed and segregated. Segregated topsoil will be placed in the trench following subsoil backfilling. Topsoil segregation may not be practical in saturated wetlands with standing water.

The plans specify the utilization of temporary and permanent seed mixes, mulching and lime in accordance with the WVDEP BMP Manual (refer to Section 11.0).

Any additional subsoil material from pipeline trenching activities will be spread thinly (2-3 inches) along the ROW and within the disturbance limits in upland areas and revegetated. Additional material may not be placed within wetlands and streams. After installation of the pipeline, the site will be restored to approximate original contour and revegetated to a meadow condition with no proposed impervious surfaces. Waste/borrow sites are not anticipated to be utilized. Waste material not suitable for on-site stockpile or backfill, or excess soil that cannot be used on-site will be disposed of at a WVDEP approved waste disposal facility with an approved E&SCP.

Permanent above ground facilities for compressor stations and interconnect sites will be addressed under a separate SWPPP.

5. Protect Slopes

MVP will employ special construction techniques where the slopes typically exceed 30 to 35 percent. Slopes that of 30 degrees or greater are identified on the attached plan sheets. In addition, MVP has developed details for potential mitigating measures which are included on the plan sheets and described in Attachment 3 – Slip Mitigation Plan.

The E&SC Plan depict placement of erosion control blanket/soil stabilization matting (or approved equivalent such as hydromulching) on all slopes greater than 20-percent. Plan details provide for installation of slope matting according to manufacturer specifications.

Waterbars (ROW Diversions) are depicted on the plans and are placed along the pipeline following spacing specification in the WVDEP BMP Manual. The waterbar discharge will be controlled by outlet protection such filter socks.

6. Convey Stormwater in a Non-Erosive Manner

The pre-construction drainage patterns surrounding the project will be maintained. All disturbed areas within the pipeline LOD will be restored to a meadow in good condition. As a result of restoring the pipeline LOD and associated workspaces to a meadow in good condition and maintaining pre-construction drainage patterns, there will be no increase in stormwater runoff rate or volume.

Permanent above ground facilities for compressor stations and interconnect sites will be addressed under a separate SWPPP.

7. Control Other Pollutants

The operator will remove from the site, recycle, or dispose of all building materials and wastes in accordance with the WVDEP BMP Manual. The contractor will not illegally bury, dump, or discharge building material or wastes at the site. Sediment removed from BMPs will either be spread in a protected area to dry and then recycled as fill material or disposed of off-site. In cases where disposal is necessary, waste materials are to be disposed of at an approved WVDEP waste disposal facility in accordance with state and federal regulations.

8. Control Dewatering

Localized trench dewatering will be in accordance with the WVDEP BMP manual and recommendations. Dewatering will occur with a dewatering filter bag and will outfall to a well-vegetated area or through a filter sock outlet protection. Trench plugs will be used to prevent the excavation from draining or changing the hydrology of water resources. Discharges from upland dewatering should not occur within wetlands or on streambanks.

9. Maintain BMPs

Temporary and permanent E&S control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with West Virginia DEP, Division of Water and Waste Management, Erosion and Sediment Control Best Management Practice Manual, 2006.

E&SCs on the site will be inspected at least once every seven calendar days and within 24 hours after any storm event equal to or greater than 0.5 inches of rain per 24-hour period.

Repairs or maintenance shall be performed immediately to BMPs.

All public and private roads adjacent to a construction entrance must be inspected and cleaned of debris originated from the construction site as necessary.

Specific maintenance will include:

Rock Construction Entrance – thickness of the stabilized construction entrance will be constantly maintained to the specific dimensions by adding rock as needed. The entrance will be cleaned and redressed when voids become choked with mud and sediment.

Compost filter sock/silt fence - accumulated sediment will be removed as required, and in all cases where uniform accumulations are $\frac{1}{2}$ the above ground height of the filter sock/fence. Any accumulated earth behind the filter sock/fence will be disposed of by the Contractor in such a manner that the removed earth will not be excessively eroded and transported into a waterbody or wetland.

The filter sock/fence installation should be inspected weekly and within 24 hours after any storm event greater than or equal to 0.5 inches of rain per 24-hr period. Loosened support stakes will be removed and new stakes driven. Filter socks/fence will be maintained and repaired as per manufacturer specifications.

Cross drain culverts with outlet protection – cross drain culverts with outlet protection should be inspected weekly and within 24 hours after any storm event greater than or equal to 0.5 inches of rain per 24-hr period. They should be maintained to ensure that the culvert inlet is free of debris so as to allow for proper flow. Damaged culverts and/or outlet protection should be repaired or replaced immediately.

Erosion Control Blanket – the erosion control blanket will be checked for torn or loose stapled areas.

Vegetative Stabilization – vegetative stabilization will be periodically inspected for proper growth. Any areas not responding will be promptly reseeded. Areas which show signs of erosion prior to stabilization will be re-graded, re-seeded and re-mulched as soon as possible.

Waterbars– waterbars should be inspected weekly and after all rainfall events. They should be maintained to ensure that the specified design dimensions and protective lining are available at all times. Damaged waterbars should be repaired or replaced immediately.

10. Manage the Project

A copy of the E&SC Plans and appropriate inspection/maintenance logs are to be kept on site at all times during active construction. A copy of the Groundwater Protection Plan will be kept onsite during construction.

The project will be generally maintained in accordance with the following:

- Coordination with Utilities – Notify Miss Utility of WV by calling 811 or 1-800-245-4848 at least 3 days prior to construction.
- Inspection and Monitoring – E&SC BMPs will be inspected at least once every seven calendar days and within 24 hours after any storm event greater than or equal to 0.5 inches per 24 hour period. Temporary and permanent E&S BMPs will be maintained and repaired as needed.
- Reporting – The E&S plan holder will notify the WVDEP of any spill/discharge of pollutants within 24 hours.
- Equipment Maintenance – Maintenance of equipment will be performed using generally accepted practices, including plastic mats, drip pans, etc.

11. Stabilization

11.1 Seedbed preparation

The seedbed must be loose at the time of seeding. The seedbed must be loosened by disking on the contour, or by bulldozer tracking up and down the slope. Backblading is acceptable on gentle slopes or road bed.

11.2 Permanent and Temporary Seeding

Temporary vegetative cover must be established where runoff will go directly into a stream. Stabilization measures will be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than seven days after the construction activity in that portion of the site has permanently ceased.

Where the initiation of stabilization measures by the seventh day after construction activity temporarily or permanently ceases is precluded by natural causes, stabilization measures will be initiated as soon as conditions allow.

Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g., the total time period that construction activity is temporarily halted is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the seventh day after construction activities have temporarily ceased.

Planting of permanent vegetative cover will be performed on all disturbed areas. Lime and fertilizer rates will be applied to all permanent seeding at the time of seedbed preparation.

Inspection shall be requested once there is uniform, perennial 70 percent vegetative coverage established. Temporary BMPs will be removed upon achieving vegetative stabilization. The 70 percent requirement refers to the total area vegetated and not a percent of the site. Disturbed areas not attaining a uniform, perennial 70 percent vegetative coverage shall be re-seeded as needed until uniform, perennial 70 percent vegetative coverage is established.

Revegetation in non-agricultural areas shall be considered successful if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands. In agriculture areas, revegetation shall be considered successful when upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field, unless the easement agreement specifies otherwise.

Restoration will be considered successful if the disturbed surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless requested otherwise by the landowner or land managing agency), revegetation is successful, proper drainage has been restored, and the appropriate federal and state agencies approve.

Wetlands along the proposed pipeline are expected to exhibit varying degrees of saturation and water elevation, requiring a variety of plant species to be re-established. In unsaturated wetlands, most vegetation will be replaced by seeding. Saturated wetlands will typically be allowed to re-vegetate naturally. Wetland revegetation will be considered successful when the cover of herbaceous and/or woody species is at least 80 percent of the type, density, and distribution of the vegetation in adjacent wetland areas that were not disturbed by construction. Revegetation efforts will continue until wetland revegetation is successful.

