Mountain Valley Pipeline Project

Docket No. CP16-__-000

Resource Report 2 – Water Use and Quality

October 2015

Mountain Valley Pipeline Project
Resource Report 2 – Water Use and Quality

Resource Report 2 Filing Requirements	
Information	**Location in Resource Report**
Minimum Filing Requirements	
1. Identify all perennial surface waterbodies crossed by the proposed project and their water quality classification. (§ 380.12(d)(1)) • Identify by milepost • Indicate if potable water intakes are within 3 miles downstream of the crossing.	Section 2.2.1, 2.2.2.2, 2.2.2.4, Appendix 2-A, Table 2-A-1 and 2-A-2
2. Identify all waterbody crossings that may have contaminated waters or sediments. (§ 380.12(d)(1)) • Identify by milepost • Include offshore sediments.	Section 2.2.2.5
3. Identify watershed areas, designated surface water protection areas, and sensitive waterbodies crossed by the proposed project. (§ 380.12(d)(1)) • Identify by milepost	Section 2.2.1.1, Appendix 2-A Table 2-A-1, Section 2.2.2 and 2.2.2.4,
4. Provide a table (based on NWI maps if delineations have not been done) identifying all wetlands, by milepost and length, crossed by the proposed project, and the total acreage and acreage of each wetland type that would be affected by construction. (§ 380.12(d)(l&4))	Section 2.3.2 Appendix 2-B, Table 2-B-1
5. Discuss construction and restoration methods proposed for crossing wetlands, and compare them to staff's Wetland and Waterbody Construction and Mitigation Procedures. (§ 380.12(d)(2))	Section 2.3.3, 2.34
6. Describe the proposed waterbody construction, impact mitigation, and restoration methods to be used to cross surface waters and compare to the staff's Wetland and Waterbody Construction and Mitigation Procedures. (§ 380.12(d)(2)) • Although the Procedures do not apply offshore, the first part of this requirement does apply. Be sure to include effects of sedimentation, etc. This information is needed on a mile-by-mile basis and will require completion of geophysical and other surveys before filing. (See also Resource Report 3.)	Section 2.2.1.4, 2.2.4
7. Provide original National Wetlands Inventory (NWI) maps or the appropriate state wetland maps, if NWI maps are not available, that show all proposed facilities and include milepost locations for proposed pipeline routes. (§ 380.12(d)(4))	Appendix 2-C, Figure 2-C-1
8. Identify all U.S. Environmental Protection Agency (EPA)- or state-designated aquifers crossed. (§ 380.12(d)(9)) • Identify the location of known public and private groundwater supply wells or springs within 150 feet of construction.	Sections 2.1.3.1, 2.1.3.2, and 2.1.3.3
9. Identify proposed mitigation for impacts on groundwater resources.	Section 2.1.4
10. Discuss the potential for blasting to affect water wells, springs, and wetlands, and associated mitigation.	Section 2.1.4.3
11. Identify all sources of hydrostatic test water, the quantity of water required, methods for withdrawal, and treatment of discharge, and any waste products generated.	Section 2.2.3
12. If underground storage of natural gas is proposed, identify how water produced from the storage field will be disposed.	Not Applicable (no underground storage)

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Information	**Location in Resource Report**
13. If salt caverns are proposed for storage of natural gas, identify the source locations, the quantity required, the method and rate of water withdrawal, and disposal methods.	Not Applicable (no salt cavern storage)
14. For each waterbody greater than 100 feet wide, provide site-specific construction mitigation and restoration plans.	Section 2.2.1.3
15. Indicate mitigation measures to be undertaken to ensure that public or private water supplies are returned to their former capacity in the event of damage resulting from construction.	Sections 2.1.3.2 and 2.1.4
16. Describe typical staging area requirements at waterbody and wetland crossings.	Section 2.2.4, 2.3.4
17. If wetlands would be filled or permanently lost, describe proposed measures to compensate for permanent wetland losses.	Section 2.3.4
18. If forested wetlands would be affected, describe proposed measures to restore forested wetlands following construction.	Section 2.3.4
19. Describe techniques to be used to minimize turbidity and sedimentation impacts associated with offshore trenching, if any.	Not Applicable (no offshore trenching)

FERC Environmental Information Request for Resource Report 2 Dated March 13, 2015	
Request	**Location in Resource Report**
1. Describe how Mountain Valley would determine the Project's effect on groundwater supplies, such as wells or springs. If construction would adversely affect a groundwater supply, outline the measures Mountain Valley would implement to mitigate impacts on landowners, including ensuring that a temporary source of water would be provided until the well is restored, and explain how the damaged water supply system would be repaired and returned to its former quality and quantity.	Section 2.1.3.1, p.2-7; Section 2.1.3.2, p.2-9; Section 2.1.3.3, p.2-10; Section 2.1.3.5, p.2-14; Section 2.1.4, p.2-16
2. Include a detailed discussion of the Red Sulphur Public Service District watershed. Include the distance crossed of both the watershed and the “Zone of Critical Concern,” a map of these areas, and proposed impact avoidance, minimization, and mitigation measures.	Section 2.1.3.4, p.2-12; Section 2.1.4, p. 2-16; Section 2.2.2.4, p.2-29; Figure 2-C-3
3. Include a discussion of the Town of Boones Mill water source and treatment plant and the Banister River Basin (Cherry Stone headwaters). Include distance crossed, a map of these areas, and proposed impact avoidance, minimization, and mitigation measures for each feature.	Section 2.1.3.4, p.2-12; Section 2.1.4, p. 2-16; Figure 2-C-4
4. List, in a table organized by MP, site-specific methods to be used to cross all waterbodies, based on waterbody size and designation, in accordance with the FERC Procedures. Identify any waterbodies that would be crossed using Direct Pipe trenchless technologies.	Appendix 2-A, Table 2-A-1 and 2-A-2
5. Include a detailed discussion of the crossing of the headwaters (Mill Creek near MP 230) to Bottom Creek, an Exceptional State Water (Tier III) stream. The analysis should outline measures proposed to avoid, minimize, or mitigate impacts on this stream system.	Section 2.2.2.2, p.2-27; Figure 2-C-2

FERC Environmental Information Request for Resource Report 2 Dated August 11, 2015		
	Request	**Location in Resource Report**
Water Resources		
1.	Discuss the significance of minor surficial aquifers along the pipeline route, and the level to which domestic water supplies and wells depend on those aquifers. Indicate if the pipeline would have impacts on those aquifers, and outline the measures Mountain Valley would implement to avoid, reduce, or mitigate those impacts.	Sections 2.1.1 and 2.1.4.
2.	Revise table 2.1-1 to include average yield and approximate depth below the ground surface for each aquifer. Explicitly denote aquifers with shallow depths that may or are likely to be encountered by Project construction activities.	Section 2.1.1.
3.	Revise section 2.1.1.3 to focus less on state-wide descriptions and more on county-specific information.	Sections 2.1.1 and 2.1.1.3
4.	Revise table 2.1-2 to include data columns for well depth and yield, and the aquifer in which the well was completed.	Sections 2.1.1 and 2.1.3
5.	The text of RR2 indicates that there were three springs identified in Virginia based on a review of the publication *Springs of Virginia*, but the exact location was not available. Consult with the appropriate state agencies to locate these springs.	Section 2.1.3.3
6.	For each spring identified within 150 feet of the planned workspaces (within 500 feet in karst areas), indicate the gradient and spatial relationship of its recharge area to the pipeline corridor.	Section 2.1.3.3 and Table 2.1-3
7.	Identify all groundwater sources, including wells and springs, in karst terrain within 500 feet of the pipeline crossing.	Section 2.1.3, Tables 2.1-2 and 2.1-3, Appendix 6-D.2, Karst Hazards Assessment
8.	Include the measures that Mountain Valley would implement to avoid, reduce, or mitigate impacts on wells and springs that originate from karst substrata. In section 2.1.1.4, define what is considered to be "in close proximity to the pipeline."	Sections 2.1.4.1 and 2.1.4.1, Appendix 6-D.2 - Karst Mitigation Plan
9.	Revise table 2.1-3 to also include a data column for karst influence (yes or no), add swallets (or insert a comparable, separate table), and confirm that there are no known springs located between MP 0 to 194.	Section 2.1.3.3 and Table 2.1-3
10.	Clarify if the pipeline route would cross any swallets. If so, outline measures to avoid, reduce, or mitigate impacts on swallets.	Sections 2.1.3.3, 2.1.4.1 and Table 2.1-3. Resource Report 6
11.	Clarify whether Mountain Valley would conduct pre-construction and post-construction testing of all domestic water supply wells and springs located within 150 feet of the proposed construction work space. Include details regarding water yields and water quality that Mountain Valley would analyze for domestic water supply wells and springs. Discuss any additional compensation Mountain Valley would offer beyond repair or replacement of domestic water sources damaged during construction.	Section 2.1.4.1
12.	Discuss mitigation measures that would be implemented near wellhead protection areas (WHPAs) and source water protection areas (SWPAs) during construction and operation or further indicate why these resources wouldn't be affected.	Sections 2.1.3.1, 2.1.3.4, and 2.1.4.1, Appendix 2-E.
13.	Revise table 2.1-4 to identify if a SWPA is located upgradient, downgradient, or sidegradient of the Project alignment, and if any of these SWPAs are located within karst terrain.	Table 2.1-4.
14.	Add a data column in table 2.1-5 to list the contaminants of concern, and media impacted (groundwater and soils). Include impact avoidance, minimization, and mitigation measures for unanticipated contamination sites.	Sections 2.1.3.5 and Table 2.1-5.

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	Request	**Location in Resource Report**
15.	Identify and provide the location and distance for former brine pit contamination sites along the Project route. Discuss the remedial status of these sites.	Section 2.1.3.5.
16.	State whether any aboveground facilities would be located within flood zones or wetlands. Include in table 2.2-2 the FEMA flood zone classification, if applicable. Explain how Mountain Valley would ensure that its Project complies with 10 CFR 1022, including a floodplain assessment. Indicate any required loss of flood storage and describe the volume removed. Discuss the potential for flash flooding, including measures Mountain Valley would implement to protect the construction right-of-way and aboveground facilities from flooding.	Section 2.2.1.2
17.	Identify any waterbodies that may be affected by the proposed compressor stations, meter stations, MLVs, pipe or contractor yards, and new or existing access roads that may be improved. Include measures to avoid, reduce, or mitigate impacts on waterbodies during construction of those non-pipeline facilities.	Appendix 2-A and Section 2.2.5
18.	Revise section 2.2.2 to include waters that have been designated for intensified water quality management and improvement and waters that support fisheries of special concern (such as trout streams). Include specific impact avoidance, minimization, and mitigation measures for sensitive waterbodies.	Sections 2.2.2 and 2.2.2.2
19.	Include a reference for the statement "public surface water intake facilities are designed to handle surface waters with heavy sediment loads. In addition, document consultations with applicable local authorities that own or manage public surface water intake facilities that may be impacted by the proposed Project. Include a discussion of impacts Project construction may have upon water intake equipment and filters, and offer measures to avoid, reduce, or mitigate those impacts.	Sections 2.2.2.4, 2.2.5
20.	Further clarify the terms used for waterbody crossing methods throughout RR 2 and appendices. Crossing methods should fall under one of the following methods: wet open-cut, dry open-cut, dam-and-pump, flume, bore, HDD, or Direct Pipe technology.	Section 2.2 and Appendix 2-A
21.	For all waterbodies greater than 100-feet-wide at the planned crossing location, include the width of the waterbody and the planned construction methods. Include detailed, site-specific construction mitigation and restoration plans for each crossing.	Section 2.2, Table 2.2-5
22.	Identify all waterbodies crossed within karst sensitive areas. Discuss methods that would be used to cross waterbodies in karst terrain.	Section 2.2.5
23.	Include an explanation for why all major waterbodies are not being crossed by an HDD, including streams and rivers considered as sensitive resources or containing special-status mussels or fish species. Specifically, evaluate the potential for using an HDD to cross under Leading Creek, Little Kanawha River, Elk River, and Pigg River.	Section 2.2.1.4
24.	Include site-specific HDD crossing plans, an HDD contingency plan in the event of a failure, and an Inadvertent Return Response Plan in the case of "frac-outs."	Section 2.2.1.4
25.	For all HDD crossings, include the results of site-specific geotechnical and geophysical investigations. For HDDs in karst terrain, also provide a lineament analysis using remote sensing platforms such as LiDAR and aerial photograph to characterize: a. the degree and maturity of karst at each crossing; b. the potential for substantial loss of drilling fluids into the karst system; and c. the potential to intersect any cave system along the HDD profile.	No HDDs are proposed
26.	Include an assessment of the Direct Pipe construction method in lieu of conventional HDD in karst sensitive areas.	Direct Pipe is not proposed.

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27.	At each crossing where HDD is being considered through karst terrain, include a Best Drilling Practices Plan that addresses the following: a. procedures to control significant loss of drilling fluids into the karst environment during drilling; b. spring and well monitoring plan for all receptors down-gradient of the crossing. This plan should identify and incorporate into the monitoring scheme all receptors that are at a minimum 2,000 feet down-gradient; c. the specific drilling muds and polymers that may be used; and d. assess the potential for impact and describe how Mountain Valley would mitigate a lateral movement of drilling fluid during trenchless crossings that could affect source groundwaters such as wells, seeps, and springs.	No HDDs are proposed in karst areas
28.	Indicate how many miles downstream Spring Hollow Reservoir is from where the pipeline would cross the Roanoke River.	Section 2.2.2.4
29.	Regarding hydrostatic testing: a. section 2.2.3 states municipal water may be used for hydrostatic testing. However, municipal water is not listed in table 2.2-9. Include specific details regarding whether municipal water would be used; b. clarify the total gallons of water needed for hydrostatic testing. Table 2.2-9 states 95,722,73 gallons would be used however, the “Total Water Anticipated for Test Segment” column sums to 233,732,876 gallons. In addition it is unclear which values sum for the proposed “water usage” rows. Resolve the apparent discrepancies; c. revise table 2.2-9 to include the expected month that the water would be withdrawn and discharged; d. indicate the anticipated withdrawal rates and its relation to the source water’s anticipated discharge volume (e.g., the percent of water that would be withdrawn from a waterbody); e. include the source and volume of water for each HDD pre-test segment and make-up of drilling fluid; f. section 2.2.3 states “test water will be drawn from various sources….” Clarify if all possible sources have been included in table 2.2-9; g. section 1.4.1.1 states that hydrostatic test water may be pumped to the next segment or discharged. Clarify if Mountain Valley would reuse test water between segments as depicted in table 2.2-9; h. clarify if Mountain Valley would commit to discharging hydrostatic test water into the same watershed as the source water; i. indicate the anticipated discharge location, volume, and rate for each hydrostatic test water discharge; j. identify whether any surface waters that would be used as hydrostatic test water sources contain invasive aquatic or invasive plant species. For any such withdrawal where invasive species are present, identify the discharge location and describe how Mountain Valley would avoid the transfer of invasive species; and k. outline measures Mountain Valley would implement to protect aquatic species, habitat, and stream flows during withdrawal of water for hydrostatic testing.	Section 2.2.3
30.	Include a Project-specific Dust Suppression Plan. The Plan should indicate: a. sources of water for dust suppression; b. volumes taken from each individual source; c. permission from owners of the water sources; d. permits or authorizations required for water withdrawals; e. any chemicals to be added to dust suppression water; f. number of water trucks per spread, and volume of water placed on the right-of-way for each truck per day; and g. involvement of the environmental inspector directing dust suppression activities.	Section 2.2.4

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31. Clarify the distance between the pipeline and a paralleling waterbody. Section 2.2.4 states 10 feet would be maintained between the pipeline and a parallel waterbody; however, our Procedures require 15 feet of separation (section V.3.c). Therefore, Mountain Valley would need to request a modification from our Procedures if a closer distance to waterbodies is planned.	Section 2.2.5
32. Include a detailed justification for temporarily sidecasting trench spoil into a dry waterbody during an open-cut crossing. Include a detailed discussion of measures to remove all spoil from the waterbody bed. Further, describe plans for compliance with our Procedures, including sediment and erosion control, in the event that a previously dry waterbody begins flowing after disturbance starts.	Section 2.2.5
33. Section 2.2.4 states "chemicals, solvents, and fuels will be kept at least 100 feet from streams and riparian areas, unless placed within secondary containment." Our Procedures state hazardous materials must be kept at least 100 feet from wetlands, waterbodies, or designated municipal watershed areas unless the location is designated for such use by an appropriate governmental authority. Clarify the apparent discrepancy.	Section 2.2.5
34. Section 2.2.4 states "blasting in smaller streams would be done during low flow or dry periods." Clarify specifically what is meant by "low flow" and "smaller streams." Identify waterbody crossings where blasting may be required and the measures that would be implemented to minimize blasting impacts on surface waters.	Section 2.2.5
Appendix 2-A Waterbody Crossing Tables	
1. Combine tables 2-A-2 and 2-A-3 into one table. Denote which waterbodies were field delineated and which were taken from desktop data (include desktop data only where needed to fill in survey gaps). Include applicable construction windows for each waterbody crossing. Identify a specific crossing method (such as wet open-cut, dry open-cut, flume, dam-and-pump, bore, HDD, or Direct Pipe).	Table 2-A-2
2. Clarify the number of HDD waterbody crossings. Appendix 2A tables states the Gauley River (MP 118.9) and the Greenbrier River (MP 170.5) would be crossed via HDD. However, table 2.2-5 states the Gauley River would be crossed via open cut. Resolve the apparent discrepancy.	Table 2-A-2 and 2.2-5
Wetlands	
1. Discuss the latest U.S. Environmental Protection Agency/U.S. Army Corps of Engineers (COE) rule (Docket ID: EPA-HQ-OW-2011-0880) regarding the definition of "Waters of the United States" and how it would apply to wetland and waterbody identification, permitting, and mitigation for the Project.	Section 2.3
2. Revise table 2.3-1 to include the following: a. temporary and permanent wetland acreage impacts broken out by county and state, and Project component (i.e., pipeline right-of-way, extra work spaces, aboveground facilities, contractor yards, pipe storage yards, and access roads); b. construction and operational (include permanent impacts on palustrine emergent wetlands if a 10-foot-wide swath would be periodically mowed and permanent impacts on palustrine scrub/shrub wetlands if the swath is mowed and a 30-foot-wide corridor undergoes periodic removal of shrubs) impacts for each wetland type, and total impacts for each construction and operational impacts; and c. if no impacts, populate appropriate cells of table with 0.0, rather than blanks.	Section 2.3.1 Table 2.3-1
3. Explain why wetlands could not be avoided at contractor yards, pipe storage yards, and access roads;	Section 2.3