Recommended Permanent and Temporary Seed Mixtures and Fertilizer/Mulch for Revegetation of Upland Areas

Item	Uplands	
Permanent Seed and Mulch Application Rates		
Seed ¹	Kentucky 31 tall fescue	65 pounds per acre
Seed ¹	Empire Birdsfoot Trefoil (1/2 Empire, 1/2 Viking)	5 pounds per acre of inoculated seed
Seed ¹	Redfescue	20 pounds per acre

Lime	Agricultural Grade (Pellet Form)	2 Tons per acre without a soil test
Fertilizer	10-20-20	1/2 ton per acre
Mulch	Cereal Straw	3 tons per acre
Temporary Seed and Mulch Application Rates		
Seed ¹	Annual Ryegrass	40 pounds per acre
Mulch	Cereal Straw	3 tons per acre

Notes

1 – all seed is pure live seed

2 – unless otherwise requested by landowner in ROW

Revegetation of Wetland Areas

Item	Wetlands ²	
Seed ¹	Annual Ryegrass	48 pounds per acre

Notes

1 – all seed is pure live seed

2 – do not apply mulch, fertilizer, or lime in wetland areas

Alternate Permanent Seed Mixtures

Item	Alternate No. 1	
Permanent Seed and Mulch Application Rates		
Seed ¹	Alfalfa	18 pounds per acre
Seed ¹	Clover	5 pounds per acre

Item	Alternate No. 2	
Permanent Seed Application Rates		
Seed ¹	Orchard Grass	30 pounds per acre
Seed ¹	Clover	5 pounds per acre

Item	Alternate No. 3 - Wildlife Seed Mix	
Permanent Seed Application Rates		
Seed ¹	ERNMX - 260 PA Piedmont Province UPL Mix: 26% Indiangrass 26% Little Bluestem 20% Virginia Wildrye 10% Big Bluestem 7% Purpletop 5% Switchgrass 4% Deertongue 2% Purple Lovegrass	20 pounds per acre

Notes

1 – all seed is pure live seed

2 – contractor to use alternate seed mixtures if specified per landowner request

4.0 Construction Schedule/Phasing

Clearing is expected to commence in October 2017 and pipeline construction is anticipated to begin March 2018 with a target full in-service date for the Project of November 2018. The order in which each facility will be constructed may vary, depending upon numerous factors, including the receipt of necessary authorizations, the capabilities of each contractor, available work force, and optimized logistics.

4.1 Construction Schedule

Construction Schedule for Major Components of the Project		
Component	Commence Activity	Complete Activity
Establish construction access, install site control BMPs, clear ROW and workspace	October 2017	March 2018
Pipeline Construction	March 2018	October 2018
Compressor Stations	October 2017	November 2018
Final Restoration	On-going per spread	November 2018
Hydrostatic Testing	October 2018	November 2018

MVP will utilize 8 construction spreads to construct the pipeline in WV. The table below provides spread by beginning and ending MP, length and construction year.

Proposed Spreads for Pipeline Construction					
Spread	Begin MP	Ending MP	Mainline Length (Miles)	Construction Year	Spread Length (Miles)
1	0	25.9	25.9	2018	25.9
2	25.9	48.05	22.15	2018	22.15
3	48.05	77.6	29.55	2018	29.55
4	77.6	104.7	26.65	2018	26.65
5	104.7	127.9	23.65	2018	23.65
6	127.9	154.2	26.3	2018	26.3
7	154.2	181.8	27.6	2018	27.6
8	181.8	End of WV section	22.95	2018	22.95

Erosion and Sediment Control Plan Mountain Valley Pipeline Project

Permanent Above-Ground Facilities

Wetzel, Harrison, Braxton, and Fayette Counties,
West Virginia

Prepared By:
Tetra Tech, Inc.
For



February 2016
Revised November 2016



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Attachments

- 1 Project Location Map
- 2 Soils Report
- 3 E&S Plan Sheets

1.0 Introduction

Tetra Tech, Inc. (Tt) has prepared this Erosion & Sediment Control Plan (E&SCP) as part of the Stormwater Pollution Prevention Plan (SWPPP) for Mountain Valley Pipeline, LLC (MVP). The Plan addresses activities associated with the Mountain Valley Pipeline Project H600 (Project) installation. The proposed pipeline will extend from the existing Equitrans, L.P. transmission system and other natural gas facilities in Wetzel County, West Virginia to Transcontinental Gas Pipe Line Company, LLC's (Transco) Zone 5 Compressor Station 165 in Pittsylvania County, Virginia. In addition to the pipeline, the Project will include approximately 171,600 horsepower (hp) of compression at three compressor stations currently planned along the route, as well as measurement, regulation, and other ancillary facilities required for the safe and reliable operation of the pipeline. The pipeline is designed to transport up to 2.0 million dekatherms per day of natural gas.

A site location map is provided in Attachment 1. This E&SCP, if properly implemented, will provide for effective E&SCs throughout construction.

Project Name:	Mountain Valley Pipeline Project
Project Start:	Lat: 39.5625N, Long: -80.5430W
Project End (in WV):	Lat: 37.4030N, Long: -80.6891W
Counties:	Wetzel, Harrison, Doddridge, Lewis, Braxton, Webster, Nicholas, Greenbrier, Fayette, Summers, and Monroe

1.1 Project Description

This SWPPP specifically addresses permanent above ground facilities as part of the MVP Project. The MVP Project will require three compressor stations to move gas from the beginning of the pipeline at the existing Equitrans transmission system in Wetzel County, West Virginia to the terminus at the Transco Station 165 in Pittsylvania County, Virginia. Additionally, three interconnect meter stations will be installed at interconnection points consistent with various receipts and deliveries, one with existing Equitrans facilities (H-302), and two with foreign facilities (MarkWest and Columbia). New permanent access roads will be constructed for each of the permanent above-ground facilities.

Bradshaw Compressor Station will be constructed at approximately milepost (MP) 2.8 in Wetzel County, West Virginia and will pull gas from the origination point, near Mobley, West Virginia for relay to Harris Compressor Station. Harris Compressor Station will be constructed at approximately MP 77.5 in Braxton County, West Virginia and will pull gas from Bradshaw Compressor Station for relay delivery to Stallworth Compressor Station. Stallworth Compressor Station will be constructed at approximately MP 154.2 in Fayette County, West Virginia and will pull gas from Harris Compressor Station, for relay delivery to Transco Station 165.

Facility	Latitude	Longitude	County	Nearest Town	Access from	Precipitation Zone	Limits of Disturbance (ac)	Approx. Pad Size (sq.yds)
Mobley Interconnect	39° 33' 45"	-80° 32' 34"	Wetzel	Big Run	Rt 15/3 - Mobley Run	1	3.3	5,125
Bradshaw Compressor Station	39° 31' 58"	-80° 31' 58"	Wetzel	Smithfield	Rt 21/1 Bear Run Rd	1	49.4	30,272
Sherwood Interconnect	39° 18' 49"	-80° 32' 06"	Harrison	East Salem	Rt 50/4 Indian Run	1	12	5,270
Harris Compressor Station	38° 43' 20"	-80° 30' 11"	Braxton	Milroy	Rt 24/5 Milroy Rd	3	16.8	27,111
WB Interconnect	38° 43' 27"	-80° 30' 06"	Braxton	Milroy	Rt 24/5 Milroy Rd	3	9.1	5,784
Stallworth Compressor Station	37° 52' 07"	-80° 45' 27"	Fayette	Spring Dale	Rt 29 Dawson-Springdale	1	27.7	34,940

Precipitation Zones:

1 – Western Plateau, 43.7 inches/year

3 – Mountains, 52.7 inches/year

Construction activities will consist of clearing and grubbing, installation new access roads, construction of pads, and site restoration activities. In addition, the Bradshaw and Harris Compressor Stations will include tie-in pipe installation.

This E&SCP has been prepared in accordance with the 2006 West Virginia Department of Environmental Protection (WVDEP) Best Management Protection (BMP) Manual. For more information on the project refer to the E&SCP and Project Location Mapping provided in this report, Attachment 1 and 3. All required State and Federal Permits, including USACE clearances, will be acquired prior to construction.

1.2 Existing and Adjacent Site Conditions

Relevant topographic features including streams, streets, pipelines, structures, utility lines, fences, paving and other significant items are indicated on the plans and U.S. Geological Survey (USGS) Maps (Attachment 1). The E&S Plan Sheets per each station are provided in Attachment 3 and provide information regarding the typical controls and construction sequence to be followed.

Past and present land use of the project area and surrounding area for all sites is pasture/hay, open space/grassland and forested land. Future land use will be a gravel pad and access road, maintained vegetated natural gas pipeline ROW, and surrounding disturbed areas restored to meadow condition.

1.3 Critical Areas

Waterbodies

Refer to the table below for a listing of watershed and stream and wetland impacts per permanent above-ground facility. MVP will obtain all necessary local, state, and federal permits. MVP will obtain necessary clearance from county floodplain coordinators for temporary impacts within 100-year FEMA floodplains.

Facility	Receiving Waters	Watershed	Stream/Wetland Impacts	Temporary, Linear Feet	Permanent, Linear Feet
Mobley Interconnect	UNT to Mobley Run	Middle Ohio North	S-ST10 (INT): replace/extend existing culvert	20	158 total (54 minus existing culvert length)
			S-ST13 (INT): replace/extend existing culvert	27	152 total (111 minus existing culvert)
			S-ST14 (EPH): adjust stream channel	79	102
			S-J63 (INT): maintain existing culvert	100	-
Bradshaw Compressor Station	UNT to Fallen Timber Run, UNT to Buck Run	Middle Ohio North	Wetland W-YZ8: construction of stockpile	0.01 ac	-
Sherwood Interconnect	UNT to Cherrycamp Run, UNT to Salem Fork	West Fork	None	-	-
Harris Compressor Station	UNT to Laurel Run	Little Kanawha River	S-AA15 (INT): replace/extend culvert/channel	54	94
			S-A12 (EPH): construction of fill slope	31	-
WB Interconnect	UNT to Laurel Run	Little Kanawha River	None	-	-
Stallworth Compressor Station	UNT to Buffalo Creek	Gauley	S-A104 (EPH): filling for new access road	115	215
			S-QR4 (INT): new culvert for road crossing	54	147
			Wetlands W-EE7 and W-EE6: construction of access road	-	0.004, 0.002 ac

It is anticipated that waterbody impacts will not result in an adverse impact to water quality, physical or biological habitat, or aquatic species within the Project area due to the temporary stream crossing construction activities and implementing the Erosion and Sedimentation Control Plan's best management practices. The methods used include but are not limited to silt fence, compost filter sock, cross-drain culverts, outlet protection, road sloping/ crowning, reinforced filtration devices, and permanent reseeding along disturbed areas and permanent vegetative cover.

Steep Terrain

Existing slopes at permanent above-ground facilities do contain areas that exceed 30° (steeper than 2:1). Precaution for steep terrain has been considered in the project and subsurface investigations were performed at each permanent above-ground facility to evaluate subsurface conditions for design and construction standards and factors of safety based on modelling for slope stability. Fill slopes are designed to be 2:1 (26.6°) or flatter except where alternative designs are used. In a few select areas, cut slopes will be at 1:1 where competent rock was noted in the subsurface exploration. Cut slopes not in competent rock are designed to be 2:1 or alternative designs are used. Compaction, benching, toe keys, and slope drains will provide good bonding of material and water control for long-term stability of all fill slopes at each site. Rapid vegetation procedures are to be followed which include a combination of installing a 6 to 12 inch layer of topsoil and erosion control blanket, flexterra, hydroseeding or equivalent to provide controls on all disturbed slopes 3:1 (18°) or steeper, including stockpiles, to provide permanent controls for post construction stormwater management. New access roads to permanent facilities will have grades of 16% or less with rock lined channels, cross drains and outlet protection.

Modified toe keys were designed in areas of the Harris Station for the proposed 2:1 slopes to meet existing grade and includes a 3 to 6 foot high gabion basket wall and 20-foot high rock toe key adjacent to stream S-AA12. Detailed geotechnical designs for soldier pile walls, Redi-Rock retaining walls, or reinforced soil slopes at Stallworth, Mobley, and Bradshaw stations will be included in contractor construction plans.

Karst

None of the permanent above-ground stations are located in known karst areas.

1.4 Soils

Project soils information was obtained from the Natural Resources Conservation Service (NRCS) Mapping Web Site, which utilizes data from the NRCS Soil Survey. The soils are shown in the attached soils report which lists the soils included within the project limits along with the limitations of each soil type.

2.0 Construction Sequence

Refer to the E&SC Plan drawings for the location of the proposed work and the associated BMPs. A generalized construction sequence is provided below, refer to individual station plans for a sequence that is specific to each station. The construction sequence is intended to provide a general course of action in order to conform to the applicable regulatory agency requirements for temporary and permanent soil E&SCs. Necessary parts for proper and complete execution of work pertaining to this plan, whether specifically mentioned or not, are to be performed by the contractor. It is not intended that the drawings and this report show every detailed piece of material or equipment. The contractor will comply with all requirements listed in this section. The contractor may be required to alter controls based on

effectiveness of controls or differing conditions encountered in the field. A copy of the SWPPP must be available at the Project site at all times.

1. At least 3 days prior to starting any earth disturbance activities, all contractors involved will notify Miss Utility of WV by calling 811 or 1-800-245-4848.
2. Install temporary erosion and sediment (E&S) controls prior to earth disturbance. Refer to best management practices (BMP) on the plan and detail sheets. Appropriate BMPs should be placed around sensitive areas where shown prior to earth disturbance. Stone construction entrances are to be provided at all locations where temporary access roads will be accessing a public roadway and until permanent access drives are completed. Hand clearing is permissible prior to E&S control installation.
3. General clearing and grubbing of the trees and brush may commence area as necessary for access road and pad construction within the Limits of Disturbance or as directed by an MVP designee, whichever is less. Smaller debris such as shrubs and limbs can be chipped and utilized on-site as part of the soil stabilization. Unless otherwise directed by the landowner, logs will be either hauled off-site or given to the landowner upon their request; stumps and/or logs will be ground, chipped, windrowed, or hauled off-site.
4. Install upslope earthen diversion berms and channels immediately following clearing and grubbing. Strip topsoil as necessary for installation of the berm with channel and install per the EARTHEN DIVERSION BERM detail.
5. It is contractor's responsibility to remove and dispose to an approved WVDEP waste disposal site all existing structures within the LOD as directed by an MVP designee.
5. Strip topsoil and construct proposed access road with roadside ditches. Install cross drain culverts with outlet protection as shown on the plan sheets.
6. Strip and stockpile topsoil within the limits of disturbance the areas needed to construct pad and stockpile areas.
8. Minimize total area of disturbance to the extent practical. Maintain temporary topsoil stockpiles within existing soil erosion and sediment controls.
9. Construct pad as shown on each station plan sheets. Refer to more detailed construction sequence in each station package.
10. Stabilize exposed and unworked soils and stockpiles by application of effective BMPs that protect the soil from the erosive forces of raindrops, flowing water, and wind. Areas at final grade should be seeded and mulched or otherwise stabilized within 7 days and areas that will not be worked again for 21 days (including stockpiles) or more must be seeded and mulched or otherwise stabilized within 7 days.
11. Revegetate disturbed area per seeding chart or per landowner request. For 3:1 or steeper slopes the disturbed area will have erosion control fabric (blanketing, flexterra, or equivalent) installed as shown on the detail sheet.
12. Final aggregate on pad and pad underdrain system to be installed during top dressing (by mechanical contractor).
13. Inspection of all erosion and sedimentation controls within disturbed areas will be, at a minimum, performed once every seven calendar days and within 24 hours after any storm event greater

- than or equal to 0.5 inches per 24 hours period. Repairs or maintenance shall be performed immediately to BMPs. A final inspection shall be requested once there is uniform, perennial 70 percent vegetative stabilization. The 70 percent requirement refers to the total area vegetated. Disturbed areas not attaining a uniform, perennial 70 percent vegetative coverage shall be re-seeded as needed until uniform, perennial 70 percent vegetative coverage is established.
14. All pollutants, including waste materials and demolition debris that occur on site during construction shall be handled and legally disposed of in accordance with state and federal regulations. Woody debris may be chopped and spread on-site.

3.0 Erosion and Sediment Control Measures

General stabilization and structural controls will be used in sediment and erosion control practices to 1) divert stormwater flows away from exposed areas, 2) convey runoff, 3) prevent sediments from moving off-site, and 4) reduce the erosive forces of runoff waters.

1. Mark Clearing Limits

Clearing limits will be staked and visibly flagged prior to construction. Adjacent sensitive areas and no-access roads will utilize signage and/or orange construction fence.

2. Establish construction access

Access to each site will be from new permanent access roads. Access roads will include the installation of a stabilized rock construction entrance to remove sediment prior to exiting the site. Stabilized construction entrances will follow the WVDEP standard detail provided in the BMP manual.