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4.	Include a list of all ATWS that may be located within 50 feet of a wetland or waterbody. For each, include site-specific justifications and the distance from the edge of the work space to the edge of the waterbody or wetland. In instances where an ATWS may be located within a wetland boundary evaluate an alternative to move the work space to an adjacent upland area.	Section 2.3.4 and Appendix 2-B
5.	Include wetland impacts associated with each component of the Project (i.e., pipeline right-of-way, ATWS, aboveground facilities, yards, and access roads). For each component, identify the number of acres of wetlands affected by Project construction and operation.	Table 2.3-1, Table 2-B-1
6.	Describe typical conditions within each identified wetland class in the project area, including typical species identified during field surveys. Also include any state wetland classifications for West Virginia and Virginia (i.e., exceptional value or protected).	Section 2.3.2
7.	Include more specific measures to avoid or minimize impacts on wetlands (i.e., crossing methods, BMPs, and decompaction).	Section 2.3.4
8.	Document communications with the COE and appropriate state agencies regarding the development of a Project-specific Wetland Mitigation Plan, and file a copy of the Plan with the FERC.	Section 2.3.4
9.	Discuss alternatives including reroutes that would locate the pipeline in uplands and avoid impacts on waterbodies and wetlands. Explain how the proposed route was chosen as the least environmentally damaging practicable alternative.	Section 2.3.4
Appendix 2-B Wetland Crossing Tables		
1.	Combine tables 2-B-1 and 2-B-2 into one table. Denote which wetlands were field delineated and which were taken from desktop data (include desktop data only where needed to fill in survey gaps). Include length of the wetland crossing (in feet), state wetland classifications (if applicable), and list wetland impacts by wetland type for both construction and operation. Include appropriate units for each column (i.e., feet and acres). Identify a specific crossing method.	Appendix 2-B

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WATER USE AND QUALITY
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RESOURCE REPORT 2
WATER USE AND QUALITY

LIST OF ACRONYMS AND ABBREVIATIONS

amsl	above mean sea level
ATWS	additional temporary workspace
BMPs	best management practices
CFR	Code of Federal Regulations
CWA	Clean Water Act
E&SC	Erosion and Sediment Control
E&SCP	Erosion and Sediment Control Plan
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIRM	Flood Insurance Rate Maps
Forest Plan	2004 Revised Land and Resource Management Plan
gpm	gallons per minute
HDD	horizontal directional drilling
HUC	hydrologic unit code
LQU	large quantity user
MGD	million gallons per day
MMDth/d	million dekatherms per day
MP	milepost
MVP	Mountain Valley Pipeline, LLC
NHD	National Hydrography Database
NPDES	National Pollutant Discharge Elimination System
NPS	National Parks Service
NRI	National Rivers Inventory
NWI	National Wetland Inventory
PEM	palustrine emergent
PFO	palustrine forested
Plan	FERC's May 2013 version of the Upland Erosion Control, Revegetation, and Maintenance Plan
Procedures	FERC's May 2013 version of the Wetland and Waterbody Construction and Mitigation Procedures
Project	Mountain Valley Pipeline Project
PSS	palustrine scrub/shrub
RCRIS	Resource and Conservation Recovery Act Information System
RSPSD	Red Sulphur Public Service District
SDWA	Safe Drinking Water Act
SPCC Plan	Spill Prevention, Control and Countermeasure Plan
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers
USDOT	United States Department of Transportation
USEPA	United States. Environmental Protection Agency

USGS	United States Geological Society
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDH	Virginia Department of Health
VDH-ODW	Virginia Department of Health – Office of Drinking Water
WHC	Wildlife Habitat Council
WVDEP	West Virginia Department of Environmental Protection
WVDHHR	West Virginia Department of Health and Human Resources
WVGES	West Virginia Geological and Economic Survey

RESOURCE REPORT 2
WATER USE AND QUALITY

Introduction

Mountain Valley Pipeline, LLC (MVP), a joint venture between EQT Midstream Partners, LP and affiliates of NextEra Energy, Inc., WGL Holdings, Inc., Vega Energy Partners, Ltd., and RGC Midstream, LLC, is seeking a Certificate of Public Convenience and Necessity from the Federal Energy Regulatory Commission (FERC) pursuant to Section 7(c) of the Natural Gas Act authorizing it to construct and operate the proposed Mountain Valley Pipeline Project (Project) located in 17 counties in West Virginia and Virginia. MVP plans to construct an approximately 301-mile, 42-inch-diameter natural gas pipeline to provide timely, cost-effective access to the growing demand for natural gas for use by local distribution companies, industrial users and power generation in the Mid-Atlantic and southeastern markets, as well as potential markets in the Appalachian region.

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 Zone 5 compressor station 165 in Pittsylvania County, Virginia. In addition to the pipeline, the Project will include approximately 171,600 horsepower 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. Resource Report 1 provides a complete summary of the Project facilities (see Table 1.2-2) and a general location map of the Project facilities (Figure 1.2-1).

Environmental Resource Report Organization

Resource Report 2 is prepared and organized according to the FERC *Guidance Manual for Environmental Report Preparation* (August 2002). This report is organized into four major sections and a separate section listing the sources used to prepare this report. Section 2.1 describes groundwater resources, Section 2.2 describes surface water resources, Section 2.3 describes wetlands, and Section 2.4 describes groundwater resources within Jefferson National Forest.

2.1 GROUNDWATER RESOURCES

2.1.1 Aquifers – Geology, Hydrology, Uses, and Quality

Information on major aquifers discussed in this section is based on information from the Ground Water Atlas of the United States (USGS 1997), Aquifer-Characteristics Data for West Virginia (USGS 2001), and Aquifer Susceptibility in Virginia (USGS 2003). Aquifer systems have generally been characterized based on physiographic provinces in Virginia and are characterized based on geologic age in West Virginia. Groundwater aquifers used for public and private water sources can be located in unconsolidated depositional units or lithified bedrock units, depending on the location. Unconsolidated surficial deposits, such as alluvium, alluvial fans, and colluvium, are found in all the aquifer system areas. These surficial aquifers are discontinuous both in extent and in terms of their aquifer characteristics and are not commonly used in the Project area. As a result, surficial aquifers have not been mapped by state agencies or otherwise documented in the area of the Project. Bedrock aquifers are the primary source of groundwater in the Project area. Aquifer systems are summarized in Table 2.1-1 by county for the Project area.

Table 2.1-1

Aquifers Crossed by the MVP Project

State / County	Approximate Mileposts / Aboveground Facilities	Aquifer System Name	Dominant Lithology
West Virginia			
Wetzel	0.0 – 42.7 / Mobley Interconnect Meter Station, Bradshaw Compressor Station	Upper Pennsylvanian (Monongahela Group) and Permian (Dunkard Group)	Sandstone, siltstone, shale
Harrison			
Doddridge			
Lewis	42.7 – 71.5		
Braxton	71.5 - 80.3 / Harris Compressor Station, TCO WB Interconnect Meter Station	Lower Pennsylvanian (Conemaugh Group) (Allegheny, Kanawha, New River, and Pocahontas formations)	Siltstone, shale, limestone, coal, sandstone
Webster	80.3 – 109.5 109.8 – 110.6	Mississippian bedrock (Pottsville Group, Mauch Chunk Group, Hinton Formation, Bluefield, Bluestone, and Princeton Formations, Greenbrier Group, Maccrady Formation and Pocono Group)	Sandstone and shale, limestone
Nicholas	109.5 – 109.8, 110.6 – 135.0	Lower Pennsylvanian (Conemaugh Group) (Allegheny, Kanawha, New River, and Pocahontas formations)	Siltstone, shale, limestone, coal, sandstone
Greenbrier	135.0 – 153.8, 154.3 – 156.7		
Fayette	153.8 – 154.3 / Stallworth Compressor Station	Mississippian bedrock (Pottsville Group, Mauch Chunk Group, Hinton Formation, Bluefield, Bluestone, and Princeton Formations, Greenbrier Group, Maccrady Formation and Pocono Group)	Sandstone and shale, limestone
Summers	156.7 - 173.4		
Monroe	173.4 – 195.5	Devonian and Silurian	Shales, sandstone, siltstone
		Ordovician	Sandstone, shale, limestone, dolomite
Virginia			
Giles	195.5 – 215.6	Ordovician	Sandstone, shale, limestone, dolomite
Craig	215.6 – 217.2	Ordovician	Sandstone, shale, limestone, dolomite
Montgomery	217.2 – 236.1	Mississippian-Devonian-Silurian aquifer system	Sandstone and shale, limestone
Roanoke	236.1 – 239.2	Mississippian-Devonian-Silurian aquifer system	Sandstone and shale, limestone
Roanoke	239.2 – 244.4	Cambrian-Ordovician aquifer system	Sandstone, shale, limestone, dolomite
Franklin	244.4 – 279.2	Blue Ridge and Piedmont aquifer system	Undifferentiated Sedimentary rock; Gneiss, schist, and metamorphic rock
Pittsylvania	279.2 – 301.0 / Transco Interconnect Meter Station	Piedmont aquifer System	Gneiss, schist, and metamorphic rock
Sources: USGS 1997, 2001, 2003			

According to West Virginia's Water Resources Management Plan (WVDEP 2013) groundwater resources and aquifer information for the state are identified as an ongoing issue for additional data collection and synthesis. Therefore, a comprehensive information source for such information including aerial distribution, thickness, fractures, yield rates and lithology of the aquifers does not currently exist, and the state does not have a water well log or permit database with such information. Although the West Virginia Department of Environmental Protection (WVDEP) has been mandated to develop a plan to characterize the groundwater aquifers within the state, there is sparse data on which this aquifer characterization may be based. This is especially true for borehole well-log data from fractured bedrock aquifers within the state. A characterization of aquifers within the state requires a better understanding of the bedding planes, joints, faults and other fractures through which a majority of groundwater flows or is stored. Numerous geologic and hydrologic investigations have been conducted by the United States Geological Survey (USGS) and the WVDEP throughout the state. Unfortunately, well-log data useful for characterizing fractured rock aquifers within the state is sparse.

A similar need for additional groundwater resources and aquifer information is documented in Virginia's Water Resources Management Plan (VDEQ 2013). The Virginia Plan notes that the structural complexity of the groundwater/surface water system in areas of fractured rock and karst terrain creates some practical limitations regarding characterization of such resources. Aquifer characterization in the Project area is highly dependent on well data in the immediate vicinity of the Project and generalized information regarding aquifer depths and yields are highly variable across entire aquifer extents. Such data, unless obtained from the immediate vicinity of the Project, are too generalized to be meaningful for the specific evaluation of the Project. However, generalized well yields and well depths for aquifers crossed by the Project are discussed in Section 2.1.1.1 with information that was available.

2.1.1.1 Major Aquifers – Geology and Hydrology

Appalachian Plateau Regional Aquifer System

In West Virginia, the Project lies almost entirely within the Appalachian Plateaus province that consists of sub-horizontal consolidated sedimentary rocks of Devonian to Permian age. The Appalachian Plateaus aquifer system is also present in parts of Giles County, Virginia. Aquifers in consolidated sedimentary rocks in the Appalachian Plateaus province are divided into the following categories-Mississippian aquifers, Permian aquifers and Pennsylvanian aquifers. Reported typical yields of wells completed in all these units range from 5 to 300 gallons per minute (gpm), but some wells yield as much as 600 gpm (USGS 2001). Well depths have been reported over 800 feet with casing depths beginning at 60 feet. The groundwater throughout the Appalachian Plateaus province moves within faulted, fractured and folded geological landscapes, some heavily affected by karst topography. Groundwater exists in the pore spaces of a variety of rock – most prominently sandstone and limestone, as well as in secondary features such as faults, folds, fractures, and solution channels. The groundwater aquifers in the Appalachian Plateau can be small, local, disconnected and seemingly flow in many different directions.

Permian and Upper Pennsylvanian aquifers are present in Wetzel, Harrison, Doddridge, and northern Lewis Counties in West Virginia; and Lower Pennsylvanian aquifers are present in Lewis, Braxton, Webster, Nicholas, and Greenbrier Counties in West Virginia. The Permian aquifers are primarily, nearly horizontal layers of shale with sandstone, limestone, and coal, with sandstone the primary groundwater source. Pennsylvanian rocks consist of cyclic sequences of fractured sandstone, shale, conglomerate, clay, coal, and minor limestone. On a regional scale, the rocks that comprise the Pennsylvanian system have little primary porosity and generally depend on facture permeability that includes joints, faults, and bedding planes separations. Groundwater is also present in solution openings in the limestone. Individual wells completed within the Pennsylvanian aquifers generally yield between 5 to 400 gpm within West Virginia.

Mississippian aquifers are present in the following West Virginia counties crossed by the Project: Webster, Greenbrier, Fayette, Summers, and Monroe. These aquifers are moderately-folded, predominantly sandstone and limestone with shale. Many of the water bearing geologic formations have similar hydrologic characteristics and are therefore grouped into aquifer systems. The aquifers may be porous or slightly fractured. Groundwater generally flows along fractures and joints in the bedrock. The Mississippian Greenbrier Limestone locally is a productive aquifer. Yields for wells completed from the Greenbrier Limestone range from 5 to 100 gpm, but some springs that issue from the Greenbrier Limestone discharge 1,000 gpm or more (USGS 2001). Yields of wells completed in sandstone of the Pocono Group range from 5 to 120 gpm.

Rocks of Devonian age are also exposed north of the Mississippian strata in the Appalachian Plateaus Province. The Project traverses Monroe County, West Virginia which has areas of Devonian bedrock in the province. Devonian strata consist mostly of fine grained sandstone, siltstone, and shale, and are not considered to be principal aquifers, although these beds can locally yield as much as 200 gpm where they are fractured.

Valley and Ridge Regional Aquifer System

The Valley and Ridge regional aquifer system is characterized by a belt of northeast-southwest trending ridges and valleys formed by the differential erosion of a thick sequence of folded and faulted Paleozoic sedimentary rocks. The Project traverses this aquifer system from southern Monroe County, West Virginia, to southern Roanoke County, Virginia. The Jefferson National Forest is crossed by the Project from milepost (MP) 195.3 to MP 196.9, MP 217.2 to MP 218.0, and MP 218.4 to 219.4. The principal aquifers in the system are carbonate rocks and sandstones that range in age from early to late Paleozoic. Although the water-yielding character of the carbonate rocks depends on the degree of fracturing and development of solution cavities in the rock, the limestone formations generally yield moderate to large volumes of water. Sandstone formations also can yield large quantities of water to wells where the sandstone is fractured. Yields of wells completed in Silurian and lower Devonian limestones commonly only range from 10 to 20 gpm, but may reach 100 gpm in some areas; and some springs that issue from these rocks discharge as much as 15,000 gpm. Devonian and Mississippian sandstones commonly yield 15 gpm or less to wells. Wells completed in the Cambrian-Ordovician yield 25 to upwards of 400 gpm. Sandstones of Ordovician to Devonian age commonly yield less than 120 gpm. Well information from Giles, Montgomery, and Roanoke Counties in Virginia indicate depths in Devonian, Mississippian, and Ordovician bedrock from 140 to 720 feet, with well casings beginning at 50 feet deep.

In the Project area, the Valley and Ridge Cambrian-Ordovician system includes a carbonate (limestone and dolostone) aquifer that is characterized by karst terrain that has caves, sinkholes, and springs. This aquifer, crossed by the Project route in southern Monroe County, West Virginia, and Giles County, Virginia, commonly includes solution channels and cavities, and large volumes of water can move at relatively high velocities along the dissolution features in areas with low hydraulic gradients. Karst aquifer areas are more specifically discussed in Section 2.1.1.4. Well information from Giles, Montgomery, and Roanoke Counties in Virginia indicate depths in Cambrian-Ordovician bedrock from 198 to 587 feet, with well casings beginning at 110 feet deep.

The Mississippian-Devonian-Silurian aquifer system is present in Roanoke County, Virginia and consists of shale and sandstone. Recharge is accomplished as water percolates locally through the soil cover and enters openings in the underlying rock. The openings are in the form of small joints, fractures, bedding planes, and fault zones.

Large springs are most characteristic of the Valley and Ridge Province. Spring-flow is particularly large for springs that issue from the carbonate rocks. Three types of springs are common, and all result from ground-water movement driven by the force of gravity. Contact springs form where water-saturated permeable material overlies less-permeable material. The water comes to the land surface at the contact of the two types of material, and the springs might issue where the contact intersects a sloping land surface. Contact springs are common in the Valley and Ridge Province but generally discharge only small volumes of water. Impermeable-rock springs are fed by fractures, joints, or bedding planes in rocks that have low intergranular permeability. Small springs of this type that issue where a vertical joint intersects a bedding plane and that generally discharge only small volumes of water are typical of parts of the Appalachian Plateaus Province, but are also in the Valley and Ridge. Tubular springs issue from solution channels in carbonate rocks. The largest magnitude springs are of this type because the catchment basins of networks of solution openings are likely to be more extensive than those of intersecting fractures, and the large solution openings in the carbonate rocks are able to transmit large quantities of water.

Blue Ridge and Piedmont Regional Aquifer System

The Project traverses the Piedmont and Blue Ridge regional aquifer system from southern Roanoke County, Virginia to the Project endpoint in Pittsylvania County, Virginia. The Piedmont and Blue Ridge Provinces are underlain by crystalline-rock and undifferentiated sedimentary-rock aquifers in the Project area. Hard, crystalline igneous and metamorphic formations dominate this region with some areas of sedimentary rocks and weathered bedrock deposits overlying the bedrock. The size and number of fractures and faults in the bedrock which store and transmit groundwater decrease with depth, so most significant water supplies are found within a few hundred feet of the surface. Most of the rocks that compose the crystalline-rock and undifferentiated sedimentary-rock aquifers are crystalline metamorphic and igneous rocks of many types. The main types of crystalline rocks are coarse-grained gneisses and schists of various mineral compositions; however, fine-grained rocks, such as phyllite and metamorphosed volcanic rocks, are common in places. Wells in crystalline rocks yield from less than 1 gpm to more than 100 gpm and range in depth from 60 to 500 feet.