3. Install sediment controls

The E&SC Plan utilizes several best management practices throughout the project area to prevent sediment from leaving the site. As depicted on the plans, controls will be placed along the boundary of sensitive areas, along stream and wetlands, downslope of all disturbed area and stockpiles, and where the potential exists for off-site sediment transport. The BMPs to be used throughout this project include:

- Rock Construction Entrance
- Outlet protection
- Silt Fence, Super Silt Fence and Belted Silt Retention Fence
- Compost Filter Sock
- Rock check dams
- Channels with permanent lining
- Pumped Water Filter Bag
- Erosion Control Blanket/Flexterra/or equivalent
- Vegetative Stabilization

3.1 Instream BMPs

If a stream crossing or encroachment is required, work will be in accordance with state and federal permits. Refer to E&SC detail sheets for stream crossing details. Procedures that will be followed at stream crossing locations include the following:

- Minimize clearing and grubbing of vegetation up to streams, as much as possible.
- Only that area which is required shall be disturbed within the proposed LOD at stream crossings;
- Locating staging areas 50 feet away from the stream, where possible;
- Storing chemicals, storing equipment, washing equipment, or refueling equipment must be done in areas that are greater than 100 feet away from stream;
- Spoil placement and BMPs will be monitored at all times during stream crossing procedures; once work within a stream area is started, it will be conducted continuously to completion, emphasis will be placed on minimizing time of disturbance
- Spoils from stream crossings must be placed at least 10 feet from the water's edge; and
- Construction equipment will not be allowed in the stream channel when excavation can be done from either side or a temporary crossing while working at the stream crossing.

Stream Bank Stabilization

Permanent stabilization shall occur immediately upon installation, backfilling, and grading at each stream crossing.

Stream Crossings

Temporary stream crossings, consisting of bridges of timber mats or clean rock fill and flume(s), will be installed to cross minor or intermediate streams. Timber mats shall be used to cross smaller streams where the span of the mat will stretch from bank to bank. Clean rock fill and flumed crossings will be utilized where it is not feasible to utilize timber mats. As an alternative, portable bridges may be used instead for small crossings. Equipment will not be allowed to ford flowing streams during construction activities. Temporary road crossings of streams must maintain adequate flow downstream.

Permanent stream crossing with the use of culverts have been designed and sized based on the 10-year storm for streams at Harris CS and Stallworth CS. New culverts for streams at Mobley IC have been designed and sized based on the 100-year storm. The schedule size for channels and culverts are included with the details for each station.

The sequence for permanent culverting and channelization of streams is as follows:

1. Prior to the stream crossing, install E&S BMP controls and have all necessary materials and containment units available at the stream crossing.
2. Minimize clearing and grubbing of vegetation up to streams, as much as possible.
3. Install bypass hose, pump, and dam (sand bags or cofferdam). Use a pump or pumps sufficiently large to pump the entire stream flow around the site so that work can be conducted **in the dry** per the TYPICAL STREAM CROSSING ACCESS ROAD PUMP DIVERSION detail.
4. Install channel or culvert as indicated on the plan sheets.

-
- a. Filter cloth shall be placed on the streambed prior to the placement of the pipe culverts. Install clean coarse aggregate as bedding, install new culvert as indicated in the plan sheets and the culvert sizing chart provided with the DITCH RELIEF CULVERT detail. The culvert shall extend a minimum of five inches beyond the upstream and downstream toe of the aggregate placed around the culvert.
 - b. Install channel per the CHANNEL DETAIL.
 5. Water from the excavation area shall be pumped to a sediment filter bag.
 6. Stabilize the channel excavation, newly constructed fill slopes, and stream banks prior to removing pump and dam and redirecting stream flow.
 7. Immediately stabilize disturbed area within 50 feet of the stream.

4. Stabilize Soils

To prevent mixing of the soil horizons or incorporation of additional rock into the topsoil, topsoil segregation (topsoil set in a separate pile) will be performed in non-saturated wetlands, pastures, hayfields, and in areas requested by the landowner. Implementing proper topsoil segregation will help ensure post-construction revegetation success, thereby minimizing the potential for long-term erosion problems. Up to 12 inches of topsoil will be removed from the ground surface, segregated, as appropriate, from all subsoil and replaced in the proper order during backfilling and final grading. Where topsoil is less than 12 inches deep, the actual depth of the topsoil will be removed and segregated. Topsoil segregation may not be practical in saturated wetlands with standing water.

The plans specify the utilization of temporary and permanent seed mixes, mulching and lime in accordance with the WVDEP BMP Manual (refer to Section 11.0). Given the nature of the existing soils at the site, it is recommended that prior to placement of seed, all disturbed areas that are to be returned to meadow conditions shall have a minimum of 6 inches of topsoil installed at final grade in order to ensure best possible conditions to allow for seed germination.

5. Protect Slopes

The E&SC Plan depict placement of erosion control blanket/soil stabilization matting (or approved equivalent such as flexterra or hydromulching) on all slopes greater than 20-percent. Plan details provide for installation of slope matting according to manufacturer specifications. Compaction, benching, toe keys, and slope drains will provide good bonding of material and water control for long-term stability of each site. Upslope earthen diversion berms/channels are depicted on site plans to protect cut slopes with larger upslope drainage areas.

6. Convey Stormwater in a Non-Erosive Manner

The pre-construction drainage patterns surrounding the Project will be maintained. All disturbed areas within the limit of disturbance will be restored to meadow in good condition, except for gravel permanent pad and permanent gravel access road. The permanent gravel pads be installed with an underdrain

system at the downslope perimeter of the pad to divert stormwater to riprap aprons and/or channels. The permanent gravel access roads to each site will be installed with a riprap or turf-reinforced matting channel with cross drain culverts, rock check dams, and riprap aprons sized and spaced appropriately as shown on the plan sheets according to WV DEP BMP Manual. As a result of restoring the site to meadow in good condition, providing riprap channel outfalls, and maintaining pre-construction drainage patterns, there will be negligible increase in stormwater runoff rate or volume.

7. Control Other Pollutants

The operator will remove from the site, recycle, or dispose of all building materials and wastes in accordance with the WVDEP BMP Manual. The contractor will not illegally bury, dump, or discharge building material or wastes at the site. Sediment removed from BMPs will either be spread in a protected area to dry and then recycled as fill material or disposed of off-site. In cases where disposal is necessary, waste materials are to be disposed of at an approved WVDEP waste disposal facility.

8. Control Dewatering

Subsurface bench drains shall be provided on fill slopes on both the pad and access road fill slopes of 20 feet or greater as shown in the typical fill embankment benching detail on the plan detail sheet. Subsurface bench drains will provide a way for water to drain away from the fill slopes.

Localized excavation dewatering will be in accordance with the WVDEP BMP manual. Dewatering will occur with a dewatering filter bag and will outfall to a well-vegetated area or through a filter sock outlet protection. Discharges from upland dewatering should not occur within wetlands or on streambanks.

9. Maintain BMPs

Temporary and permanent E&S control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with West Virginia DEP, Division of Water and Waste Management, Erosion and Sediment Control Best Management Practice Manual, 2006.

E&SCs on the site will be inspected at least once every seven calendar days and within 24 hours after any storm event equal to or greater than 0.5 inches of rain per 24-hour period.

Repairs or maintenance shall be performed immediately to BMPs.

All public and private roads adjacent to a construction entrance must be inspected and cleaned of debris originated from the construction site as necessary.

Specific maintenance will include:

Rock Construction Entrance – thickness of the stabilized construction entrance will be constantly maintained to the specific dimensions by adding rock as needed. The entrance will be cleaned and redressed when voids become choked with mud and sediment.

Compost filter sock/silt fence - accumulated sediment will be removed as required, and in all cases where uniform accumulations are $\frac{1}{2}$ the above ground height of the filter sock/fence. Any accumulated earth behind the filter sock/fence will be disposed of by the Contractor in such a manner that the removed earth will not be excessively eroded and transported into a waterbody or wetland.

The filter sock/fence installation should be inspected weekly and within 24 hours after any storm event greater than or equal to 0.5 inches of rain per 24-hr period. Loosened support stakes will be removed and new stakes driven. Filter socks/fence will be maintained and repaired as per manufacturer specifications.

Erosion Control Blanket – the erosion control blanket will be checked for torn or loose stapled areas.

Vegetative Stabilization – vegetative stabilization will be inspected for proper growth. Any areas not responding will be promptly reseeded. Areas which show signs of erosion prior to stabilization will be re-graded, re-seeded and re-mulched as soon as possible.

Roadside Channel - Inspect channel weekly. Remove any flow obstructions and make the necessary repairs immediately.

Cross Drain Culverts with Outlet Protection – cross drain culverts with outlet protection should be inspected weekly and within 24 hours after any storm event greater than or equal to 0.5 inches of rain per 24-hr period. They should be maintained to ensure that the culvert inlet is free of debris so as to allow for proper flow. Specified design dimensions including the width and depth of specified stone as shown on the plan sheets and details shall be maintained. Damaged culverts and / or outlet protection should be repaired or replaced immediately.

Waterbars– waterbars should be inspected weekly and after all rainfall events. They should be maintained to ensure that the specified design dimensions and protective lining are available at all times. Damaged waterbars should be repaired or replaced immediately.

10. Manage the Project

A copy of the E&SC Plans and appropriate inspection/maintenance logs are to be kept on site at all times during active construction. A copy of the Groundwater Protection Plan will be kept onsite during construction.

The project will be generally maintained in accordance with the following:

- Coordination with Utilities – Notify Miss Utility of WV by calling 811 or 1-800-245-4848 at least 3 days prior to construction.

- Inspection and Monitoring – E&SC BMPs will be inspected at least once every seven calendar days and within 24 hours after any storm event greater than 0.5 inches per 24 hour period. Temporary and permanent E&S BMPs will be maintained and repaired as needed.
- Reporting – The E&S plan holder will notify the WVDEP of any spill/discharge of pollutants within 24 hours.
- Equipment Maintenance – Maintenance of equipment will be performed using generally accepted practices, including plastic mats, drip pans, etc.

11. Stabilization

11.1 Seedbed preparation

The seedbed must be loose at the time of seeding. The seedbed must be loosened by disking on the contour, or by bulldozer tracking up and down the slope. Backblading is acceptable on gentle slopes or road bed.

11.2 Permanent and Temporary Seeding

Temporary vegetative cover must be established where runoff will go directly into a stream. Stabilization measures will be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than seven days after the construction activity in that portion of the site has permanently ceased.

Where the initiation of stabilization measures by the seventh day after construction activity temporarily or permanently ceases is precluded by natural causes, stabilization measures will be initiated as soon as conditions allow.

Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g., the total time period that construction activity is temporarily halted is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the seventh day after construction activities have temporarily ceased.

Planting of permanent vegetative cover will be performed on all disturbed areas. Lime and fertilizer rates will be applied to all permanent seeding at the time of seedbed preparation.

Inspection shall be requested once there is uniform, perennial 70 percent vegetative coverage established. Temporary BMPs will be removed upon achieving vegetative stabilization. The 70 percent requirement refers to the total area vegetated and not a percent of the site. Disturbed areas not attaining a uniform, perennial 70 percent vegetative coverage shall be re-seeded as needed until uniform, perennial 70 percent vegetative coverage is established.

Revegetation in non-agricultural areas shall be considered successful if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands. In

agriculture areas, revegetation shall be considered successful when upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field, unless the easement agreement specifies otherwise.

Restoration will be considered successful if the disturbed surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless requested otherwise by the landowner or land managing agency), revegetation is successful, proper drainage has been restored, and the appropriate federal and state agencies approve.

Wetlands along the proposed pipeline are expected to exhibit varying degrees of saturation and water elevation, requiring a variety of plant species to be re-established. In unsaturated wetlands, most vegetation will be replaced by seeding. Saturated wetlands will typically be allowed to re-vegetate naturally. Wetland revegetation will be considered successful when the cover of herbaceous and/or woody species is at least 80 percent of the type, density, and distribution of the vegetation in adjacent wetland areas that were not disturbed by construction. Revegetation efforts will continue until wetland revegetation is successful.

Recommended Permanent and Temporary Seed Mixtures and Fertilizer/Mulch for Revegetation of Upland Areas

Item	Uplands	
Permanent Seed and Mulch Application Rates		
Seed ¹	Kentucky 31 tall fescue	65 pounds per acre
Seed ¹	Empire Birdsfoot Trefoil (1/2 Empire, 1/2 Viking)	5 pounds per acre of inoculated seed
Seed ¹	Redfescue	20 pounds per acre
Lime	Agricultural Grade (Pellet Form)	2 Tons per acre without a soil test
Fertilizer	10-20-20	1/2 ton per acre
Mulch	Cereal Straw	3 tons per acre
Temporary Seed and Mulch Application Rates		
Seed ¹	Annual Ryegrass	40 pounds per acre
Mulch	Cereal Straw	3 tons per acre

Notes

1 – all seed is pure live seed

2 – unless otherwise requested by landowner in ROW

Revegetation of Wetland Areas

Item	Wetlands ²	
Seed ¹	Annual Ryegrass	48 pounds per acre

Notes

1 – all seed is pure live seed

2 – do not apply mulch, fertilizer, or lime in wetland areas

Alternate Permanent Seed Mixtures

Item	Alternate No. 1	
Permanent Seed and Mulch Application Rates		
Seed ¹	Alfalfa	18 pounds per acre
Seed ¹	Clover	5 pounds per acre

Item	Alternate No. 2	
Permanent Seed Application Rates		
Seed ¹	Orchard Grass	30 pounds per acre
Seed ¹	Clover	5 pounds per acre

Item	Alternate No. 3 - Wildlife Seed Mix	
Permanent Seed Application Rates		
Seed ¹	ERNMX - 260 PA Piedmont Province UPL Mix:	
	26% Indiangrass	26% Little Bluestem
	20% Virginia Wildrye	10% Big Bluestem
	7% Purpletop	5% Switchgrass
	4% Deertongue	2% Purple Lovegrass
		20 pounds per acre

Notes

1 – all seed is pure live seed

2 – contractor to use alternate seed mixtures per landowner request

4.0 Construction Schedule/Phasing

Clearing is expected to commence in October 2017 and site build construction is anticipated to begin October/November 2017 with a target full in-service date for the Project of November 2018. The order in which each facility will be constructed may vary, depending upon numerous factors, including the receipt of necessary authorizations, the capabilities of each contractor, available work force, and optimized logistics.

4.1 Construction Schedule

Each station will follow a similar schedule:

1. Establish construction access and install site control BMPs (week 1-8)
2. Clear necessary LOD area and stockpile topsoil (week 1-8)
3. Build access road and compressor pad (week 4-12)
4. Re-establish grade (including restoration - seed & mulch, controls, etc.) (week 10-16)
5. Upon stabilization, remove temporary controls and perform final restoration (week 10-18)

ATTACHMENT 1

Project Location Map

(Refer to the cover sheet for each station package)

ATTACHMENT 2

Soils Report

Soil Types at Permanent Above-Ground Facilities

Station	Map Unit Symbol	Map Unit Name	Farm Class	% of Soil Type
Mobley Interconnect	GpF	Gilpin-Peabody complex, 35 to 70 percent slopes	Not prime farmland	24%
	Sk	Skidmore gravelly loam	Farmland of statewide importance	76%
Bradshaw Compressor Station	GpD	Gilpin-Peabody complex, 15 to 25 percent slopes	Farmland of statewide importance	51%
	GpE	Gilpin-Peabody complex, 25 to 35 percent slopes	Farmland of local importance	40%
	GpF	Gilpin-Peabody complex, 35 to 70 percent slopes	Not prime farmland	8%
	VaD	Vandalia silty clay loam, 15 to 25 percent slopes	Farmland of statewide importance	1%
Harris Compressor Station and WB Interconnect	BuE	Buchanan channery loam, 15 to 35 percent slopes, extremely stony	Not prime farmland	5%
	GaF	Gilpin silt loam, 35 to 70 percent slopes, very stony	Not prime farmland	36%
	GID	Gilpin-Lily complex, 15 to 25 percent slopes	Farmland of statewide importance	32%
	GIE	Gilpin-Lily complex, 25 to 35 percent slopes	Farmland of local importance	27%
Stallworth Compressor Station	CaC	Cateache channery silt loam, 8 to 15 percent slopes	Farmland of statewide importance	20%
	CcG	Cateache-Pipestem complex, 35 to 80 percent slopes, very stony	Not prime farmland	71%
	CgF	Cateache silt loam, 35 to 55 percent slopes, very stony	Not prime farmland	2%
	MI	Melvin-Lindside complex	Farmland of local importance	3%
	MIA	Melvin-Lindside complex, 0 to 3 percent slopes, frequently flooded	Farmland of local importance	4%