The undifferentiated sedimentary-rock aquifers consist of tightly cemented, predominately clastic rocks, many of which grade into metamorphic rocks. The undifferentiated sedimentary-rock aquifers consist principally of fractured sandstone but locally include fractured shale. Crystalline metamorphic and igneous rock aquifers are present from the karst area to the end of the Project in Pittsylvania County, Virginia.

2.1.1.2 Mine Pools

Another source of stored groundwater is abandoned coal mines in West Virginia; abandoned coal mines could be considered an aquifer. Recently, mine pools have been considered as a source for large quantity water use to facilitate various processes, such as aquaculture, public supply, coal-to-liquid hydrocarbons, hydraulic fracturing for gas wells and power plant cooling. The West Virginia Geological and Economic Survey (WVGES) and the WVDEP have collaborated to produce a Mine Pool Atlas (Atlas) (WVGES 2012) to estimate the potential groundwater reserves within these abandoned coal mines across the state.

While flooded mines potentially hold large volumes of groundwater, this water typically requires treatment before it can be used. The coal bearing formations within and above coal seams generally contain sulfur containing minerals and are prone to development of acidic water, which in turn leaches metals from exposed natural rock formations. Treatment costs limit the usefulness of mine water as an alternative to other readily available freshwater sources.

The Atlas examined the best available information on mine locations and also noted that such information should be considered approximate and that many underground mine locations remain unknown. The extent of potential mine flooding is dependent on several factors, including mine orientation, mine entry location, proximity to other underground mines and direction of groundwater flow. Groundwater pumping to enable underground mining can affect water levels in adjacent underground mines. The groundwater flooding potential for underground mines in one coal bed also may be affected by underground mining in stratigraphically lower coals. In general, once pumping ceases, the mines begin to flood. The Atlas provides information showing that 99 mines in West Virginia, most of which exceed 500 acres in area, are potentially totally flooded.

An evaluation of the proposed route in relation to the mapped mine pools indicates that the pipeline route potentially crosses a very small area of the Pittsburgh Mine Pools in Harrison County, West Virginia from approximate MP 19.0 to MP 20.0. This area is mapped as partially flooded in the Atlas. Total potential storage in partially flooded areas of these pools is estimated to be 219,639 million gallons. The pipeline route crosses discontinuous areas of the Sewell Mine Pools in Nicholas County, West Virginia from approximate MP 113.0 to MP 121.0 and from approximate MP 133.0 to MP 135.0; and in Greenbrier County, West Virginia from approximate MP 135.0 to MP 139.0. These areas are mapped as partially flooded. Total potential storage in partially flooded areas of these pools is estimated to be 50,731 million gallons (WVGES 2012). There are no MVP aboveground facilities located in the vicinity of mapped mine pools.

2.1.1.3 Water Quality

The chemical quality of water in the freshwater parts of the bedrock aquifers of the Appalachian Plateaus is somewhat variable but generally is satisfactory for municipal supplies and other purposes. Groundwater in the aquifers is generally hard to very hard but is otherwise of excellent quality and is suitable for all uses. Contamination of groundwater by the improper construction or plugging of oil and gas wells is a common problem in the Appalachian Plateaus province. Natural brines are associated with accumulations of oil and gas and are at shallow depths in many places. Wells that penetrate aquifers that contain brine, if not properly cased and cemented, can provide conduits for the brine to enter shallower freshwater aquifers. It was once a common practice for brine produced with oil and gas to be discharged into open pits from which it seeped downward to contaminate fresh ground-water bodies. Such practices are generally prohibited now, but effects of the past remain. Contamination from septic systems located too close to domestic wells is also a common water quality issue.

Coal mining areas located generally within the limits of Pennsylvanian rocks, commonly includes water that has been in contact with mine workings or that has infiltrated and leached mine spoil piles. Water affected by coal-mining operations is usually acidic. Sulfur-bearing minerals, such as pyrite, that are present in the coal are exposed to air in mines and spoil piles, and the oxidized sulfur combines with water to form sulfuric acid. The acid water commonly contains large concentrations of iron, manganese, sulfate, and dissolved solids and is dis-colored. An exception is in the southern coal fields of West Virginia where the coal is low in sulfur, mine drainage tends to be alkaline, and water from working or abandoned mines is commonly treated and used for public supply.

Water quality in the aquifers of the Valley and Ridge province is somewhat variable but is generally suitable for municipal supplies and other purposes. Most of the water in the upper parts of the aquifers is not greatly mineralized and is suitable for drinking and most other uses. As with the Appalachian Piedmont province, abandoned or improperly plugged boreholes drilled for oil and gas exploration provide paths for upward movement of mineralized water in some areas. Potential for contamination is also high in limestone rock where groundwater moves rapidly. In karst terrain, recharge may occur through surface run-off into limestone sinkholes, bypassing filtration through the soil. This can cause serious water quality problems since polluted surface water may be introduced directly into the groundwater system. Groundwater quality can also be adversely affected by private trash dumps located in sinkholes that receive surface run-off. In addition, carbonate formations contribute to the "hardness" of the groundwater.

The quality of water from aquifers in the different rock types of the Piedmont and the Blue Ridge provinces is similar. The water generally is suitable for drinking and other uses, but iron, manganese, and sulfate locally occur in objectionable concentrations. The potential for contamination in crystalline rock is high because of rapid movement of water in fractures, joints, and bedding planes.

As stated in Resource Report 1, MVP proposes the use of a 125-foot-wide construction right-of-way, and the pipeline trench would be excavated to a depth of about 7 to 10 feet in most locations. The Project is not anticipated to have any impacts to groundwater resources or require additional mitigation measures. This is due to the surficial nature of the disturbance, the relatively short-term nature of the disturbance, and because the aquifers and typically much deeper than any proposed disturbance area.

2.1.1.4 Water Use

The area crossed by the Project is primarily rural and groundwater supplies – including wells and springs which– are relied upon by private and public entities. Approximately 70 million gallons of groundwater per day are withdrawn to supply the 42 percent of all West Virginians who rely on groundwater for domestic supplies. Twenty-three percent obtain water from private wells and 19 percent from public supply wells (USGS 2012). The 2005 USGS Water Use report (USGS 2005) estimated that approximately 2.2 million Virginians depend on groundwater for their domestic supply. Approximately 3 out of every 10 Virginians use groundwater from public water supplies, private wells, or springs for their daily water supply. While Virginia's groundwater is generally of good quality, both the quality and quantity can vary across the five physiographic provinces found in the state. Reliance on groundwater is also highly variable across the state, depending on a variety of geographic, geologic, and socioeconomic factors.

Approximately half of the groundwater use in sedimentary-rock aquifers in the Appalachian Plateaus aquifer system is used for domestic and commercial purposes and less than half is attributed to other purposes including industrial, mining, and thermoelectric power purposes with most of this water used in coal mining operations. Slightly more than one-half of groundwater in the Valley and Ridge province is used for domestic and commercial supplies. Agricultural use of groundwater is generally insignificant in the area. There has been little residential or industrial development in the Blue Ridge province, and groundwater use has been mainly for domestic needs rather than for public wells. The lower slopes of the mountains are the most favorable areas for groundwater accumulation. Springs are common and are often used for private water supplies.

Water use data is available from Virginia's Water Use Plan (VDEQ 2015c) by hydrologic unit code (HUC) 8 watershed. The Project is located in two HUC 8 watersheds in Virginia: the New River Basin and the Roanoke River Basin. The following Project area counties are located in the New River Basin: Giles, Craig, and a portion of Montgomery. An estimated 98,927 people used private groundwater wells for residential water supply in the New River Basin during 2010. The estimated 2010 groundwater use in the basin is 1.96 million gallons per day (MGD) by community water systems, 9.27 MGD by small private users, 6.55 MGD by large private users, and 5.32 MGD for agricultural use. The following Project area counties are located in the Roanoke River Basin: Montgomery (portion), Roanoke, Franklin, and Pittsylvania. Approximately 345,880 people in the Roanoke River Basin used private groundwater wells for residential supply during 2010. The estimated 2010 groundwater use in the basin is 417 MGD by community water systems, 182 MGD by large private users, and 2 MGD for agricultural use.

According to West Virginia's Water Resources Management Plan (WVDEP 2013), additional information is necessary to fully assess groundwater resources and use in the state. Information on water use is provided in the Plan in terms of surface, and groundwater is provided by large quantity user (LQU). Large quantity users withdraw more than 750,000 gallons of water per month. Although there are a number of LQUs in the Project counties of West Virginia, this water use information does not provide a comprehensive picture of groundwater usage on a local basis (e.g., by county) that would be meaningful for the Project.

2.1.1.5 Groundwater in Karst Terrain

Groundwater in karst terrain is present along the pipeline route from approximate MP 172.2 to MP 173.2 in Summers County, West Virginia; from approximate MP 193.4 to MP 194.5 in Monroe County, West Virginia; in segments from approximate MP 197.9 to MP 212.0 in Giles County, Virginia; and from approximate MP 216.0 to MP 221.1 in Montgomery County, Virginia (Draper Aden Associates 2015).

Surface water in karst terrain in the Project area generally flows from higher elevations to sinks when it reaches limestone and dolostone rock formations. These soluble rock formations form the sinkholes, insurgencies, and caves that are common in the area and form the basis for the karst hydrology that includes sinking streams, springs, and complex underground flow conditions.

Caves, sinkholes, and sinking streams are examples of openings in karst terrain that provide direct access for surface water to flow directly into the groundwater. In karst terrain, the flow of surface water into openings into the ground (sinkholes, swallets) is a natural geologic process in the formation and development of karst terrain. Water can flow through connected solution conduits, for distances that range from thousands of feet to several miles. As it moves downgradient from recharge areas, the water tends to be concentrated in ever-larger conduits until it typically discharges as flow from a large spring. The larger solution channels, including caves, generally form at or near the water table, but some dissolution takes place as deep as 100 feet below the top of the zone of saturation. The orientation of the solution openings is parallel to that of the joints and fractures in the carbonate rocks. Secondary openings, such as joints in noncarbonate rocks, also have preferred orientations. As a result, wells completed in fractures or solution openings and wells completed in the intervening bedrock can have dissimilar heads and specific capacities, and the pumping of one well will have little effect on water levels in the other. Due to its connection with surface water through sinkholes, caves, and swallets, groundwater in karst geologic terrain is vulnerable to contamination.

MVP is continuing to conduct ongoing studies of these areas to evaluate specific karst features crossed or within 0.25 mile of the pipeline, and will use results of this study to evaluate potential impacts on groundwater. Additional information and analysis is provided in the Karst Hazards Report (Resource Report 6) and in Section 2.1.3. Sensitive areas and features on or near the alignment would be given additional consideration for development of specific mitigation procedures or alignment adjustments. Mitigation measures proposed in the area of karst features are discussed in Section 2.1.4 and in the Karst Mitigation Plan (Resource Report 6). The karst areas crossed are also discussed in greater detail in Resource Report 6.

2.1.2 Sole-Source Aquifers

The United States. Environmental Protection Agency (USEPA) defines a sole- or principal-source aquifer as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. USEPA guidelines also stipulate that these areas can have no alternative drinking water sources that could physically, legally, or economically supply all those who depend upon the aquifer for drinking water (USEPA 2015a).

No sole-source aquifers have been designated in the Project area according to USEPA Region 3 (USEPA 2015a). There are no sole-source aquifers in West Virginia. One sole-source aquifer exists in Virginia in the northeastern part of the state, over 100 miles from the Project area; therefore, no impacts to sole-source aquifers are anticipated.

2.1.3 Water Supply Resources

2.1.3.1 Public Water Supply Wells and Springs

A detailed assessment of public water supplies (includes wells, springs and surface water intakes) was initiated and is documented in Draper Aden Associates' report entitled Water Resources Identification and Testing Plan (DAA 2015c). The public water supply assessment effort is on-going and updates to the Plan will be provided as they are acquired. The following discussion and table presents a general overview of public water supplies within 15 miles of the MVP Project. While certain water supplies were initially located in the near vicinity of the MVP Project, these water sources will be confirmed and evaluated as part of the on-going Water Resources Identification and Testing Plan (DAA 2015c).

Initial information on public wells and springs located within one mile of the Project alignment was obtained from EPA's Safe Drinking Water Information System (USEPA 2015b), and digital location information for public supplies in Virginia was obtained from the Virginia Department of Environmental Quality (VDEQ) (VDEQ 2015a), and digital information obtained from the West Virginia Department of Environmental Protection (WVDEP 2015a) as listed in Table 2.1-2. Two public water supplies were identified within 0.1 mile of the Project (one of three wells, town of Crichton, Greenbrier PSD#2, Greenbrier County WVA; Robin Court Subdivision well, Pittsylvania County VA) (Table 2.1-2). One of the town of Crichton wells appears to be located within 0.1 mile of MP 138.3. The Robin Court Subdivision groundwater supply well that serves a population of 40 appears to be located within 0.1 mile of MP 297.6; The groundwater supplies (wells and spring) for Red Sulphur Public Service District (RSPSD) in Monroe County, West Virginia serving a population of 5,352 are located within 0.3 mile of the MP 194.4 The groundwater supplies (spring and wells) for the Town of Boones Mill in Franklin County, Virginia serving a population of 350 are located approximately 1 mile from MP 154.0 to 155.0. These public supplies are further discussed in Section 2.1.3.4.

Table 2.1-2

Public Supply Wells and Springs within approximately 15 miles of the MVP Project

State/County	Public Groundwater Supply in Project Area	Location	Supply Information	Population Served
West Virginia (location based on digital location data or as estimated from map information)				
Braxton	Groundwater supply for public campgrounds	1.2 mile west of MP 73.0	Big Run campground	25
Braxton	Groundwater supply for public campground	1.2 mile west of MP 73.0	Lakes Carryout campground	25
Greenbrier	Public groundwater supply for town of Crichton	0.4 mile SE of MP 136.3	Greenbrier County PSD 2	1,188
Greenbrier	Public groundwater supply	2.7 mile east of MP 136.4	Greenbrier County PSD #2	1,188
Greenbrier	Public groundwater supply	0.03 mile west of MP 138.3	Greenbrier County PSD #2	1,188
Greenbrier	Public groundwater supply for town of Rainelle	2.7 mile southwest of MP 143.9	Rainelle Water Department	2,178
Greenbrier	Public groundwater supply for business in town of Rainelle	0.3 mile east of MP 144.4	Debs Party Club	25
Greenbrier	Public groundwater supply for business in town of Rainelle	0.3 mile east of MP 144.4	J and S Restaurant and Catering	25
Greenbrier	Public water supply for town of Rupert	2.9 miles northeast of 145.6	Rupert Water Department	1,180
Greenbrier	Public water supply for town of Rupert	2.5 miles east of MP 146	Rupert Water Department	1,180
Greenbrier	Public groundwater supply for town of Rainelle	1.2 mile west of MP 147.1	Rainelle Water Treatment Plant 2	290
Fayette	Public water supply for town of Meadow Bridge	6.0 miles west of 154.3	Meadow Bridge Water Department	725
Monroe	Public water supply to town of Union	8.4 miles east of 177.7	Town of Union	972
Monroe	Public water supply (wells)	12.8 miles east of MP 181	Gap Mills Public Service District	392
Monroe	Public water supply (uses Rich Creek Spring) for Peterstown	0.3 mile east of MP 194.4	Red Sulphur Public Service District	5,352
Virginia				
Giles	Groundwater supply (spring) for town of Ripplemead	0.9 mile east of MP 197.4	LHoist North America of Virginia	160
Giles	Groundwater supply (well)	0.84 mile northwest of MP 204.3	Cascades	90
Roanoke	Groundwater supply well for camp	0.35 mile east of MP 235.7	Camp Roanoke	25
Roanoke	Groundwater supply (well) in town of Bent Mountain	0.88 mile east of MP 240.4	Bent Mountain Bistro	80
Roanoke	Groundwater supply (well) in town of Bent Mountain	0.69 mile east of MP 241.2	Bent Mountain Library and Community Center	25

Table 2.1-2 Public Supply Wells and Springs within approximately 15 miles of the MVP Project				
State/County	**Public Groundwater Supply in Project Area**	**Location**	**Supply Information**	**Population Served**
Franklin	Groundwater supply (well)	4 miles east/northeast of MP 248.254.6	Woodcrest	40
Franklin	Boones Mill water supply (spring and 2 wells)	1 mile north of MP 254.5	Town of Boones Mill	350
Franklin	Boones Mill water supply (1 well)	1 mile north 255.1	Town of Boones Mill	350
Franklin	Groundwater supply (3 wells)	0.43 mile west of MP 259.6	Teel Brooke Estates	187
Franklin	Groundwater supply (well)	0.67 mile east/northeast of MP 160.4	Sunshine Valley School	100
Franklin	Groundwater supply (well)	5 miles southwest of MP 260.9	Waid Park well	unknown
Franklin	Groundwater supply (3 wells)	10.7 miles southwest of MP 260.8	Town of Ferrum	1,825
Franklin	Groundwater supply (4 wells)	6.2 to 6.8 miles south of MP 262.9	Commerce City well, LARC Field recreational wells,	unknown
Franklin	Groundwater supply (well)	1 mile southwest of MP 272.4	The Meadows	89
Franklin	Groundwater supply (well)	0.75 mile south of MP 272.9	Glad Hill Elementary	365
Franklin	Groundwater supply (2 wells)	0.3 mile northeast of MP 276.2	La Trattoria	250
Franklin	Groundwater supply (well)	0.95 mile north of MP 276	Whistle Stop	100
Franklin	Groundwater supply (2 wells)	0.93 mile north of MP 279.7	Carls Place	200
Franklin	Groundwater supply (5 wells)	3.3 to 3.9 miles north of MP 280	Waters Edge wells	949
Pittsylvania	Groundwater supply (well)	1 mile north of MP 281.8	Smith Mountain RV Campground	40
Pittsylvania	Groundwater supply (well)	0.5 mile northeast of MP 298.8	The Cedars Country Club	60
Pittsylvania	Groundwater supply (well)	Within 0.1 mile north of MP 297.6	Robin Court Subdivision	40
a/ Source: USEPA 2015b; WVDEP 2015a; VDEQ 2015a				

As noted above, an effort is currently underway to identify public water suppliers within the U.S. Geological Survey's 10-digit HUC water shed through which the MVP alignment crosses. This effort includes contacting the resource owner to characterize the public water resource (location, yield, depth of well, formation tapped, etc.) and request permission for MVP to conduct pre-construction water quality testing. This public water resource identification process is documented in Draper Aden Associates' report entitled

Water Resources Identification and Testing Plan (DAA, 2015c). See Figure 5.4 and Figure 5.5 and Table 5.2 of DAA (2015c) for the list of public water resources in HUC 10 watersheds identified for further assessment, updated as of October 14, 2015. Public water resource evaluations are on-going, and FERC will be provided additional updates on the assessment and testing of water resources by MVP.