Wetzel County, West Virginia

GpF—Gilpin-Peabody complex, 35 to 70 percent slopes

Map Unit Setting

National map unit symbol: k7k9
Mean annual precipitation: 36 to 45 inches
Mean annual air temperature: 41 to 64 degrees F
Frost-free period: 134 to 167 days
Farmland classification: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 50 percent
Peabody and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, footslope, shoulder
Landform position (three-dimensional): Side slope, head slope, nose slope
Down-slope shape: Convex, concave
Across-slope shape: Convex
Parent material: Fine-loamy residuum weathered from sandstone and siltstone

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 4 inches: silt loam
Bt1+Bt2 - 4 to 28 inches: channery silty clay loam
Bt3 - 28 to 34 inches: very channery silt loam
Cr - 34 to 38 inches: unweathered bedrock

Properties and qualities

Slope: 35 to 70 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Other vegetative classification: Acid Hills (AH3)

Description of Peabody

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder, footslope

Custom Soil Resource Report

Landform position (three-dimensional): Side slope, head slope, nose slope

Down-slope shape: Convex, concave

Across-slope shape: Convex

Parent material: Residuum weathered from shale and siltstone

Typical profile

A - 0 to 2 inches: silty clay loam

Bt - 2 to 22 inches: silty clay

C - 22 to 27 inches: channery silty clay

Cr - 27 to 31 inches: weathered bedrock

Properties and qualities

Slope: 35 to 70 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Minor Components

Other soils

Percent of map unit: 20 percent

Sk—Skidmore gravelly loam

Map Unit Setting

National map unit symbol: k7kj

Elevation: 100 to 290 feet

Mean annual precipitation: 36 to 45 inches

Mean annual air temperature: 41 to 64 degrees F

Frost-free period: 134 to 167 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Skidmore and similar soils: 75 percent

Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Skidmore

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Gravelly alluvium

Typical profile

Ap+Bw - 0 to 15 inches: gravelly loam
C - 15 to 65 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 36 to 48 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Other vegetative classification: Fertile Loams (FL3)

Minor Components

Other soils

Percent of map unit: 22 percent

Melvin

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave

Wetzel County, West Virginia

GpD—Gilpin-Peabody complex, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: k7k7

Mean annual precipitation: 36 to 45 inches

Mean annual air temperature: 41 to 64 degrees F

Frost-free period: 134 to 167 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Gilpin and similar soils: 40 percent

Peabody and similar soils: 30 percent

Minor components: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder, backslope, footslope

Landform position (three-dimensional): Side slope, crest, nose slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Fine-loamy residuum weathered from sandstone and siltstone

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material

A - 1 to 4 inches: silt loam

Bt1+Bt2 - 4 to 28 inches: channery silty clay loam

Bt3 - 28 to 34 inches: very channery silt loam

Cr - 34 to 38 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 25 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Other vegetative classification: Acid Loams (AL3)

Description of Peabody

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder, backslope, footslope

Custom Soil Resource Report

Landform position (three-dimensional): Side slope, crest, nose slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from shale and siltstone

Typical profile

A - 0 to 2 inches: silty clay loam

Bt - 2 to 22 inches: silty clay

C - 22 to 27 inches: channery silty clay

Cr - 27 to 31 inches: weathered bedrock

Properties and qualities

Slope: 15 to 25 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Minor Components

Other soils

Percent of map unit: 30 percent

GpE—Gilpin-Peabody complex, 25 to 35 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2vyz1

Elevation: 700 to 1,650 feet

Mean annual precipitation: 42 to 48 inches

Mean annual air temperature: 50 to 53 degrees F

Frost-free period: 134 to 167 days

Farmland classification: Farmland of local importance

Map Unit Composition

Gilpin and similar soils: 45 percent

Peabody and similar soils: 35 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Ridges, hillslopes

Landform position (two-dimensional): Shoulder, summit, backslope

Landform position (three-dimensional): Interfluvium, crest, side slope, nose slope, head slope

Down-slope shape: Convex, linear

Across-slope shape: Linear, convex

Parent material: Residuum weathered from sandstone and siltstone

Typical profile

O_i - 0 to 1 inches: slightly decomposed plant material

A - 1 to 4 inches: silt loam

BA - 4 to 5 inches: silt loam

B_t - 5 to 30 inches: channery silty clay loam

Cr - 30 to 40 inches: bedrock

Properties and qualities

Slope: 25 to 35 percent

Depth to restrictive feature: 25 to 37 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high to high (0.20 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Description of Peabody

Setting

Landform: Ridges, hillslopes

Landform position (two-dimensional): Shoulder, summit, backslope

Landform position (three-dimensional): Interfluvium, side slope, nose slope, head slope

Down-slope shape: Convex, linear

Across-slope shape: Linear, convex

Parent material: Residuum weathered from shale and siltstone

Typical profile

O_i - 0 to 1 inches: slightly decomposed plant material

A - 1 to 3 inches: silty clay loam

B_t - 3 to 23 inches: silty clay

C - 23 to 28 inches: parachannery silty clay

Cr - 28 to 38 inches: bedrock

Properties and qualities

Slope: 25 to 35 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Minor Components

Weikert

Percent of map unit: 10 percent

Landform: Ridges, hillslopes

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Crest, side slope, nose slope

Down-slope shape: Convex, linear

Across-slope shape: Convex, linear

Otwell

Percent of map unit: 10 percent

Landform: Stream terraces

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Fertile Loams (FL3)

Rock outcrop

Percent of map unit: 0 percent

GpF—Gilpin-Peabody complex, 35 to 70 percent slopes

Map Unit Setting

National map unit symbol: k7k9

Mean annual precipitation: 36 to 45 inches

Mean annual air temperature: 41 to 64 degrees F

Frost-free period: 134 to 167 days

Farmland classification: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 50 percent

Peabody and similar soils: 30 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope, footslope, shoulder

Landform position (three-dimensional): Side slope, head slope, nose slope

Down-slope shape: Convex, concave

Across-slope shape: Convex

Parent material: Fine-loamy residuum weathered from sandstone and siltstone

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material

A - 1 to 4 inches: silt loam

Bt1+Bt2 - 4 to 28 inches: channery silty clay loam

Bt3 - 28 to 34 inches: very channery silt loam

Cr - 34 to 38 inches: unweathered bedrock

Properties and qualities

Slope: 35 to 70 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: Acid Hills (AH3)

Description of Peabody

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope, shoulder, footslope

Landform position (three-dimensional): Side slope, head slope, nose slope

Down-slope shape: Convex, concave

Across-slope shape: Convex

Parent material: Residuum weathered from shale and siltstone

Typical profile

A - 0 to 2 inches: silty clay loam

Bt - 2 to 22 inches: silty clay

C - 22 to 27 inches: channery silty clay

Cr - 27 to 31 inches: weathered bedrock

Properties and qualities

Slope: 35 to 70 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Custom Soil Resource Report

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 20 percent

Hydric soil rating: No

VaD—Vandalia silty clay loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2t31g

Elevation: 600 to 1,490 feet

Mean annual precipitation: 41 to 49 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 175 to 192 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Vandalia and similar soils: 75 percent

Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vandalia

Setting

Landform: Hillslopes

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave, convex

Across-slope shape: Concave

Parent material: Clayey colluvium derived from sedimentary rock

Typical profile

Ap - 0 to 7 inches: silty clay loam

Bt1 - 7 to 14 inches: silty clay loam

Bt2 - 14 to 29 inches: silty clay loam

Bt3 - 29 to 50 inches: silty clay loam

Custom Soil Resource Report

Bt4 - 50 to 65 inches: channery silty clay loam

Properties and qualities

Slope: 15 to 25 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Other vegetative classification: Fertile Loams (FL3)

Hydric soil rating: No

Minor Components

Gilpin

Percent of map unit: 10 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, nose slope

Down-slope shape: Convex

Across-slope shape: Convex, linear

Hydric soil rating: No

Upshur

Percent of map unit: 10 percent

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Crest, nose slope, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Peabody