Although it is unlikely that there are public water supply wells or springs that have not been identified within 150 feet of the alignment, MVP land personnel will survey affected landowners to identify locations of any known public supply water wells and springs that have not been identified. Additionally, private water wells may be identified during title reviews. MVP will specifically contact the Robin Court Subdivision (Pittsylvania County, Virginia) to locate the groundwater supply well.

If any public water supply well or spring is confirmed present within 150 feet of a proposed Filing Alignment work area (500 feet in karst terrain), MVP will clearly flag the wellhead or spring (if landowner access is provided) as a precaution for construction equipment and activities. To further mitigate the potential for land disturbance associated with the pipeline to impact a water resource, MVP will implement the FERC's May 2013 version of the Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) and FERC's May 2013 version of the Wetland and Waterbody Construction and Mitigation Procedures (Procedures) requirements for stormwater-runoff control and control of petroleum and hazardous materials. In the event that the water resource is affected or a significant potential for impact arises, MVP will be responsible for notifying the owner/operator of the well. Mitigation measures for protection of public water supplies are further described in Sections 2.1.3.4 and 2.1.4.

In addition, MVP will offer to conduct a pre-construction water quality evaluation of public water resources (see Draper Aden Associates 2015c). MVP will document any public resource owner choosing to opt out of pre-construction evaluation. Public resource owners participating in the testing program will be contacted by an MVP representative, and a qualified independent contractor will perform the testing. MVP will evaluate public resource owner complaints or damage associated with construction and identify a suitable plan of action to help the water supplier provide adequate quantities of potable water to its customer base and return the public source to baseline quality.

2.1.3.2 Private Water Resources (Wells)

Publically accessible database information for private wells in West Virginia and Virginia is not available. As previously discussed, there are ongoing efforts in both states to improve characterization and documentation of groundwater resources (WVDEP 2013; VDEQ 2015c). The West Virginia Department of Health and Human Resources (WVDHHR) has years of water well data, but the aquifers have not been characterized, the wells have not been mapped; nor have the potential maximum withdrawal rates been established for the state's groundwater aquifers.

In response to negative impacts experienced by many localities, businesses, and domestic well users during the drought of 2002, the VDEQ (VDEQ 2015b) is in the process of compiling a Geographic Information System (GIS) database of historical water well construction, withdrawal, and water quality data. However, this dataset is not yet available. Private water wells in the area of the Project are primarily completed in bedrock aquifers. The depths of the tapped aquifer zones range from 30 to over 400 feet, and water levels range from less than 10 feet to over 400 feet (USGS 2001). In general, bedrock aquifers are not expected to be impacted by the Project with the implementation of mitigation measures and procedures described in Section 2.1.4. Potential impacts to bedrock aquifers include impacts from blasting and trenching during construction. For areas of karst terrain conditions described in Section 2.1.1.4 and Resource Report 6, additional study and mitigation measures would be implemented as described in Section 2.1.4.

MVP is in the process of conducting landowner surveys and civil surveys where access was granted, which includes efforts to identify private water resources within 150 feet of the proposed alignment work area (500 feet in karst terrain), and this includes contacting the property owner to characterize the resource and request permission for MVP to conduct pre-construction water quality testing. The water resource identification process is documented in the Water Resources Identification and Testing Plan (DAA, 2015c) included in Appendix 2-E. See Figures 5.2 and 5.3 and Table 5.1 in the subject report for the list of potential private water supplies identified with 150 feet of the proposed alignment (and within 500 feet in karst areas), updated as of October 14, 2015. The process by which the potential private water supplies were identified is described in the report. This work is on-going, and FERC will be provided additional future updates on the assessment and testing of water resources by MVP.

During Project construction, water supplies (wells and springs) located within 150 feet of the construction area will be staked and flagged for visibility, and surrounded with silt fence and safety fence. Additional precautions to protect water resources in karst terrain will also be undertaken (see Draper Aden Associates' documents 2015b and 2015c in Resource Report 6). In addition, MVP will offer to conduct a pre-construction water quality evaluation of water resources identified within 150 feet of the Project work area (see Draper Aden Associates 2015c). MVP will document any landowner choosing to opt out of pre-construction evaluation. Landowners participating in the testing program will be contacted by an MVP representative, and a qualified independent contractor will perform the testing. MVP will evaluate landowner complaints or damage associated with construction. In the unlikely event that any private landowner wells are damaged by Project construction as documented by MVP pre and post –construction testing, MVP will negotiate a settlement with the landowner that may include repair or replacement. MVP will provide adequate temporary accommodations or a temporary water supply to affected homeowners while their well is repaired or replaced in the event that no other potable water source is readily available. If an impact occurs to a livestock well or an irrigation well, MVP will provide a temporary water source to sustain livestock while a new permanent water supply well is constructed. MVP will not provide temporary water source for crops, but would compensate landowners for any losses in crops resulting from well damage. Well damage is not expected to occur as a result of Project construction or operations.

2.1.3.3 Springs and Swallets

Table 2.1-3 lists an initial assessment of springs and swallets identified within approximately one mile of the Project. Data on springs were documented from historical sources and from field surveys conducted where access was granted by landowners (Draper Aden Associates 2015a and 2015d). Springs located within 150 feet to approximately 0.25 mile of the Project right-of-way were identified through route alignment civil surveying. In the karst areas, springs were also identified through desktop review (see Resource Report 6) and confirmed in the field by observation on those parcels where property owner permission was granted for access. In karst terrain, the evaluation of possible springs was expanded to approximately 0.25 mile of the Project right-of-way. The presence of the swallets is indicative of the karst conditions in these areas and the associated hydrologic interconnectivity of surface water with groundwater (see Resource Report 6 [DAA 2015b]).

Table 2.1-3

Springs and Swallets Identified Within Approximately 0.25 mile of the MVP Project Construction Workspace

State / County	Name	MP	Direction / Location	Geologic Occurrence / Karst Influence? d/
West Virginia				
Lewis c/	spring	46	526 feet north	Uniontown Sandstone / No
Lewis c/	spring	58.7	261 feet east	Uniontown Sandstone / No
Webster c/	spring	81.7	623 feet south	Kanawha Sandstone / No
Webster c/	spring	81.8	123 feet south	Kanawha Sandstone / No
Webster c/	spring	82.4	566 feet south	Kanawha Sandstone / No
Nicholas c/	spring	122.6	271 feet east	Kanawha Sandstone / No
Greenbrier c/	spring	150.5	139 feet northwest	Pocahontas Sandstone, Shale / No
Greenbrier c/	spring	150.6	74 feet south	Pocahontas Sandstone, Shale / No
Greenbrier c/	spring	155	303 feet northeast	Bluestone, Princeton Shale and Sandstone / No
Summers b/	swallet	172.5	400 feet south	Pickaway Limestone / Yes
Summers b/	Unnamed spring	172.8	260 feet south	Pickaway Limestone / Yes
Summers b/	swallet	172.9	500 feet south	Pickaway Limestone / Yes
Monroe c/	spring	184.5	561 southeast	Bluefield shale / No
Monroe a/, b/	Rich Creek Spring	194.5	1,500 feet west	Knox dolostone/undivided Limestone / Yes
Virginia				
Giles b/	Unnamed small spring	200.4	1,450 feet south	Undivided limestone / Yes
Giles b/	Swallet (40-foot headwall)	200.5	1,450 feet south	Undivided limestone / Yes
Giles b/	Little Stoney Spring	203.2	900 feet south	Martinsburg / Eggleston / Moccasin / Yes
Giles b/	Swallet (dye traced to Doe Creek Spring on New River by DCR)	206.7	430 feet south	Martinsburg / Eggleston / Moccasin / Yes
Giles b/	Multiple stream sink points	208.0	760 feet northeast	Undivided limestone / Yes
Giles b/	Tawneys Spring (Hydrologic system drains Clover Hollow)	209.9	700 feet north	Knox dolostone / Yes
Giles b/	Smokehole Spring (Hydrologic system drains Clover Hollow)	210.2	More than 1,320 feet north	Knox dolostone / Yes
Giles b/	Large unnamed spring	213.6	300 feet north	Knox dolostone / Yes
Giles b/	Stream insurgence	214.9	200 feet south	Undivided limestone / Yes
Giles b/	Large stream insurgence in sinkhole filled with farm trash.	215.2	400 feet north	Undivided limestone / Yes
Giles b/	Large unnamed spring	215.3	750 feet north	Undivided limestone / Yes
Giles b/	swallet	215.3	400 feet north	Undivided limestone / Yes

Table 2.1-3

Springs and Swallets Identified Within Approximately 0.25 mile of the MVP Project Construction Workspace

State / County	Name	MP	Direction / Location	Geologic Occurrence / Karst Influence? d/
Giles b/	Unnamed spring	215.4	750 feet south	Undivided limestone / Yes
Giles b/	Unnamed spring	216.0	Over 1,320 feet south	Undivided limestone / Yes
Craig b/	Stream insurgence in open throat sinkhole	216.8	140 feet east	Undivided limestone / Yes
Montgomery b/	Losing streambed and swallets	220.7	800 feet east	Elbrook dolomite / Yes
Montgomery b/	Wet weather insurgence	220.9	1,200 feet east	Elbrook dolomite / Yes
Montgomery b/	Mill Creek Cave spring	223.0	north of 2,800+ feet	Knox dolostone / Yes
Montgomery b/	Old Mill Cave spring (Resurgence from Dry Branch)	224.3	2,000+ feet south	Knox dolostone / Yes
Montgomery b/	Dam Spring	224.4	2,000+ feet south	Knox dolostone / Yes
Montgomery b/	Unnamed small spring	224.6	800+ feet south	Knox dolostone / Yes
Montgomery b/	Hancock spring (large)	224.8	2,000+ feet south	Knox dolostone / Yes
Montgomery b/	Unnamed wet weather spring	224.9	1,200 feet south	Knox dolostone / Yes
Montgomery b/	Unnamed spring used for cattle	225.0	south / within 150 feet	Knox dolostone / Yes
Montgomery b/	Unnamed spring	225.3	600 feet south	Stones River limestone / Yes
Montgomery b/	Unnamed spring	225.4	500 feet south	Stones River limestone / Yes
Montgomery b/	Johnsons Cave spring	225.5	south of, 300 feet	Stones River limestone / Yes
Montgomery b/	swallet	225.9	South, within 150 feet	Stones River limestone / Yes
Franklin c/	spring	246.8	675 feet west	layered biotite granulite and gneiss / No
Franklin c/	spring	250.4	599 feet west	layered biotite granulite and gneiss / No
Franklin c/	spring	254	256 feet east	porphyroblastic biotite-plagioclase augen gneiss / No

a/ McColloch 1986
b/ Draper Aden Associates 2015c
c/ Holland 2015
d/ It is noted that specific groundwater direction and velocity information is not available for springs and swallets in the karst areas. The Karst Mitigation Plan (Resource Report 6) and the Water Resources Identification and Testing Plan (Appendix 2-E) include measures to ensure the protection of water resources in karst terrain – including additional field studies if necessary.

Rich Creek Spring is located approximately 1,500 feet west of MP 194.5. This spring was identified during field studies and via a West Virginia database search (McColloch 1986).

Springs of Virginia (Virginia Division of Water Resources and Power 1930) provides information on springs based on largely anecdotal information, and the exact location of the springs listed in the publication is not available. MVP has attempted to augment published data and nomenclature on wells and springs with information obtained from landowners where survey access has been obtained. As additional survey access is obtained, MVP will continue to identify water resources within at least 150 feet of the alignment. MVP will continue to consult with landowners, and local and state agencies to identify water resources – including springs and wells – in the immediate vicinity of the Project.

Efforts to identify springs include contacting the property owner to characterize the resource and request permission for MVP to conduct pre-construction water quality testing. The water resource identification process is documented in the Water Resources Identification and Testing Plan (Appendix 2-E). The distance for spring and swallet identification was extended to 500 feet in karst areas. As described in the testing plan, spring and swallet evaluations are on-going, and MVP will file with FERC updates when available.

Ground disturbance for construction activities (e.g., clearing, trenching, boring, etc.) of the alignment is not expected to directly impact any identified swallets. In addition, avoidance, evaluation, and mitigation recommendations for karst features (including swallets) are included in the Karst Mitigation Plan (Resource Report 6).

MVP will survey affected landowners to request the locations of known springs to help minimize or avoid potential impacts to private springs that are used for water supply purposes. If springs are identified that could be affected by construction activities, MVP will consult with the appropriate regulatory agencies and with individual landowners to minimize impacts. Springs, if used for domestic, livestock, or agriculture, purposes may be tested and evaluated, and repaired or replaced, in the same manner as described for water wells in Section 2.1.3.2.

2.1.3.4 Wellhead or Source Water Protection Areas

An assessment of public water resources that are located in the vicinity of the MVP alignment was made using information derived from Virginia and Waste Virginia agency water supply protection efforts. Public water supplies within approximately 15 miles of the Project are listed in Table 2.1-2. Most of these supplies are located at a distance that is not considered a concern with regard to the Project. Table 2.1-4 includes public water supplies that are associated with Wellhead or Source Water Protection Areas that serve populations of 100 or more, and that are within 0.3 mile of the Project.

Under a 1986 amendment to the Safe Drinking Water Act (SDWA), each state is required to develop and implement a wellhead protection program in order to identify the land and recharge areas contributing to public supply wells and prevent the contamination of drinking water supplies. The SDWA was later updated in 1996 to require the development of a broader-based source water assessment program, which includes the assessment of potential contamination to both groundwater and surface water through a watershed approach. The Source Water Assessment and Protection Program for the West Virginia Bureau for Public Health is completing assessments of contamination threats to all public water sources.

Table 2.1-4 Source Water Protection Areas or Specific Water Sources of within 0.3 mile of the Proposed MVP Project			
Water Supply	**Milepost**	**Approximate Distance (from pipeline) / Approximate gradient relationship**	**Water Source**
Greenbrier County PSD #2 (one Town of Crighton Well)	138.3	< 0.1 mile / pipeline is sidegradient	well
Rainelle Water Department, Greenbrier County (source water protection area)	144.2	< 0.1 mile west / pipeline is upgradient	3 wells
Red Sulphur PSD, Monroe County (zone of critical concern)	194.5	<0.3 mile (0.75 mile) / pipeline is sidegradient west	Spring and surface water (located in karst terrain)
Boones Mill water supply (spring source)	254.5	>0.3 mile north / pipeline is downgradient	Spring and 3 wells
La Trattoria (wells)	276.2	0.3 mile northeast / pipeline is downgradient	2 wells
Source: WVDHHR 2015; VDEQ 2015			

In 1999, the Virginia Department of Health – Office of Drinking Water (VDH-ODW) developed a Source Water Assessment Program, as a result of the 1996 Amendments to the SDWA, Section 1453. By 2003, all existing drinking water sources were assessed. The objective of the Source Water Assessment Program is to facilitate and promote the implementation of source water protection measures among the waterworks community. To achieve this, VDH-ODW delineates an assessment area for each drinking water source and creates an inventory of potential sources of contamination. This information is used to make a susceptibility determination of the drinking water source in relation to the potential source of contaminants found in the assessment area. VDH-ODW submits annual progress reports to the Environmental Protection Agency about the protection status of community water systems in Virginia. A source water protection program annual survey is typically performed from June to August of each year (VDH-ODW 2015). Virginia's program focuses on the assessment of aquifers that might be susceptible to contamination.

One public water supply well for the Town of Crighton is identified less than 0.1 mile west of MP 138.3 in Greenbrier County (Table 2.1-2). The well serves the Greenbrier County Public Supply District #2. The well is located at nearly the same elevation as the alignment and is not in an area of karst terrain. MVP will contact the District during the final design of the Project.

Robin Court Subdivision groundwater supply well that serves a population of 40 appears to be located within 0.1 mile of MP 297.6 (Table 2.1-2).

The only source water protection area identified as potentially within 0.1 mile of the Project area is for the Rainelle Water Department located in Greenbrier County, Virginia (WVDHHR 2003) (Table 2.1-4). However, the source water protection area is upgradient of the Project and therefore is not anticipated to be impacted. Numerous potential commercial and industrial contaminant sources are located in the town of Rainelle within the protection area. The Rainelle Water Department water system serves a population of approximately 1,865, and the supply is from three wells, although only two are currently in use. The specific locations of the town water supply wells were not available. The Rainelle water system has been contacted by MVP, and an informational meeting will be held between the town and MVP to clearly identify the water supply locations for Rainelle, characterize the public system, and coordinate pre-construction baseline water quality testing (see Draper Aden Associates 2015c).

One water supply (Rich Creek Spring) is located approximately 1,500 feet west of MP 194.5 in West Virginia. The Red Sulphur Public Service District (RSPSD) uses Rich Creek Spring and downstream portions of Rich Creek as a backup water supply. This location is along the western flank of Peters Mountain in the Beekmantown/Knox limestone and dolomite. The spring is not part of the "zone of critical concern" in the lower Rich Creek watershed by the RSPSD's 2005 Source Water Assessment Report (Draper Aden Associates 2015). The pipeline alignment comes within approximately 0.75 mile of the zone of critical concern at MP 193.4 (see Figure 2-C-3, in Appendix 2-C). Potential groundwater contaminant sources include domestic sewage, abandoned mines and gas extraction, and unknown sources (WVDHHR 2005). The Project is generally located east and upgradient of the zone of critical concern, and this area is also located in an area of karst conditions. The presence of sinking streams and open throat sinkholes in the vicinity could provide direct conduits for rapid surface water flow into subsurface karst features and potentially impact the cave and spring. However, additional study, and mitigation measures and procedures described in Section 2.1.4 would be employed to avoid impacts to groundwater supplies in karst areas. An informational meeting was held in September 2015 with the RSPSD. MVP will conduct pre-construction baseline water quality testing as described in the Water Resources Identification and Testing Plan (Appendix 2-E).

In Virginia, the Town of Boones Mill is served by a public water system, owned and operated by the Town. The Town's water supply consists of three (3) wells, one (1) spring, a water treatment facility, a 250,000-gallon water storage tank, and distribution system. The elevation of the spring is approximately 1,468 feet above mean sea level (amsl) and is located approximately 200 feet north of the Town public water supply treatment facility. The spring can produce 110 gpm during normal precipitation conditions but may go dry during drought. The three (3) wells combined produce 153 gpm (220,000 GPD) during normal conditions; well production decreases by approximately 25% during drought. A source water assessment conducted in 2002 by the Virginia Department of Health (VDH) indicated the water to be of high susceptibility to contamination due to land uses and locations of potential sources of contamination, which include fertilizer, erosion of natural deposits that produce radiological contaminants, septic tanks, and copper from natural deposits (Town of Boones Mill 2013). The Town's spring is located approximately 1 mile north, and the wells approximately 0.5 mile north of MP 254.7 on the pipeline route (see Figure 2-C-4, in Appendix 2-C). The Project alignment is also located across a perennial drainage called Teel's Creek from the wells and spring. Relative to the originally MVP alignment, the spring and wells were located approximately 0.5 mile south and downslope, and 1 mile south and downslope, respectively. The current Project alignment provides notably greater protection of the Town's water supplies as regards construction activities. If required, mitigation measures and procedures described in Section 2.1.4 would be employed to avoid impacts to the water supply. The Town of Boones Mill water system was contacted by MVP, and an informational meeting was held in October 2015. MVP will continue consultation with the Boones Mill water system, including coordination of pre-construction baseline water quality testing.

The water supply for La Trattoria is not anticipated to be impacted by the Project because this area is located 0.3 mile from the Project alignment in fairly flat terrain and is not located in an area of karst conditions. Adherence to the FERC Plan and Procedures and implementation of best management practices (BMPs) during construction and restoration will prevent or mitigate impacts to the wellhead protection area. MVP has contacted the local water departments and other public supply entities in the vicinity of the Project including the areas of concern identified above with a schedule of construction activities in this area prior to construction, as discussed in the Water Resources Identification and Testing Plan (Appendix 2-E). Locational and other public water supply information available at this time does not indicate adverse impacts from the Project to public supply wells, springs, or source water protection areas. Continuing measures to identify and protect public water supplies are addressed in Section 2.1.4.1.

2.1.3.5 Potential Contaminated Groundwater

Groundwater quality and common sources of potential contamination are discussed in Section 2.1.1.2 and in Section 2.1.3.4 in relation to public water supplies. In addition, EPA's Facility Registry System database (USEPA 2015c) was searched to perform a preliminary identification of documented contaminated sites located within the vicinity of the Project. The database includes information on regulated sites for hazardous waste handling, releases to air, and federal cleanup sites. Digital databases available from the West Virginia Department of Environmental Protection (2015) and Virginia Department of Environmental Quality (2015) were also searched for locations of potential contamination concern.

Documented contamination sites identified within 0.5 mile of the Project are listed in Appendix 2-D. The sites identified are primarily regulated National Pollutant Discharge and Elimination System (NPDES) sites, Resource and Conservation Recovery Act Information System (RCRIS) sites, and state registered above-ground and underground storage tank sites. The NPDES sites include regulated stormwater discharges or other regulated discharges to water drainages or sewer systems. The RCRIS sites indicate regulated entities that handle hazardous waste and materials. Their regulated status is not indicative of a contaminant release. Based on the review of the database search results, the potential of encountering contaminated groundwater in the vicinity of the Project area is low. The table does not include sites related to air quality or air releases as these facilities would not have the potential to impact groundwater. Sites of potential concern within 200 feet of the Project work space include the Consolidation Coal Company site at MP 8.0, the Pike Coal Recovery completed reclamation site at MP 87.4, the William D. Smith Trucking enforcement and reporting site at MP 210.1, the closed Howard Allen residence storage tank site at MP 234.1, and the closed Environmental Options Article 11 Facility storage tank site at MP 263.9. Although most of these sites are closed or have otherwise been addressed via regulatory processes, there is the potential for low residual levels of contamination to exist in these areas.

However, the probability of encountering contaminated soil and groundwater resources during construction is expected to be low. In the rare instance that unexpected contamination is present in areas of Project trenching or other necessary construction work, MVP's Environmental Inspectors will be trained to detect direct and indirect evidence of soil and/or groundwater contamination. If contaminated soil or groundwater is encountered during construction, MVP will notify the affected landowner and will coordinate with the appropriate federal and state agencies in accordance with applicable notification requirements.

Although there are no State databases that identify brine pits and brine pit contamination in the area of the Project, MVP identified potential brine pits and well pads based on Google (September 2014) imagery within one mile of the construction right-of-way (see Table 2.1-5). Based on the imagery analyses, there is only one potential brine pit located within 150 feet of the Project construction right-of-way at MP 54.3; and a total of 41 potential brine pits located within 0.25 mile of the construction right-of-way. Potential brine pits within 150 feet of the construction right-of-way would be evaluated for potential leakage or local contamination prior to construction of the Project by contacting landowners.

Table 2.1-5

Identified Potential Brine Pits within 1 mile of the Construction Right-of-Way

Milepost	Relation to Route	Distance from Construction ROW (feet)	Distance from Construction ROW (miles)
0.1	West	4,726	0.90
0.6	East	4,136	0.78
15.9	West	1,590	0.30
16.5	East	611	0.12
17.1	West	1,960	0.37
17.4	East	2,334	0.44
17.6	East	1,909	0.36
17.8	East	1,507	0.29
17.9	East	580	0.11
20.6	East	2,180	0.41
23.0	East	1,298	0.25
23.1	West	1,409	0.27
24.8	West	2,696	0.51
27.9	West	786	0.15
29.2	West	744	0.14
30.9	West	2,038	0.39
33.1	West	1,520	0.29
33.9	West	1,345	0.25
34.0	West	1,810	0.34
34.2	West	1,984	0.38
34.5	East	1,029	0.19
34.8	East	2,850	0.54
34.9	West	468	0.09
35.2	West	1,219	0.23
35.3	West	1,860	0.35
35.8	West	2,545	0.48
37.7	East	2,665	0.50
39.3	East	2,340	0.44
40.2	East	1,770	0.34
43.3	West	2,650	0.50
43.4	West	181	0.03
43.6	East	1,155	0.22
44.2	East	1,164	0.22
44.3	East	1,498	0.28
44.3	East	1,677	0.32
44.4	East	1,226	0.23
44.7	West	376	0.07
44.7	East	469	0.09
44.8	East	1,465	0.28
44.9	East	1,719	0.33
45.0	East	297	0.06
45.0	East	1,430	0.27
45.1	East	2,570	0.49

Table 2.1-5

Identified Potential Brine Pits within 1 mile of the Construction Right-of-Way

Milepost	Relation to Route	Distance from Construction ROW (feet)	Distance from Construction ROW (miles)
45.4	West	2,277	0.43
45.8	West	486	0.09
45.8	West	1,599	0.30
46.0	West	355	0.07
46.0	West	1,107	0.21
46.0	West	1,263	0.24
46.1	West	2,062	0.39
46.4	West	1,936	0.37
46.4	West	2,670	0.51
46.5	West	738	0.14
46.7	West	1,400	0.27
46.7	West	512	0.10
46.9	East	232	0.04
46.9	West	1,185	0.22
47.1	West	790	0.15
47.2	East	730	0.14
47.4	East	1,211	0.23
47.6	East	2,425	0.46
47.7	West	534	0.10
48.0	West	2,239	0.42
48.4	East	1,968	0.37
48.7	West	1,870	0.35
49.8	West	466	0.09
49.8	West	1,480	0.28
49.9	West	2,610	0.49
50.0	West	638	0.12
50.0	East	1,302	0.25
50.2	East	581	0.11
50.4	West	1,046	0.20
50.5	West	1,663	0.31
50.5	West	2,620	0.50
50.6	West	2,631	0.50
51.2	East	358	0.07
51.2	East	1,611	0.31
51.2	East	2,680	0.51
51.3	West	2,172	0.41
51.4	West	1,330	0.25
51.5	East	757	0.14
51.6	East	2,176	0.41
51.8	West	1,564	0.30
51.9	East	1,357	0.26
52.1	East	1,667	0.32
54.1	West	1,532	0.29

Table 2.1-5

Identified Potential Brine Pits within 1 mile of the Construction Right-of-Way

Milepost	Relation to Route	Distance from Construction ROW (feet)	Distance from Construction ROW (miles)
54.3	West	145	0.03
54.6	West	275	0.05
54.6	West	1,593	0.30
54.7	East	1,999	0.38
55.0	West	1,701	0.32
55.0	East	1,892	0.36
55.2	West	2,123	0.40
55.9	West	2,013	0.38
55.9	West	2,242	0.42
56.3	West	1,764	0.33
56.6	East	2,149	0.41
57.5	West	1,725	0.33
59.4	East	1,391	0.26
59.6	West	2,411	0.46
60.1	West	1,375	0.26
60.1	West	2,480	0.47
60.3	West	2,605	0.49
61.1	East	2,183	0.41
65.5	East	1,291	0.24
79.8	East	2,642	0.50
126.2	East	879	0.17
138.9	East	1,000	0.19

2.1.4 Construction Impacts and Mitigation

Construction, operation, and maintenance of the Project facilities are not expected to have significant or long-term impacts on groundwater resources. Impacts will be minimized or avoided by implementation of the construction practices outlined in the FERC Plan and Procedures and as described in the mitigation measures detailed below.

Although no impacts to supply or quality are expected due to the limited depth of excavation and the short duration of open trench and typical depths to groundwater supplies, MVP will employ accepted measures and procedures to minimize potential impacts. Construction activities associated with the Project that have the potential to impact groundwater include shallow excavations, blasting for trench excavation, hydrostatic test discharges, and potential spills or leaks of contaminants from the refueling of construction vehicles or storage of fuel, oil, and other fluids. MVP has not proposed HDDs for the Project, which will reduce the potential impacts to groundwater. MVP proposes to implement construction practices designed to avoid impacts on groundwater during construction. These practices will include measures from the FERC Plan and Procedures and a Project-specific Spill Prevention, Control, and Countermeasures Plan (SPCC) Plan. During construction, the construction contractors will adhere to these general practices related to groundwater protection including:

- Enforcing restrictions on refueling locations and storage of contaminants; and

- Installation of permanent trench plugs, where needed, to maintain existing groundwater flow patterns.

Additional information on groundwater impacts and mitigation associated with construction is provided in the following sections.

2.1.4.1 Aquifer Disturbance Impacts to Groundwater Sources and Mitigation Measures during

Construction Activities

Construction activities such as trenching, dewatering, and backfilling may affect shallow aquifers and could cause minor temporary fluctuations in groundwater levels and/or increased turbidity. Impacts will be minimized or avoided by implementation of the construction practices outlined in the FERC Plan and Procedures and in this section.

Ground disturbance associated with typical pipeline construction is generally within 7-10 feet of the existing ground surface. A depth of 10 feet is above most surficial aquifers utilized as a water source and most existing wells that might be drilled in a shallow aquifer will be cased to at least 20 feet; however, construction activities such as trenching, blasting, dewatering, and backfilling may encounter shallow alluvial aquifers and could cause minor, localized fluctuations in groundwater levels and/or increased turbidity. Most alluvial aquifers exhibit rapid recharge and groundwater movement; therefore, it is likely that such aquifers would quickly re-establish equilibrium, and turbidity levels would rapidly subside.

Surficial aquifers could experience minor disturbances from changes in overland water flow and recharge caused by clearing and grading of the right-of-way. The ability of soil to absorb water can be altered through near-surface compaction by heavy construction vehicles. This minor impact would be temporary and is not expected to significantly affect groundwater resources or quality. It is noted that most groundwater use along the Project alignment taps deeper bedrock aquifers. Impacts to bedrock aquifers are not expected since construction activities are not likely to occur at a depth which would impact the bedrock aquifers in the Project area. Potential impacts would be greatest in areas of shallow aquifers, including shallow karst areas. In these areas, potential impacts would be avoided by implementing the same measures from the FERC Procedures and BMPs. MVP is also evaluating specific karst features in the vicinity of the proposed pipeline (Draper Aden Associates 2015b) and will develop site-specific measures as appropriate to further ensure that impacts to shallow groundwater will be avoided (Draper Aden Associates 2015d). Extensive field review of karst features and rock strata will be completed to gain a better understanding of groundwater flow conditions. In addition, property owners have been interviewed to obtain information regarding their water resources (e.g., high/low water flow patterns) as discussed in Draper Aden Associates 2015c. Results of the ongoing karst evaluation (Draper Aden Associates 2015b) and proposed site-specific measures (Draper Aden Associates 2015d) is contained in Resource Report 6.

Groundwater depth varies based on a number of factors including site elevation and setting, weather, season and surficial geology. Accordingly, the depth to groundwater varies along the Project route based on these conditions. Shallow groundwater along the Project alignment would generally coincide with wetland areas (see Section 2.2) and locations near springs and karst geological conditions (see Section 2.1.1.4 and Section 2.1.3.3). The excavated trench for pipeline installation would be most likely to intercept shallow groundwater in these locations. Typical installation depth is anticipated to be approximately 7-10 feet below existing grade. As described in Section 2.1.1.1, bedrock aquifers are predominant along the entire extent of the Project. Typical depths to groundwater in bedrock aquifers in higher elevation settings are 30 to 400 feet as described in Section 2.1.1.1 and Section 2.1.3.2. Therefore, in most upland portions of the route, groundwater will not be encountered during trench excavation. However, the trench will intersect the water table in some wetland and floodplain areas that are crossed. Accordingly, temporary trench dewatering is anticipated to be required in wetland areas.

Dewatering of the pipeline trench, the only activity requiring pumping of groundwater, may be necessary in areas where there is a high water table. However, pipeline construction activities within a particular location are typically completed within several days, and any lowering of localized groundwater is expected to be temporary. MVP will discharge water from trench dewatering activities into well-vegetated upland areas, or into straw bale structures if vegetation is insufficient.

Private Wells and Springs

The potential for impact to a water supply from ground disturbance associated with MVP construction would be indicated by negative effects on water quality well before, and in a more demonstrable manner than, assessment of effects to water yields. Therefore, MVP is not planning to monitor yield of wells or springs. MVP will conduct two pre-construction water quality testing events at water supplies (wells, springs, streams) where owner permission is granted to access the supply (see Draper Aden Associates 2015c). The water quality analysis will include field indicator parameters, total and fecal coliform bacteria, and major water quality analytes, along with other target analytes that may be pertinent based on the setting. MVP will attempt to sample the supplies approximately six months prior to construction in the vicinity of the supply, and re-sample within three months of construction activities. This water quality data will be provided to the water supply owner, and a copy retained by MVP for future reference. Water supply identification, characterization and pre-construction sampling are addressed in more detail in the Water Resources Identification and Testing Plan (Appendix 2-E).

MVP would not conduct post-construction water quality monitoring in addition to sampling event described above. However, if a complaint regarding water quality is lodged by the water supply owner post-construction, MVP will resample the supply(ies) within two weeks after receiving the complaint in writing and compare the post-construction and pre-construction monitoring results to identify if a notable and negative difference in water quality is observed. If it is determined that MVP construction negatively impacted the water supply, MVP will take all reasonable and responsible actions to restore, supplement and/or replace the water supply to the satisfaction of the owner, at no expense to the owner.

Karst Areas

MVP identified through desktop review, and in certain cases through civil surveying during pipeline routing, the locations of private water supplies (wells, springs, streams) and public water supplies (wells, springs, stream intakes) located within a minimum of 150 feet from the MVP Project work areas as described in Section 2.1.3. MVP has been interviewing all water supply owners that grant permission for access to their supply. MVP will document the characteristics of each supply, including the local watershed and the specific source of water (e.g., location of source, depth of well, type of pump, water treatment equipment) (see the Water Resources Identification and Testing Plan [Appendix 2-E]).

MVP will monitor the structural integrity of wells during construction and will complete daily visual inspection of stream and spring clarity and flow during construction. Daily inspection logs will be completed by MVP. Construction erosion and sediment control (E&SC) measures will be strictly followed to prevent overland flow of water and sediment toward or into a stream, spring or wellhead. If blasting is required to advance pipeline construction, additional monitoring and safeguards for structures and water supplies will be specified in the blasting plan provided in Resource Report 6. The primary mitigation measure related to construction impacts to karst terrain and associated water resources is avoidance of these features as described in Section 3.9 of the Karst Mitigation Plan (Resource Report 6). Avoidance measures include following relevant conservation standards, E&SC, and SPCC that would be prepared by MVP's construction contractor. General guidelines to be incorporated into the SPCC plan are documented in Section 3.9.4 of the Karst Mitigation Plan.

A karst-specific E&SCP would be prepared by MVP's construction contractor as described in Section 3.9.5 of the Karst Mitigation Plan. The E&SCP would include enhanced BMPs to provide additional protection in identified karst areas of concern in the Karst Hazards Assessment (Resource Report 6). The Karst Mitigation Plan (Draper Aden Associates 2015d, Resource Report 6) describes protocols for the discharge of hydrostatic test water that would avoid impacts in the area of karst terrain. Measures include controlling the rate and volume of discharge and discharge to areas downgradient of karst features to the degree feasible.