Percent of map unit: 5 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope, summit, shoulder

Landform position (three-dimensional): Crest, nose slope, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Other vegetative classification: Fertile Loams (FL3)

Hydric soil rating: No

Harrison and Taylor Counties, West Virginia

GuE3—Gilpin-Upshur complex, 25 to 35 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: k9r2

Mean annual precipitation: 38 to 50 inches

Mean annual air temperature: 49 to 55 degrees F

Frost-free period: 158 to 181 days

Farmland classification: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 70 percent

Upshur and similar soils: 20 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Benches, ridges, hillslopes

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Side slope, interfluve

Down-slope shape: Concave, linear, convex

Across-slope shape: Linear, concave

Parent material: Acid fine-loamy residuum weathered from interbedded sedimentary rock

Typical profile

A - 0 to 5 inches: silt loam

Bt - 5 to 22 inches: channery silty clay loam

C - 22 to 32 inches: very channery silt loam

R - 32 to 36 inches: bedrock

Properties and qualities

Slope: 25 to 35 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: Acid Hills (AH3)

Description of Upshur

Setting

Landform: Benches, ridges

Landform position (two-dimensional): Shoulder, summit

Custom Soil Resource Report

Landform position (three-dimensional): Side slope, interfluvium

Down-slope shape: Linear, convex

Across-slope shape: Linear

Parent material: Limy-influenced red clayey residuum weathered from shale

Typical profile

Ap - 0 to 4 inches: silty clay loam

Bt+B3 - 4 to 32 inches: clay

C - 32 to 38 inches: extremely channery silty clay loam

Cr - 38 to 42 inches: bedrock

Properties and qualities

Slope: 25 to 35 percent

Depth to restrictive feature: 38 to 60 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.02 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Other vegetative classification: Fertile Hills (FH3)

Minor Components

Other soils

Percent of map unit: 10 percent

GuF3—Gilpin-Upshur complex, 35 to 70 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: k9r3

Mean annual precipitation: 38 to 50 inches

Mean annual air temperature: 49 to 55 degrees F

Frost-free period: 158 to 181 days

Farmland classification: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 70 percent

Upshur and similar soils: 20 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Benches, ridges

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Side slope, interfluve

Down-slope shape: Linear, concave, convex

Across-slope shape: Concave, linear

Parent material: Acid fine-loamy residuum weathered from interbedded sedimentary rock

Typical profile

A - 0 to 5 inches: silt loam

Bt - 5 to 22 inches: channery silty clay loam

C - 22 to 32 inches: very channery silt loam

R - 32 to 36 inches: bedrock

Properties and qualities

Slope: 35 to 70 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: Acid Hills (AH3)

Description of Upshur

Setting

Landform: Benches, ridges

Landform position (two-dimensional): Shoulder, summit

Landform position (three-dimensional): Side slope, interfluve

Down-slope shape: Linear, convex

Across-slope shape: Linear

Parent material: Limy-influenced red clayey residuum weathered from shale

Typical profile

Ap - 0 to 4 inches: silty clay loam

Bt+B3 - 4 to 32 inches: clay

C - 32 to 38 inches: extremely channery silty clay loam

Cr - 38 to 42 inches: bedrock

Properties and qualities

Slope: 35 to 70 percent

Depth to restrictive feature: 38 to 60 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.02 in/hr)

Depth to water table: More than 80 inches

Custom Soil Resource Report

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Other vegetative classification: Fertile Hills (FH3)

Minor Components

Other soils

Percent of map unit: 10 percent

Uhd3—Upshur silty clay, 15 to 25 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: k9rq

Mean annual precipitation: 38 to 50 inches

Mean annual air temperature: 49 to 55 degrees F

Frost-free period: 158 to 181 days

Farmland classification: Not prime farmland

Map Unit Composition

Upshur and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Upshur

Setting

Landform: Benches, ridges

Landform position (two-dimensional): Shoulder, summit

Landform position (three-dimensional): Side slope, interfluvium

Down-slope shape: Linear, convex

Across-slope shape: Linear

Parent material: Limy-influenced red clayey residuum weathered from shale

Typical profile

Ap - 0 to 4 inches: silty clay loam

Bt+B3 - 4 to 32 inches: clay

C - 32 to 38 inches: extremely channery silty clay loam

Cr - 38 to 42 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent

Depth to restrictive feature: 38 to 60 inches to paralithic bedrock

Natural drainage class: Well drained

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.02 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Other vegetative classification: Fertile Loams (FL3)

Minor Components

Other soils

Percent of map unit: 20 percent

Braxton County, West Virginia

BuE—Buchanan channery loam, 15 to 35 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: k6vx

Elevation: 180 to 730 feet

Mean annual precipitation: 39 to 51 inches

Mean annual air temperature: 42 to 67 degrees F

Frost-free period: 155 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Buchanan and similar soils: 75 percent

Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Buchanan

Setting

Landform: Hillslopes

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave

Across-slope shape: Convex

Parent material: Colluvium derived from sandstone and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A+E - 1 to 5 inches: channery loam

BE+Bt1+Bt2 - 5 to 26 inches: channery clay loam

Btx1+Btx2 - 26 to 59 inches: very channery sandy loam

C - 59 to 65 inches: very channery sandy loam

Properties and qualities

Slope: 15 to 35 percent

Percent of area covered with surface fragments: 9.0 percent

Depth to restrictive feature: 26 to 35 inches to fragipan

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Other vegetative classification: Very Rocky, Acid Soils (RA3)

Minor Components

Other soils

Percent of map unit: 25 percent

GaF—Gilpin silt loam, 35 to 70 percent slopes, very stony

Map Unit Setting

National map unit symbol: k6w3
Mean annual precipitation: 39 to 51 inches
Mean annual air temperature: 42 to 67 degrees F
Frost-free period: 155 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and siltstone

Typical profile

Oe - 0 to 4 inches: moderately decomposed plant material
A+E - 4 to 7 inches: silt loam
BE+Bt - 7 to 28 inches: channery silty clay loam
C - 28 to 35 inches: channery silt loam
R - 35 to 39 inches: bedrock

Properties and qualities

Slope: 35 to 70 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 32 to 36 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Other vegetative classification: Not Suited (NS)

Minor Components

Other soils

Percent of map unit: 25 percent

GID—Gilpin-Lily complex, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: k6w5

Mean annual precipitation: 39 to 51 inches

Mean annual air temperature: 42 to 67 degrees F

Frost-free period: 155 to 180 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Gilpin and similar soils: 50 percent

Lily and similar soils: 30 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, backslope

Landform position (three-dimensional): Crest, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from sandstone and siltstone

Typical profile

Oe - 0 to 4 inches: moderately decomposed plant material

A+E - 4 to 7 inches: silt loam

BE+Bt - 7 to 28 inches: channery silty clay loam

C - 28 to 35 inches: channery silt loam

R - 35 to 39 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Custom Soil Resource Report

Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Other vegetative classification: Acid Loams (AL3)

Description of Lily

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone

Typical profile

Ap - 0 to 6 inches: loam
BA+Bt1+Bt2 - 6 to 23 inches: clay loam
C - 23 to 27 inches: channery clay loam
R - 27 to 31 inches: bedrock

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Other vegetative classification: Acid Loams (AL3)

Minor Components

Other soils

Percent of map unit: 20 percent

GIE—Gilpin-Lily complex, 25 to 35 percent slopes

Map Unit Setting

National map unit symbol: k6w6
Mean annual precipitation: 39 to 51 inches
Mean annual air temperature: 42 to 67 degrees F
Frost-free period: 155 to 180 days
Farmland classification: Farmland of local importance

Map Unit Composition

Gilpin and similar soils: 60 percent

Lily and similar soils: 20 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from sandstone and siltstone

Typical profile

Oe - 0 to 4 inches: moderately decomposed plant material

A+E - 4 to 7 inches: silt loam

BE+Bt - 7 to 28 inches: channery silty clay loam

C - 28 to 35 inches: channery silt loam

R - 35 to 39 inches: bedrock

Properties and qualities

Slope: 25 to 35 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Other vegetative classification: Acid Hills (AH3)

Description of Lily

Setting

Landform: Ridges

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Crest

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from sandstone

Typical profile

Ap - 0 to 6 inches: loam

BA+Bt1+Bt2 - 6 to 23 inches: clay loam

C - 23 to 27 inches: channery clay loam

R - 27 to 31 inches: bedrock

Custom Soil Resource Report

Properties and qualities

Slope: 25 to 35 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Other vegetative classification: Acid Hills (AH3)