As described in the Karst Mitigation Plan, if a sinkhole cannot be reasonably avoided and ground disturbance will directly affect the feature, the sinkhole will be stabilized prior to construction in accordance with local and state guidance and recommendations provided by an on-site Karst Specialist (to be deployed by MVP during construction in karst areas). Inspection, stabilization and mitigation protocol for existing, previously unidentified or newly formed karst features are provided in the Karst Mitigation Plan.

Public Water Supplies and Source Water Protection

An initial assessment of public water resources that are located in the vicinity of the MVP alignment was made using information derived from Virginia and Waste Virginia agency water supply protection efforts. The information obtained through this effort will be combined with a direct assessment of public water resources that is currently underway. MVP is currently, either in discussions with or in the process of, contacting public water suppliers in the vicinity of the proposed alignment to gather information on the water source(s) and distribution systems. MVP will coordinate a pre-construction baseline water quality testing program with the public water suppliers, also. FERC will be provided updates as MVP completes the supplier contacts and baseline sampling program. In addition, MVP will work with various public water suppliers to discuss independent engineering studies or planning assistance for contingency and mitigation plans during construction to ensure adequate supply of water for their system users is maintained. Possible solutions could include temporary filtration installation or additional settling tank storage for temporary turbidity issues, depending on individual site assessment.

2.1.4.2 Blasting Impacts on Water Supply Wells and Mitigation Measures

Although mechanical methods of removing bedrock are preferred, blasting may be conducted as needed to excavate the pipeline trench in some areas of shallow bedrock. If blasting is required in an area near water supply wells, blasting could cause temporary changes in water level. Additionally, turbidity may affect groundwater quality in bedrock-based water well systems located in close proximity to the construction right-of-way.

MVP will implement the following measures to avoid, minimize, and mitigate potential impacts to water supply wells from blasting:

- Blasting will be conducted in a manner to minimize possible impacts on nearby water supply wells. Use of controlled blasting techniques should avoid the impacts of blasting and limit rock fracture to the immediate vicinity of detonation along the trench line, and contain impact to within the construction right-of-way.
- If blasting is conducted within 150 feet of an active water well, MVP will conduct a pre-construction evaluation of the well. The well will be sampled for water quality parameters and, if deemed necessary based on the specifics of the setting and location, yield testing may be recommended. Upon request by a landowner who had a pre-construction test, a post-construction test will be performed. Landowners will be contacted by an MVP representative and a qualified independent contractor will conduct the testing.
- MVP will evaluate, on a timely basis, landowner complaints regarding potential damage resulting from blasting to wells, homes, or outbuildings. If the damage is substantiated, MVP will negotiate a settlement with the landowner that may include repair or replacement.

2.1.4.3 Contaminated Groundwater Impacts and Mitigation Measures

Although the probability of encountering contaminated groundwater resources during construction is expected to be low, should existing contaminated groundwater be encountered it could pose health and safety concerns to construction workers and potentially elevate overall environmental risk through increased exposure. MVP's Environmental Inspectors will be trained to detect direct and indirect evidence of soil and/or groundwater contamination. If contaminated soil or groundwater is encountered during construction, MVP will notify the affected landowner and will coordinate with the appropriate federal and state agencies in accordance with applicable notification requirements.

MVP does not propose to install any segments of pipeline using HDD. Therefore no pipeline will be installed by HDD in any karst areas.

MVP will operate and maintain the Project and aboveground facilities in compliance with United States Department of Transportation (USDOT) regulations provided at 49 CFR Part 192, the FERC's regulations at 18 CFR Part 380.15, and maintenance provisions of the FERC Plan and Procedures. Typically, unless requested by a land management agency, it is MVP policy not to use herbicides or pesticides to maintain the right-of-way or any of its Project facilities. Operations and maintenance considerations for pipeline facilities are described in Resource Report 11.

2.2 SURFACE WATER RESOURCES

Surface water resources identified in the vicinity of the Project include rivers, streams, associated tributaries, ponds, lakes, and catchment basins. This section describes the surface water resources crossed by the Project and the measures proposed by MVP to mitigate potential adverse effects on those resources.

To determine the surface water resources crossed by the Project, this report relied on watershed data from USGS, delineated stream data up to and including July 31, 2015, the National Hydrography Database (NHD) maintained by USGS, and the 303(d)/305(b) reports submitted by the states to the USEPA.

Field delineations were conducted in 2015 within a 300–foot-wide pipeline survey corridor, access roads, additional temporary workspace (ATWS), contractor yards, and proposed aboveground facility work space where land access was granted.

2.2.1 Waterbody Crossings

2.2.1.1 Surface Water Basins

The United States is divided and sub-divided into successively smaller hydrologic units that are classified into four levels and HUC: regions (HUC 2), sub-regions (HUC 4), basins (HUC 6), and sub-basins (HUC 8). Sub-basins are further divided into watersheds (HUC 10). The Project is located in three major regions, the Ohio River, the Mid-Atlantic and the South Atlantic-Gulf. The Project will cross nine sub-basins and 23 watersheds in the Ohio River Basin, one sub-basin and one watershed in the Mid-Atlantic Region, and two sub-basins and eight watersheds in the South Atlantic-Gulf Basin. Table 2.2-1 identifies these major regions and their respective sub-basins by 8-digit HUC and watershed by 10-digit HUC. Appendix 2-A Table 2-A-1 is a comprehensive list of watersheds crossed by milepost.

Table 2.2-1

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)	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
	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

Table 2.2-1

Watersheds Crossed by the MVP Project

Major Region (2-digit HUC)	Sub-basin (8-digit HUC)	Watershed (10-digit HUC)	County
Virginia			
Ohio Region (05)	Middle New (05050002)	Sinking Creek-New River (0505000203)	Craig, Giles, Montgomery
Mid-Atlantic Region (02)	Upper James (02080201)	Upper Craig Creek (0208020110)	Montgomery
Ohio Region (05)	Middle New (05050002)	East River-New River (0505000206)	Giles
	Upper Roanoke (03010101)	North Fork Roanoke River (0301010102)	Montgomery
	Upper Roanoke (03010101)	Mason Creek-Roanoke River (0301010103)	Montgomery, Roanoke
South Atlantic-Gulf Region (03)	Upper Roanoke (03010101)	South Fork Roanoke River (0301010101)	Montgomery, Roanoke
	Banister (03010105)	Upper Blackwater River (0301010105)	Franklin, Roanoke
	Banister (03010105)	Lower Blackwater River (0301010106)	Franklin
	Banister (03010105)	Upper Pigg River (0301010108)	Franklin
	Banister (03010105)	Lower Pigg River (0301010110)	Franklin, Pittsylvania
	Banister (03010105)	Stinking River-Banister River (0301010502)	Pittsylvania
	Banister (03010105)	Cherrystone Creek-Banister River (0301010501)	Pittsylvania

2.2.1.2 Flood Zones

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 Table 2.2-2. Flood zones are shown in Figure 2-C-5 in Appendix 2-C.

Table 2.2-2

FEMA-100 year Flood Zones crossed by the MVP Project

State/County	Floodplain Waterbody	Flood Zone	Milepost	Length Crossed (feet)
West Virginia				
Wetzel	North Fork Fishing Creek	A	0.7	931
Wetzel	Price Run	A	5.0	1,284
Harrison	Little Tenmile Creek	AE	15.5	310
Harrison	Rockcamp Run	A	18.8	217
Harrison	Indian Run	A	23.1	171
Harrison	Salem Fork	A	26.0	434
Doddridge	Laurel Run	AE	34.9	200
Lewis	Right Fork Freemans Creek	A	42.7	269
Lewis	Left Fork Freemans Creek	A	46.0	665
Lewis	Sand Fork	A	55.2	484
Lewis	Indian Fork	A	58.6	364

Table 2.2-2

FEMA-100 year Flood Zones crossed by the MVP Project

State/County	Floodplain Waterbody	Flood Zone	Milepost	Length Crossed (feet)
Lewis	Oil Creek	A	62.3	334
Braxton	Falls Run	A	72.6	545
Braxton	Little Kanawha River	A	75.0	1,610
Webster	Left Fork Holly River	A	81.7	486
Webster	Oldlick Creek	A	82.4	1,138
Webster	Right Fork Holly River	A	84.1	419
Webster	Elk River	A	87.4	881
Webster	Camp Creek	A	93.1	1,565
Webster	Amos Run	A	97.7	875
Webster	Lost Run	AE	98.7	255
Webster	Laurel Creek	AE	98.9	454
Webster	Strouds Creek	AE	109.9	517
Nicholas	Big Beaver Creek a/	A	114.0	473
Nicholas	Big Beaver Creek a/	A	115.8	233
Nicholas	Gauley River	A	118.6	804
Nicholas	Hominy Creek	A	126.5	512
Greenbrier	Meadow Creek a/	A	140.1	97
Greenbrier	Meadow River a/	AE	143.7	333
Greenbrier	Little Sewell Creek	A	146.7	252
Greenbrier	Buffalo Creek	A	154.5	320
Greenbrier	Morris Fork	A	155.4	277
Summers	Hungard Creek	A	169.8	326
Summers	Greenbrier River	AE	170.4	3682
Summers	Kelly Creek	AE	171.8	344
Monroe	Indian Creek	A	181.9	223
Monroe	Hans Creek	A	186.7	515
Monroe	Dry Creek	A	191.1	659
Virginia				
Giles	Stony Creek	AE	199.4	729
Giles	Little Stony Creek	AE	203.3	313
Giles	Sinking Creek	AE	209.9	166
Giles	Greenbrier Branch	AE	211.6	87
Montgomery	Craig Creek a/	AE	218.1	1,962
Montgomery	Craig Creek a/	AE	218.6	440
Montgomery	Mill Creek	A	223.9	823
Montgomery	North Fork Roanoke River a/	AE	225.2	1,135
Montgomery	North Fork Roanoke River a/	AE	225.5	121
Montgomery	North Fork Roanoke River a/	AE	225.6	232
Montgomery	North Fork Roanoke River a/	AE	225.7	857
Montgomery	Bradshaw Creek	AE	229.2	754
Montgomery	Roanoke River	AE	233.6	2,892
Franklin	Little Creek	AE	260.8	1,684
Franklin	Blackwater River a/	AE	262.2	400

Table 2.2-2

FEMA-100 year Flood Zones crossed by the MVP Project

State/County	Floodplain Waterbody	Flood Zone	Milepost	Length Crossed (feet)
Franklin	Blackwater River a/	AE	262.4	800
Franklin	Blackwater River a/	AE	262.5	284
Franklin	Blackwater River a/	AE	262.8	1,396
Franklin	Maggodee Creek	A	266.6	333
Franklin	Blackwater River	A	266.9	408
Pittsylvania	Jonnikin Creek	A	281.6	166
Pittsylvania	Jonnikin Creek	A	281.9	57
Pittsylvania	Rocky Creek	A	284.3	259
Pittsylvania	Pigg River	AE	286.3	803
Pittsylvania	Harpen Creek a/	A	287.1	579
Pittsylvania	Harpen Creek a/	A	287.7	334
Pittsylvania	Harpen Creek a/	A	289.2	357
Pittsylvania	Cherrystone Creek	A	291.4	365
Pittsylvania	Cherrystone Creek	A	292.4	448
Pittsylvania	Pole Bridge Branch	AE	293.7	584
Pittsylvania	Little Cherrystone Creek	A	298.6	353
Pittsylvania	Little Cherrystone Creek	A	299.1	2,932
Pittsylvania	Little Cherrystone Creek	A	300.2	262
Pittsylvania	Little Cherrystone Creek	A	300.3	717

Source: FEMA 2015.

Flood Zone A = Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies.

Flood Zone AE = Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods.

a/ Pipeline crosses floodplain multiple times

If applicable, MVP will acquire permits to perform construction within FEMA flood zones. MVP will restore pipeline facility workspaces as closely as practicable to pre-construction contours, including the areas within FEMA flood zones. Restoration of pre-construction contours will preserve the existing condition of the FEMA flood zones and preclude the Project pipeline facilities from having adverse effects on flood storage capacity. There are 4 mainline block valves (MLVs) and 2 new permanent access roads located within the 100-year flood zone. Each MLV will consist of approximately 0.06 acres for a total displacement of 0.23 acre at MPs 15.49, 34.97, 93.17, and 262.41. The two new permanent access roads, located at MPs 15.5 and 93.1, will displace 0.61 and 0.2 acres, respectively. Temporary access roads located within floodplains will affect flood storage minimally in the short-term but will be restored after construction unless requested to be maintained by the landowner or agency. There are some aboveground facilities such as interconnects and compressor stations that are located in the moderate flood hazard areas, which are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood. The Project will comply with 10 CFR 1022 with no significant loss of flood storage as above ground facilities will displace approximately 1 acres within 100-year flood zones, therefore a floodplain assessment is not necessary. Details on impacts to wetlands are discussed in Section 2.3.

2.2.1.3 Pipeline Crossings

The following waterbody information is based on waterbodies included within the NHD dataset and surveyed field data collected where survey access has been obtained through July 31, 2015. A total of 136 waterbodies would be crossed by the pipeline, with 799 waterbodies impacted by construction and operational footprint for all project facilities including the pipeline right-of-way, ATWS, aboveground facilities, and contractor yards and access roads. Appendix 2-A and Table 2-A-2 list waterbodies crossed using NHD and survey field data. Appendix 2-C Figure 2-C-1, displays waterbodies crossed by the Project.

USEPA and United States Army Corps of Engineers (USACE) published in the Federal Register on June 29, 2015 The Clean Water Rule: Definition of "Waters of the United States" and the rule originally became effective on August 28, 2015. (Federal register Vol. 80, No. 124, June 29, 2015, pp 37054-37127). The Clean Water Rule only protects waters that have historically been covered by the Clean Water Act and more clearly defines waters protected under the Clean Water Act (CWA): a tributary or headwater must show physical features of flowing water including a bed, bank, and ordinary high water mark. It does not apply to rills, gullies, erosional features, or ditch not constructed in streams that only flow when it rains. The Clean Water Rule does not create any new permitting requirements. However, on October 9, 2015 the United States Court of Appeals for the Sixth Circuit issued a stay against enforcement under the Clean Water Rule. MVP will continue to coordinate with the USACE to determine application requirements, or other requests, to ensure the Project is in compliance with legislation as it develops.

A separate wetland delineation report identifying Waters of the United States and wetlands will be completed for submittal to the USACE for permitting requirements. The steam identification and wetland delineation report will be provided to FERC after submittal to the USACE. Table 2.2-3 is a summary of waterbodies crossed by the Project, including all temporary work spaces and permanent facilities.

Table 2.2-3

Summary of Waterbodies Affected by the MVP Project a/

State	Flow	Area Affected (Acres)
West Virginia	Artificial Path	0.08
	Ephemeral	2.39
	Intermittent	3.26
	Perennial	14.50
	NR	0.25
	West Virginia Total	**20.49**
Virginia	Artificial Path	0.66
	Dry ditch	0.23
	Ephemeral	0.75
	Intermittent	3.97
	Perennial	5.02
	NR	0.01
	Virginia Total	**10.65**
	Grand Total	**31.14**

a/ Based on data from field delineation where access has been obtained to the pipeline corridor, and NHD data elsewhere. Sum of acres is for all project facilities.

MVP proposes to cross intermediate waterbodies (between 10 and 100 feet wide at water's edge) and minor waterbodies (less than 10 feet wide at water's edge) by the open-cut method where a dry-ditch method is not specifically required by the FERC Procedures. Crossings of minor perennial and intermittent streams will be accomplished in accordance with FERC's Procedures and variances requested by MVP, if approved. MVP will also develop and implement its own Project-specific Erosion and Sediment Control Plan (E&SCP) that will outline BMPs to minimize impacts on various resources, including waterbodies. Major waterbodies (over 100 feet wide at water's edge) will be assessed on a case by case basis to determine the best crossing method and site specific construction and restoration plans. Table 2.2-4 is a summary of the number of FERC classification of waterbodies crossed by the Project. Table 2.2-5 is a list of intermediate and major waterbodies crossed by the Project and proposed crossing method. The Project will cross three major waterbodies (crossings greater than 100 feet): Little Kanawha River (MP 75.0), Left Fork Holly River (MP81.7), and Gauley River (118.6). Site-specific construction mitigation and restoration plans for the major waterbody crossings are included in Appendix 1-C of Resource Report 1.

Table 2.2-4

Summary of FERC Classification of Waterbody Crossings by the MVP Project a/

State	Minor	Intermediate	Major	Total
West Virginia	536	160	2	**698**
Virginia	232	108	1	**341**
Total	**768**	**268**	**3**	**1,039**

a/ Based on data from field delineation where access has been obtained to the pipeline corridor, and NHD data elsewhere. Waterbodies may be crossed multiple times.

Table 2.2-5

Intermediate and Major Waterbodies Crossed by the MVP Project a/

State/County	Waterbody Name	Milepost	Waterbody Width (feet)	Crossing Method	Length of Crossing (feet)
West Virginia					
Wetzel	Price Run	5.1	35	Open Cut Dry Ditch	41
Wetzel	UNT/Price Run	5.1	12	Open Cut Dry Ditch	8
Wetzel	Sams Run	8.0	14	Open Cut Dry Ditch	14
Wetzel	Manion Run	8.9	10	Open Cut Dry Ditch	10
Harrison	Little Tenmile Creek	15.5	30	Open Cut Dry Ditch	70
Harrison	Salem Fork	26.0	25	Open Cut Dry Ditch	25
Doddridge	Laurel Run	35.0	14	Open Cut Dry Ditch	9
Lewis	Right Fork Freemans Creek	42.7	25	Open Cut Dry Ditch	25
Lewis	Fink Creek	44.8	15	Open Cut Dry Ditch	15
Lewis	Left Fork Freemans Creek	46.0	12	Open Cut Dry Ditch	13
Lewis	UNT/Left Fork Freemans Creek	46.8	13	Open Cut Dry Ditch	14
Lewis	Sand Fork	55.2	20	Open Cut Dry Ditch	20
Lewis	Indian Fork	58.6	22	Open Cut Dry Ditch	26

Table 2.2-5

Intermediate and Major Waterbodies Crossed by the MVP Project a/

State/County	Waterbody Name	Milepost	Waterbody Width (feet)	Crossing Method	Length of Crossing (feet)
Lewis	Sugarcamp Run	59.5	15	Open Cut Dry Ditch	15
Lewis	UNT/Indian Fork	60.0	15	Open Cut Dry Ditch	18
Lewis	Oil Creek	62.3	10	Open Cut Dry Ditch	10
Lewis	Clover Fork	65.6	10	Open Cut Dry Ditch	12
Braxton	Barbecue Run	67.5	20	Open Cut Dry Ditch	24
Braxton	Left Fork Knawl Creek	68.8	30	Open Cut Dry Ditch	31
Braxton	Keith Run	71.8	14	Open Cut Dry Ditch	14
Braxton	Falls Run	72.6	60	Open Cut Dry Ditch	61
Braxton	Little Kanawha River	75.0	50	Open Cut Dry Ditch	114
Braxton	Stonecoal Run	76.8	15	Open Cut Dry Ditch	16
Braxton	UNT/Laurel Run	77.7	15	Open Cut Dry Ditch	15
Braxton	Mudlick Run	79.8	30	Open Cut Dry Ditch	30
Webster	UNT/Left Fork Holly River	80.8	12	Open Cut Dry Ditch	13
Webster	Left Fork Holly River	81.7	100	Open Cut Dry Ditch	151
Webster	Oldlick Creek	82.4	20	Open Cut Dry Ditch	45
Webster	UNT/Oldlick Creek	82.7	10	Open Cut Dry Ditch	14
Webster	Right Fork Holly River	84.2	85	Open Cut Dry Ditch	92
Webster	Cow Run	87.6	12	Open Cut Dry Ditch	13
Webster	Houston Run	90.7	30	Open Cut Dry Ditch	23
Webster	UNT/Camp Creek	92.5	25	Open Cut Dry Ditch	25
Webster	Lower Laurel Fork	93.1	14	Open Cut Dry Ditch	15
Webster	Camp Creek	93.2	15	Open Cut Dry Ditch	9
Webster	Amos Run	97.7	30	Open Cut Dry Ditch	23
Webster	Lost Run	98.7	20	Open Cut Dry Ditch	26
Webster	Laurel Creek	98.9	55	Open Cut Dry Ditch	52
Webster	UNT/Birch River	104.7	20	Open Cut Dry Ditch	24
Webster	Strouds Creek	109.9	30	Open Cut Dry Ditch	31
Nicholas	Barn Run	111.0	10	Open Cut Dry Ditch	11
Nicholas	Big Beaver Creek	114.0	35	Open Cut Dry Ditch	66
Nicholas	UNT/Big Beaver Creek	115.1	25	Open Cut Dry Ditch	29
Nicholas	Big Beaver Creek	115.8	60	Open Cut Dry Ditch	91
Nicholas	UNT/Granny Run	116.4	12	Open Cut Dry Ditch	12
Nicholas	UNT/Big Run	117.0	10	Open Cut Dry Ditch	11
Nicholas	UNT/Gauley River	118.1	10	Open Cut Dry Ditch	10
Nicholas	Gauley River	118.6	100	Open Cut Wet Ditch	290
Nicholas	UNT/Little Laurel Creek	119.9	10	Open Cut Dry Ditch	20
Nicholas	Jims Creek	123.1	20	Open Cut Dry Ditch	13

Table 2.2-5

Intermediate and Major Waterbodies Crossed by the MVP Project a/

State/County	Waterbody Name	Milepost	Waterbody Width (feet)	Crossing Method	Length of Crossing (feet)
Nicholas	Hominy Creek	126.5	55	Open Cut Dry Ditch	89
Nicholas	UNT/Hominy Creek	128.0	10	Open Cut Dry Ditch	11
Nicholas	Sugar Branch	130.1	40	Open Cut Dry Ditch	50
Nicholas	UNT/Hominy Creek	132.0	12	Open Cut Dry Ditch	28
Greenbrier	Meadow Creek	140.1	30	Open Cut Dry Ditch	265
Greenbrier	Meadow River	143.7	50	Open Cut Dry Ditch	85
Greenbrier	Buffalo Creek	154.6	25	Open Cut Dry Ditch	21
Greenbrier	UNT/Buffalo Creek	154.9	10	Open Cut Dry Ditch	11
Greenbrier	UNT/Meadow River	156.4	12	Open Cut Dry Ditch	21
Summers	UNT/Lick Creek	161.4	15	Open Cut Dry Ditch	17
Summers	Lick Creek	162.6	15	Open Cut Dry Ditch	16
Summers	Hungard Creek	169.8	20	Open Cut Dry Ditch	20
Summers	UNT/Greenbriar River	171.1	10	Open Cut Dry Ditch	10
Summers	Kelly Creek	171.8	20	Open Cut Dry Ditch	20
Summers	UNT/Keller Creek	173.0	10	Open Cut Dry Ditch	12
Monroe	Wind Creek	175.9	20	Open Cut Dry Ditch	43
Monroe	UNT/Stony Creek	176.6	25	Open Cut Dry Ditch	16
Monroe	UNT/Slate Run	181.4	10	Open Cut Dry Ditch	10
Monroe	Slate Run	181.6	18	Open Cut Dry Ditch	21
Monroe	Indian Creek	181.9	65	Open Cut Dry Ditch	69
Monroe	Hans Creek	186.7	16	Open Cut Dry Ditch	16
Monroe	UNT/Blue Lick Creek	187.9	12	Open Cut Dry Ditch	12
Virginia					
Giles	Kimballton Branch	198.0	15	Open Cut Dry Ditch	22
Giles	Stony Creek	199.4	40	Open Cut Dry Ditch	47
Giles	UNT/Little Stony Creek	202.5	25	Open Cut Dry Ditch	37
Giles	Little Stony Creek	203.4	25	Open Cut Dry Ditch	26
Giles	UNT/Doe Creek	204.8	16	Open Cut Dry Ditch	15
Giles	Doe Creek	205.6	25	Open Cut Dry Ditch	23
Giles	UNT/Doe Creek	205.6	10	Open Cut Dry Ditch	20
Giles	UNT/Sinking Creek	206.1	25	Open Cut Dry Ditch	60
Giles	Sinking Creek	209.9	25	Open Cut Dry Ditch	25
Giles	UNT/Sinking Creek	213.0	10	Open Cut Dry Ditch	15
Montgomery	UNT/Craig Creek	218.3	12	Open Cut Dry Ditch	12
Montgomery	Craig Creek	218.5	12	Open Cut Dry Ditch	23
Montgomery	UNT/Mill Creek	220.1	10	Open Cut Dry Ditch	10
Montgomery	Mill Creek	223.9	25	Open Cut Dry Ditch	13

Table 2.2-5 Intermediate and Major Waterbodies Crossed by the MVP Project a/					
State/County	**Waterbody Name**	**Milepost**	**Waterbody Width (feet)**	**Crossing Method**	**Length of Crossing (feet)**
Montgomery	North Fork Roanoke River	225.8	20	Open Cut Dry Ditch	35
Montgomery	UNT/Flatwoods Branch	227.7	15	Open Cut Dry Ditch	39
Montgomery	Bradshaw Creek	229.2	25	Open Cut Dry Ditch	25
Montgomery	Roanoke River	233.8	45	Open Cut Dry Ditch	47
Montgomery	UNT/Roanoke River	234.0	14	Open Cut Dry Ditch	14
Roanoke	UNT/Bottom Creek	238.8	14	Open Cut Dry Ditch	15
Roanoke	Mill Creek	243.0	10	Open Cut Dry Ditch	10
Franklin	UNT/Green Creek	244.8	10	Open Cut Dry Ditch	11
Franklin	UNT/North Fork Blackwater River	246.9	10	Open Cut Dry Ditch	10
Franklin	North Fork Blackwater River	247.3	18	Open Cut Dry Ditch	25
Franklin	UNT/North Fork Blackwater River	248.6	20	Open Cut Dry Ditch	22
Franklin	UNT/Little Creek	253.9	15	Open Cut Dry Ditch	15
Franklin	UNT/Teels Creek	256.1	12	Open Cut Dry Ditch	13
Franklin	Teels Creek	259.3	50	Open Cut Dry Ditch	36
Franklin	UNT/Teels Creek	259.6	15	Open Cut Dry Ditch	9
Franklin	Little Creek	260.8	60	Open Cut Dry Ditch	62
Franklin	UNT/Blackwater River	264.5	20	Open Cut Dry Ditch	24
Franklin	UNT/Maggodee Creek	266.1	30	Open Cut Dry Ditch	22
Franklin	Blackwater River	262.8	70	Open Cut Wet Ditch	75
Franklin	Maggodee Creek	266.6	40	Open Cut Dry Ditch	36
Franklin	Blackwater River	266.9	70	Open Cut Wet Ditch	88
Franklin	UNT/Blackwater River	267.7	15	Open Cut Dry Ditch	19
Franklin	UNT/Foul Ground Creek	268.6	15	Open Cut Dry Ditch	15
Franklin	Foul Ground Creek	269.6	12	Open Cut Dry Ditch	23
Franklin	UNT/Poplar Camp Creek	271.4	12	Open Cut Dry Ditch	12
Franklin	Poplar Camp Creek	271.6	10	Open Cut Dry Ditch	11
Franklin	UNT/Blackwater River	273.7	12	Open Cut Dry Ditch	13
Franklin	UNT/Jacks Creek	276.0	15	Open Cut Dry Ditch	22
Franklin	UNT/Little Jacks Creek	277.2	10	Open Cut Dry Ditch	46
Franklin	Owens Creek	279.4	15	Open Cut Dry Ditch	4
Franklin	Strawfield Creek	279.5	30	Open Cut Dry Ditch	30
Pittsylvania	UNT/Jonnikin Creek	281.6	10	Open Cut Dry Ditch	10
Pittsylvania	Jonnikin Creek	282.0	18	Open Cut Dry Ditch	18
Pittsylvania	UNT/Rocky Creek	284.3	20	Open Cut Dry Ditch	20
Pittsylvania	Pigg River	286.3	100	Open Cut Wet Ditch	83
Pittsylvania	UNT/Rocky Creek	286.7	15	Open Cut Dry Ditch	18
Pittsylvania	Harpen Creek	289.2	30	Open Cut Dry Ditch	33

Table 2.2-5 Intermediate and Major Waterbodies Crossed by the MVP Project a/					
State/County	**Waterbody Name**	**Milepost**	**Waterbody Width (feet)**	**Crossing Method**	**Length of Crossing (feet)**
Pittsylvania	UNT/Harpen Creek	289.6	11	Open Cut Dry Ditch	11
Pittsylvania	UNT/Cherrystone Creek	292.0	12	Open Cut Dry Ditch	7
Pittsylvania	Cherrystone Creek	292.4	15	Open Cut Dry Ditch	16
Pittsylvania	UNT/Pole Bridge Branch	293.8	25	Open Cut Dry Ditch	18
Pittsylvania	UNT/Little Cherrystone Creek	298.6	12	Open Cut Dry Ditch	14
a/ Based on data from field delineation where access has been obtained to the pipeline corridor, and aerial photo interpretation elsewhere.					

2.2.1.4 Waterbody Crossing Methods

Construction methods at waterbody crossings will vary with the characteristics of the waterbody encountered and will be performed consistent with permit conditions outlined in the regulatory permit approvals. MVP will follow FERC's Procedures and its E&SCP to limit water quality and aquatic resource impacts during and following construction. The crossing method planned for each waterbody crossed by the proposed pipeline route is listed in Table 2-A-2 in Appendix 2-A. The crossing methods are designed to maintain water flow and minimize changes in waterbody flow characteristics. All in-stream work will be conducted during low-flow periods as much as possible, coordinated in the field during construction. MVP will coordinate with the appropriate local, state, and federal resource agencies during the permitting process. Typical drawings for the waterbody crossings are provided in Resource Report 1. Waterbody crossing methods are described in detail in Resource Report 1. The main types of waterbody crossing methods are described as follows:

Dam and Pump Crossing Method: Temporary dams, typically constructed using sandbags and plastic sheeting, are installed upstream and downstream. Following dam installation, pumps are used to dewater and transport the stream flow around the construction work area and trench. This is a dry-ditch method.

Flume Crossing Method: The flow of water is temporarily directed through one or more flume pipes placed over the area to be excavated. This method allows excavation of the pipe trench across the waterbody completely underneath the flume pipes without disruption of water flow in the stream. Stream flow is diverted through the flumes by constructing two bulkheads, using sand bags or plastic dams, to direct the stream flow through the flume pipes. This is a dry-ditch method.

Horizontal Bore Crossing Method: Waterbodies directly associated with or immediately adjacent to railroads or major roadways may be crossed using a horizontal boring machine as part of railroad or road crossing. This method entails excavation of two pits, one on each side of the waterbody and feature to be crossed. The boring machine is lowered into one pit and then a horizontal hole is bored for the length of crossing. The pipeline section is pushed through the bore hole.

HDD method: This method allows for trenchless construction across an area by pre-drilling a hole well below the depth of a conventional pipeline lay and then pulling the pipeline through the pre-drilled borehole.

Because of the minimal environmental impact of HDD, this method has been investigated for crossing major and sensitive waterbodies, where practicable. MVP does not propose to cross any waterbodies, or install any segments of the pipeline, using HDD. This is primarily due to the lack of suitable topography. A summary of HDD feasibility for the crossing of the Greenbrier River, Leading Creek, Little Kanawha River, Elk River, and Pigg River is below.

Greenbrier River: HDD is not a feasible crossing method at the proposed crossing location of the Greenbrier River. The current alignment has approximately 390 feet on the northerly side of the river and approximately 810 feet on the southerly side of the river before it makes relatively sharp changes in direction. These changes in alignment direction do not allow for adequate pull-back area and the related required workspace. Therefore, MVP has determined that crossing the Greenbrier River using HDD is not a feasible option.

Leading Creek: HDD is not a feasible crossing method within the current alignment at Leading Creek. The 370-foot straight section between the points of intersection is not long enough for an HDD with an elevation change of 40-foot. The existing slopes on either side of the creek exceed 16°to 18°. Due to these steep slopes, the drill would not exit to the surface within the limits identified for the pipeline alignment.

Little Kanawha River: HDD is not a feasible crossing method within the current alignment for Little Kanawha River. The 490-foot straight section between the points of intersection is not long enough for an HDD with an elevation change of 95 feet. MVP based the analysis on an allowable bend radius of 2,500 feet and an entry and exit angle of 12° and 6° respectively. Based on the above, this HDD would require a lineal length of over 4,170 feet to reach the desired depth of 25 feet beneath the river, which is too long to fit the topography.

Elk River: HDD is not feasible crossing method within the current alignment for Elk River. The 490-foot long straight section between the points of intersection is not long enough to accommodate an HDD with an elevation change of 46 feet. MVP based the analysis on a bend radius of 2,500 feet and an entry/exit angle of 12° and 6°, respectively. Based on the above, this HDD would require a lineal length of over 4,250 feet to reach the desired depth of 25 feet beneath the river, which is too long to fit the topography.

Pigg River: HDD is not feasible crossing method within the current alignment for the Pigg River. The 710-foot long straight section between the points of intersection is not long enough to accommodate an HDD with an elevation change of 136 feet. MVP based the analysis on a bend radius of 2,500 feet and an entry/exit angle of 12° and 6° respectively. Based on the above, this HDD would require a lineal length of over 2,175 feet to reach the 25-foot desired depth beneath the river, which is too long to fit the topography.

A primary advantage to using HDD is that it avoids disturbance of the streambed, stream banks, and upland in the immediate vicinity of the crossing. Hence, the need for re-contouring approaches and stream banks is avoided, as are the challenges of re-establishing vegetation adjacent to these features. One disadvantage of the HDD method is the possibility of an inadvertent return, when the pressurized drilling mud in the borehole finds a fracture or weak area and the drilling fluids discharge into the waterbody and other areas. Another disadvantage is the amount of required workspace for HDD is much larger than other crossing methods, creating a greater amount of land disturbance. A typical drawing of a directional drill of a waterbody is included in Resource Report 1.

Direct Pipe ©: Direct Pipe © is a trenchless installation method that combines features of HDD and utilizes a Microtunnel Boring Machine connected to the leading edge of an assembled length of pipe and a pipe thruster to jack the pipeline into place, similar to, but in the opposite direction of HDD pullback operations. As with microtunneling, the slurry collection/recycling system and pressure control features at the excavation face minimize the potential for drilling fluid loss. MVP is not proposing any Direct Pipe © or Microtunneling on the Project; however, more information on this method is provided in Resource Report 1.

Open-Cut Crossing Method: An open-cut waterbody crossing is conducted using methods similar to conventional upland open-cut trenching. The pipeline trench is excavated across the waterbody, followed by installation of a prefabricated segment of pipeline, and backfilling of the trench with native material. Stream flow is not isolated from the construction activities, and upland methods are used for crossing of the waterbody when it is temporarily dry or frozen and not flowing. If there is perceptible flow, the open-cut crossing method may be used on minor or intermediate waterbodies with restrictions in timing of in-stream construction activities, limiting use of equipment within the waterbody or use of an equipment bridge as per the FERC Procedures.

For all crossings, MVP will follow the FERC Procedures and MVP's E&SCP, as well as BMPs to limit water quality and aquatic resource impacts during and following construction across all waterbodies. Federal, State, and local (where applicable) permitting erosion and sediment control requirements will be followed.

Cleanup and Restoration

Cleanup and restoration commence as soon as practicable following completion of backfilling and testing. A detailed discussion is presented in Resource Report 1. These activities include replacing grade cuts to original contours, seeding, fertilizing, and mulching to restore ground cover and minimize erosion. Temporary workspaces are stabilized for their natural reversion toward their previous state.

Completed stream crossings using the flume or dam and pump methods will be stabilized before returning flow to the channel. Areas disturbed will be restored to pre-construction or better conditions. Original streambed and bank contours will be re-established for surface water and groundwater flow, and mulch, jute thatching, or bonded fiber blankets will be installed on the stream banks, which are preferential to plastic erosion control blankets because they reduce wildlife entrapment and are biodegradable. Where the flume technique is used, stream banks will be stabilized before removing the flume pipes and returning flow to the waterbody channel.