Minor Components

Other soils

Percent of map unit: 20 percent

Fayette and Raleigh Counties Area, West Virginia

CaC—Cateache channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2nbt6

Mean annual precipitation: 37 to 47 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 140 to 170 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Cateache and similar soils: 60 percent

Minor components: 40 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cateache

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Interfluvium

Down-slope shape: Linear

Across-slope shape: Convex

Parent material: Non-acid fine-loamy residuum weathered from shale and siltstone

Typical profile

A - 0 to 4 inches: channery silt loam

Bt (upper) - 4 to 30 inches: channery silty clay loam

Bt (lower) - 30 to 36 inches: channery silty clay loam

Cr - 36 to 40 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C

Other vegetative classification: Limy Uplands (LU3)

Minor Components

Pipestem

Percent of map unit: 20 percent

Landform: Mountain slopes

Landform position (two-dimensional): Backslope

Custom Soil Resource Report

Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Concave
Other vegetative classification: Very Rocky, Limy Soils (RL3)

Berks

Percent of map unit: 10 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Mountainflank, mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Dry Uplands (DU3)

Fenwick

Percent of map unit: 5 percent
Landform: Ridges
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Acid Loams (AL3)

Clifftop

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Acid Loams (AL3)

CcG—Cateache-Pipestem complex, 35 to 80 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2qdp3
Elevation: 180 to 850 feet
Mean annual precipitation: 37 to 47 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 140 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Cateache and similar soils: 40 percent
Pipestem and similar soils: 40 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pipestem

Setting

Landform: Mountain slopes

Custom Soil Resource Report

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank

Down-slope shape: Linear

Across-slope shape: Concave

Parent material: Reddish brown silty and clayey colluvium derived from interbedded sedimentary rock

Typical profile

A - 0 to 4 inches: channery silty clay loam

BA+Bw - 4 to 54 inches: stony silty clay loam

BC - 54 to 79 inches: very stony silty clay loam

Properties and qualities

Slope: 35 to 80 percent

Percent of area covered with surface fragments: 1.5 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: B

Other vegetative classification: Not Suited (NS)

Description of Cateache

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank

Down-slope shape: Linear

Across-slope shape: Convex

Parent material: Non-acid fine-loamy residuum weathered from shale and siltstone

Typical profile

A - 0 to 4 inches: channery silt loam

Bt (upper) - 4 to 30 inches: channery silty clay loam

Bt (lower) - 30 to 36 inches: channery silty clay loam

Cr - 36 to 40 inches: bedrock

Properties and qualities

Slope: 35 to 80 percent

Percent of area covered with surface fragments: 1.5 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Custom Soil Resource Report

Frequency of ponding: None

Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Other vegetative classification: Not Suited (NS)

Minor Components

Highsplint

Percent of map unit: 7 percent

Landform: Mountain slopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank

Down-slope shape: Linear

Across-slope shape: Concave

Other vegetative classification: Not Suited (NS)

Meckesville

Percent of map unit: 7 percent

Landform: Coves, mountainsides

Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Upper third of mountainflank, mountainbase

Down-slope shape: Concave

Across-slope shape: Concave, linear

Other vegetative classification: Very Rocky, Acid Soils (RA3)

Rock outcrop

Percent of map unit: 3 percent

Landform: Escarpments

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank

Laidig

Percent of map unit: 3 percent

Landform: Mountain slopes

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Mountainflank, mountainbase

Down-slope shape: Linear, concave

Across-slope shape: Concave, linear

MIA—Melvin-Lindside complex, 0 to 3 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2ndqx

Elevation: 10 to 30 feet

Mean annual precipitation: 31 to 47 inches

Mean annual air temperature: 48 to 55 degrees F

Custom Soil Resource Report

Frost-free period: 117 to 158 days

Farmland classification: Farmland of local importance

Map Unit Composition

Melvin and similar soils: 50 percent

Lindside and similar soils: 35 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Melvin

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Fine-silty alluvium derived from limestone, sandstone, and shale

Typical profile

Ap - 0 to 10 inches: silt loam

Bg+BCg - 10 to 58 inches: silt loam

Cg - 58 to 65 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Poorly drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 1.98 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: Frequent

Frequency of ponding: None

Available water storage in profile: Very high (about 12.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: B/D

Other vegetative classification: Wetlands (W3)

Description of Lindside

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Fine-silty alluvium derived from limestone, sandstone, and shale

Typical profile

Ap - 0 to 9 inches: silt loam

BA+Bw+BC - 9 to 60 inches: silt loam

C - 60 to 65 inches: fine sandy loam

Custom Soil Resource Report

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Very high (about 12.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Other vegetative classification: Moist Loams (ML3)

Minor Components

Other soils

Percent of map unit: 15 percent

PmE—Pipestem channery silty clay loam, 15 to 35 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2nbtd
Elevation: 240 to 460 feet
Mean annual precipitation: 37 to 47 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 140 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Pipestem and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pipestem

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Concave

Custom Soil Resource Report

Parent material: Reddish brown silty and clayey colluvium derived from interbedded sedimentary rock

Typical profile

A - 0 to 4 inches: channery silty clay loam

BA+Bw - 4 to 54 inches: stony silty clay loam

BC - 54 to 79 inches: very stony silty clay loam

Properties and qualities

Slope: 15 to 35 percent

Percent of area covered with surface fragments: 9.0 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: B

Other vegetative classification: Very Rocky, Limy Soils (RL3)

Minor Components

Cateache

Percent of map unit: 10 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Interfluvium

Down-slope shape: Linear

Across-slope shape: Convex

Other vegetative classification: Limy Uplands (LU3)

Albrights

Percent of map unit: 3 percent

Landform: Mountain slopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainbase

Down-slope shape: Concave

Across-slope shape: Concave

Jefferson

Percent of map unit: 2 percent

Landform: Drainageways, mountain slopes

Landform position (two-dimensional): Backslope, footslope, toeslope

Landform position (three-dimensional): Mountainbase, mountainflank

Down-slope shape: Linear, concave, convex

Across-slope shape: Concave, convex

Other vegetative classification: Very Rocky, Acid Soils (RA2)

Greenbrier County, West Virginia

CgF—Cateache silt loam, 35 to 55 percent slopes, very stony

Map Unit Setting

National map unit symbol: lkh3
Mean annual precipitation: 31 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 117 to 158 days
Farmland classification: Not prime farmland

Map Unit Composition

Cateache and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cateache

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Fine-loamy residuum weathered from shale and siltstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A + BA - 1 to 12 inches: silt loam
Bt - 12 to 29 inches: very channery silty clay loam
C - 29 to 36 inches: extremely channery silty clay loam
Cr - 36 to 40 inches: bedrock

Properties and qualities

Slope: 35 to 55 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 36 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Other vegetative classification: Not Suited (NS)

Minor Components

Other soils

Percent of map unit: 15 percent

MI—Melvin-Lindside complex

Map Unit Setting

National map unit symbol: lkkb

Elevation: 10 to 30 feet

Mean annual precipitation: 31 to 47 inches

Mean annual air temperature: 48 to 55 degrees F

Frost-free period: 117 to 158 days

Farmland classification: Farmland of local importance

Map Unit Composition

Melvin and similar soils: 50 percent

Lindside and similar soils: 35 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Melvin

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Fine-silty alluvium derived from limestone, sandstone, and shale

Typical profile

Ap - 0 to 10 inches: silt loam

Bg+BCg - 10 to 58 inches: silt loam

Cg - 58 to 65 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Poorly drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 1.98 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: Frequent

Frequency of ponding: None

Available water storage in profile: Very high (about 12.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: B/D

Other vegetative classification: Wetlands (W3)

Description of Lindside

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Fine-silty alluvium derived from limestone, sandstone, and shale

Typical profile

Ap - 0 to 9 inches: silt loam

BA+Bw+BC - 9 to 60 inches: silt loam

C - 60 to 65 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Moderately well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 1.98 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: Occasional

Frequency of ponding: None

Available water storage in profile: Very high (about 12.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: C

Other vegetative classification: Moist Loams (ML3)

Minor Components

Other soils

Percent of map unit: 15 percent

ATTACHMENT 3

E&S Plan Sheets