Seeding of disturbed stream approaches will be completed in accordance with FERC's Procedures after final grading, weather and soil conditions permitting. Other Federal and State permit seeding requirements as well as Wildlife Habitat Council recommendations will be considered where applicable. MVP is committed to increase conservation and biodiversity in the region by using native grasses and wildflowers. Where necessary, slope breakers will be installed adjacent to stream banks to minimize the potential for erosion. Sediment barriers, such as silt fence and/or straw bales will be maintained across the right-of-way until permanent vegetation is established. Temporary equipment bridges will be removed following construction.

2.2.2 Sensitive Waterbodies

Sensitive surface waters include the following:

- Outstanding or exceptional quality waterbodies;
- Waterbodies that contain threatened or endangered species, or critical habitat;
- Waterbodies located in sensitive and protected watershed areas;
- Waterbodies that are crossed less than 3 miles upstream of potable water intake structures;
- Waters that do not meet the water quality standards associated with their designated beneficial uses;
- Rivers on or designated to be added to the Nationwide Rivers Inventory (NRI) or a State River Inventory;
- Waters that have been designated for intensified water quality management and improvement; and
- Waters that support fisheries of special concern (including trout streams).

Several waterbodies crossed by the Project possess one or more of the above characteristics of sensitive surface waters. The following sections discuss these sensitive waterbodies.

Measures to minimize impacts on sensitive waterbodies are discussed in more detail in Resource Report 3. MVP attempted to avoid or minimize impact on sensitive waterbodies during pipeline siting as discussed in the alternatives analysis in Resource Report 10. For example one reason that MVP chose the preferred route over Route Alternative 1 (see Resource Report 10) is that Route Alternative 1 would cross the New River twice, while the proposed route avoids crossing the New River. MVP will follow the BMPs outline in the FERC Plan and Procedures that by design, include more protection for sensitive waterbodies. Where impact on sensitive waterbodies cannot be avoided due to the linear nature of the pipeline, and if measures beyond those required by the FERC's Procedures are required as a result of state permitting, MVP will develop additional mitigation measures during state permitting. In accordance with the FERC Procedures, MVP will prepare site-specific crossing plans for the three waterbodies that are greater than 100 feet. Detailed, site-specific construction mitigation and restoration plans for each crossing greater than 100 feet are provided in Resource Report 1.

2.2.2.1 National or State Wild and Scenic Rivers

MVP reviewed rivers that are included on the NRI and those that may be designated as wild and scenic. The different sources viewed include the NRI (NPS 2009), the National Wild and Scenic River System (National Wild and Scenic Rivers (System 2015), and The Wild and Scenic Rivers Act (16 USC 1271-1287).

The NRI is a listing of more than 3,400 free-flowing river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values considered to be of more than local or regional significance (NPS 2009). The National Park Service (NPS) maintains the NRI as a list of river segments that potentially qualify as national wild, scenic, or recreational river areas. All federal agencies must seek to avoid or mitigate actions that would adversely affect any NRI segments. Table 2.2-6 lists four rivers identified in the NRI database the Project is proposed to cross (NPS 2009).

Table 2.2-6

NRI Crossed by the MVP Project

State/ County	MP	Stream Name	Eligibility Value	Description
West Virginia				
Webster	81.7	Left Fork Holly River	S	Scenic - Diverse juxtaposition and combination of land, water and vegetation elements.)
Webster	87.4	Elk River	O	Hydrologic - One of the longest, relatively free-flowing rivers in this section and province
Summers	170.6	Greenbrier River	S, R, G, F, H	Mainstem of the Greenbrier providing flat and whitewater boating and excellent warmwater fishing. Generally accessible, with several towns and significant residential and seasonal home development, and paralleled by CSX Railroad.
Virginia				
Montgomery	218.2	Craig	R, G, H, C	Historic- Segment includes the Phoenix Bridge crossing, a National Historic Register Site in the vicinity of Eagle Rock. The bridge was built in 1887 and is a notable example of pre-fabricated bridges by one of the most important manufacturers, the Phoenix Bridge Company. Recreation- Segment is recognized as a clean, clear, free-flowing mountain stream in close proximity to the large public land holdings of the Jefferson National Forest and the City of Roanoke. Cultural - Segment corridor includes Mulberry Bottom, a locally significant historic dwelling dating from 1786. Geologic-Segment includes a classic example of an anticline, an arch of stratified rock in which layers bend downward in opposite directions from the crest.

Source : NPS 2009
Eligibility Values:
S – Scenery; R – Recreation; G – Geology; F – Fish; W – Wildlife; P – Prehistory; H – History; C – Cultural;
O – Other (including, but not limited to, hydrology, paleontology and botany resources)

The National Wild and Scenic River System was created by Congress in 1968 to preserve certain rivers with outstanding natural, cultural and recreational values in a free-flowing condition. Rivers are designated as wild, scenic or recreational. The Project does not cross federally designated wild and scenic rivers according to the National Wild and Scenic River System (National Wild and Scenic Rivers System 2015).

Virginia Department of Conservation and Recreation (VDCR) administers the Virginia Scenic River program to identify, designate and help protect rivers and streams that possess outstanding scenic, recreational, historic and natural characteristics of statewide significance for future generations. In addition to existing designated state scenic rivers, other river segments have been deemed qualified or worthy of further study. Although no designated segments are crossed by the Project, VDCR lists two waterbodies qualified for designation and three waterbodies considered worthy of designation that are crossed by the Project (VDCR 2014). Table 2.2-7 lists the five waterbodies crossed that are qualified and worthy of scenic designation.

Table 2.2-7 Significant Rivers Crossed by the MVP Project in Virginia			
County	**MP**	**Stream Name**	**Eligibility Status**
Giles	203.2	Little Stoney Creek	Worthy
Giles	210.0	Sinking Creek	Worthy
Montgomery	218.2	Craig Creek	Potential
Montgomery	233.8	Roanoke River	Qualifier
Franklin	266.9	Blackwater River	Qualifier
Pittsylvania	286.3	Pigg River	Worthy
Source: VDCR 2014			

2.2.2.2 State-Designated Use and Exceptional Waters

West Virginia and Virginia classify surface waters to evaluate water quality. Each system includes a "designation use" that describes the potential or realized capacity of a waterbody to provide defined ecological benefits and recreational values for residents and visitors. A summary of the use designation system for each state is provided below. State water classifications for waterbodies crossed by the Project route are detailed in Appendix 2-A, Table 2-A-2.

West Virginia

West Virginia classifies surface waters according to five categories of designated use: public water supply; propagation and maintenance of fish and other aquatic life; water contact recreation; agriculture and wildlife; and water supply for industrial, water transport, cooling and power (Title47CSR2 Section 6.2-6.6). The public water supply category has four sub-categories: all community domestic water supply systems, all non-community domestic water supply systems, all private domestic water systems, and all other surface water intakes used for human consumption. The propagation and maintenance of fish and other aquatic life category has three sub-categories: warm-water fishery streams, trout waters, and wetlands. The agriculture and wildlife category has three sub-categories: irrigation, livestock watering, and wildlife. The water supply for industrial, water transport, cooling and power has four sub-categories: water transport, cooling water, power production, and industrial. Waters that have not been assigned a designated use are assigned a default designation of propagation and maintenance of fish and other aquatic life or water contact recreation (Title47CSR2 Section6.2-6.6).

The WVDEP also designates surface waters into one of three tiers of antidegradation protection as set forth by the Antidegradation Implementation Procedures found in the state code, Title 60CSR5. Tier 1 maintains and protects existing uses and the water quality conditions. Tier 2 maintains and protects high quality waters where the water quality exceeds levels necessary to support recreation and wildlife and the propagation and maintenance of fish and other aquatic life. Waters placed in the Tier 3 category are known as "outstanding national resource waters". These include waters in Federal Wilderness Areas, specifically designated federal waters, and high quality waters or naturally reproducing trout streams in state parks, national parks, and national forests.

The Project does not cross Tier 3 streams in West Virginia (WVDEP 2013).

Virginia

In Virginia, “all state waters, including wetlands, are designated for the following uses: recreational uses, e.g., swimming and boating; the propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them; wildlife; and the production of edible and marketable natural resources, e.g., fish and shellfish” (9 VAC 25-260-10).

The Virginia Department of Game and Inland Fisheries (VDGIF) has established a classification system for trout waters based on aesthetics, productivity, resident fish population and stream structure. In general, these include natural trout waters with wild trout habitat, and stockable trout waters with cold-water habitat not suitable for wild trout but adequate for year-round hold-over of stocked trout (9 VAC 260-370). Remaining streams are considered unsuitable for trout due to one or more of the following conditions: summer temperatures; a significant population of warm-water gamefish; insufficient flow; and intolerable water quality.

The Commonwealth of Virginia further designates all surface waters within the Commonwealth into one of three levels, or tiers, of antidegradation protection as set forth by the Antidegradation Policy found in the state code, 9VAC25-260-30. The crossing of Tier I waters requires satisfying the adopted water quality standards. The crossing of Tier II waters permits negative effects on water quality only in limited circumstances. Tier III waters are considered to be of exceptional quality and, as such, the Antidegradation Policy prohibits any increased pollutant discharge. However, activities causing temporary sources of pollution may be allowed where they are demonstrated to be temporary and affected waters are returned to equal or better conditions within a minimal timeframe. Tier III waters are designated by name within the code.

The Project does not cross any Tier III water segments but does come in close proximity to two Tier III water segments including Little Stoney Creek and Bottom Creek (VDEQ 2014). The 6.5 mile Tier III segment of Little Stoney Creek is located approximately 1.3 miles upstream of the Project. The 2.2 mile Tier III segment of Bottom Creek is located over 3 miles downstream from the Project (Figure 2-C-2, in Appendix 2-C). The Project alignment crosses Bottom Creek approximately at MP 240.4. To minimize potential impacts to Tier III streams, MVP will implement measures in the FERC Procedures and MVP’s E&SCP.

The FERC Procedures require a construction window from June 1 through September 30 for all crossings of coldwater fisheries and a construction window from June 1 through November 30 for other fisheries (warmwater and warmwater/coolwater). The FERC Procedures state these construction windows may be modified by state agencies. The allowable construction windows for fisheries of special concern crossed by the Project are included in Resource Report 3. In West Virginia, the WVDNR requests that no in-stream construction occur in warmwater streams from April 1 through July 30 or in coldwater streams September 15 through March 31. These date ranges are based on the USACE Nationwide Permit 401 Water Quality Certification. In Virginia, the VDGIF requests that no in-stream construction should occur in warmwater streams from April 15 through July 15 or in coldwater streams from March 1 through June 30. MVP will abide by the state designated time-of-year-restrictions for in-stream construction.

2.2.2.3 Waters Containing Federally or State-listed Threatened or Endangered Species or Critical Habitat

Resource Report 3 provides details and species descriptions of threatened and endangered species identified as potentially occurring along the Project, including aquatic species and the waterbodies where these species potentially occur.

The proposed pipeline does not cross waterbodies containing critical habitats for federally or state-listed species (USFWS 2015).

Additional information for threatened and endangered species, including suitable habitat within the Project area is presented in Resource Report 3.

2.2.2.4 Surface Water Protection Areas and Public Surface Water Supplies

MVP prepared a draft Water Resources Identification and Testing Plan that identifies public water supplies within, and in some cases beyond three miles of the proposed alignment. The plan documents the process by which MVP identified public water supplies relative to the proposed alignment (watershed based analysis), the process by which MVP will contact the public water suppliers to address concerns and document the location and characteristics of specific water source(s) and describes a pre-construction water quality testing program. As described in the plan, a public water supply that is located within the geographic boundary of a USGS HUC-10 watershed through which the alignment traverses was identified as a candidate public supply. MVP is contacting the suppliers to confirm the types and locations of the water sources.

As part of the effort to compile the above referenced plan, public water supplies in West Virginia and Virginia within along the Project area were identified from publicly available data sources (WVDEP 2015; VDEQ 2015d). These locations are listed in Table 2.2-8. Note that the information presented in Table 2.2-8 is based on public data, and have not yet been confirmed through direct contact with the suppliers (as described in the Water Resources Identification and Testing Plan).

Table 2.2-8

Public Surface Water Supply Intakes along the MVP Project

County/State	Surface Water	Nearest Milepost	Distance to Construction ROW (miles)	Direction from Construction ROW
West Virginia				
Wetzel	Fishing Creek	1.0	4.9	NW
Harrison	Jones Run Creek	15.4	0.5	N
Harrison	Lower Dog Run	23.7	1.0	W
Harrison	West Fork River	26.5	8.8	S
Doddridge	Middle Island Creek	31.6	12.0	W
Harrison	Hackers Creek	35.5	12.3	E
Lewis	West Fork	50.0	4.3	E
Gilmer	Little Kanawha River	54.5	13.7	W
Braxton	Little Kanawha	62.0	4.5	W
Braxton	Elk River	85.2	3.1	S

Table 2.2-8

Public Surface Water Supply Intakes along the MVP Project

County/State	Surface Water	Nearest Milepost	Distance to Construction ROW (miles)	Direction from Construction ROW
Braxton	Elk River	90.8	3.2	N
Braxton	Elk River	93.4	5.9	W
Webster	Elk River	100.5	6.0	E
Nicholas	Panther Creek/Impoundment/Jim's Branch	116.9	1.8	NE
Nicholas	Gauley River	118.5	3.1	SE
Nicholas	Panther Creek/Impoundment/Jim's Branch	120.4	1.3	E
Nicholas	Panther Creek/Impoundment/Jim's Branch	120.5	0.3	E
Fayette	Meadow River/Anglins Creek	128.4	9.4	W
Nicholas	Meadow River/Anglins Creek	129.5	6.5	W
Greenbrier	Greenbrier River At Alderson WV	161.6	4.6	E
Summers	Greenbrier River	172.0	1.4	W
Monroe	Rich Creek Spring (Source of Rich Creek)	194.5	0.3	W
Virginia				
Montgomery	NRV Regional Water Authority, New River Intake	211.8	9.8	S
Salem	Salem WTP	233.4	7.2	NE
Roanoke	WVWA Spring Hollow Reservoir	234.4	0.8	E
Franklin	Rocky Mount Intake	262.2	0.1	NE
Pittsylvania	Gretna Georges Creek Reservoir	293.1	6.2	NE
Pittsylvania	Chatham Cherrystone Creek Intake	297.1	2.2	SW
Sources: WVDEP 2015, VDEQ 2015d. This publically available information on public water suppliers will be confirmed by MVP through direct supplier contact and documented in future submittals.				

The following agencies were contacted to determine the location of any surface water protection areas and potable surface water intakes located within three miles downstream of waterbody crossings: the WVDHHR and the VDH. Online services were also reviewed, including WVDHHR's Safe Drinking Water Information System, Source Water Assessment Reports, which was limited to source water protection areas. Online resources for Virginia include: The Western Virginia Water Authority, Water Quality Reports and The West Piedmont Planning Commission Regional Supply Plan. Information on public water supplies has not been received from West Virginia agencies, to date. Public and private groundwater supplies are discussed above in Section 2.1. As noted above, this information is based on publically available data sources and will be confirmed through direct contact with the supplier.

West Virginia

Initial efforts to evaluate public surface water resources included evaluation of source water protection areas were identified within three miles of the Project area in West Virginia (WVDHHR 2015). There are two source water protection areas that are crossed by the Project and one that is less than one mile away. In Nicholas County, the Project crosses the Craigsville Public Service District and Zone of Critical Concern in the Gauley River watershed at MP 110. The source water protection surrounds the Gauley River and its tributaries, and provides water to the town of Craigsville. In Summers County, the Project crosses the Greenbrier River at MP 170.6, approximately 2 miles upstream of the Big Bend Public Supply District water intake at MP 172.0. The Zone of Critical Concern for the Big Bend Public Supply District is extensive, including the Greenbrier River and numerous small tributaries. The pipeline alignment crosses two of the tributaries, Kelly Creek at MP 171.8 and Wind Creek at MP 175.9. In Monroe County, the Project crosses the RSPSD and watershed from approximately MP 190.1 to approximately MP 195.4 and is 0.85 mile upstream of the Zone of Critical Concern which surrounds Rich Creek. The Zone of Critical Concern is not crossed by the pipeline, and neither is Rich Creek. The pipeline corridor does cross Dry Creek, which is a tributary to Rich Creek, at MP 191.1. Figure 2-C-3, in Appendix 2-C shows the Project alignment in relation to the RSPSD and the Zone of Critical Concern.

Virginia

In Virginia there are no surface water intakes located in Giles County as water is withdrawn from groundwater sources (New River Valley Planning District Commission 2011). The 158-acre, 3.3 billion gallon Spring Hollow Reservoir supplies water to various neighborhoods in Roanoke and Franklin Counties (Western Virginia Water Authority 2015). The Project crosses the Roanoke River at MP 233.8, which feeds the reservoir from a point about 1.2 miles downstream. The reservoir is not crossed by the Project, but it is 0.9 mile east of the pipeline at MP 234.5. The other locations within these counties receive water from springs and groundwater wells.

Due to the short-term duration of the proposed construction activities, impacts to these surface water protection areas are not anticipated. Adherence to the FERC Plan and Procedures and implementation of MVP's E&SCP and BMPs during construction and restoration will prevent, minimize, and/or mitigate impacts to the source water protection area. MVP has contacted the local water supplier department and provide a schedule of construction activities in this area prior to construction.

There is typically downstream movement of existing sediments within the streams during large storm events. Additionally, the streams in this area receive significant sediment input from industry, accidental erosion, and other non-point sources. Public surface water intake facilities are designed to filter out large debris and are designed to remove sediment from the raw water intakes depending on the water quality and adjust the treatment processes as necessary (USEPA 2004a). Mitigation measures specified in the FERC Plan and Procedures and MVP's E&SCP to address potential impacts to public water supplies from the construction right-of-way in Section 2.2.5.

2.2.2.5 Contaminated Sediments and Impaired Waters

MVP has reviewed the National Sediment Quality Survey for information regarding contaminated sediments at all waterbody crossings. None of the watersheds in the Project area are listed as containing areas of probable concern for sediment contamination (USEPA 2004b). Sampling locations for sites with Tier 1, 2, and 3 contaminated sediments were viewed in the National Sediment Inventory Database (NOAA 2007). None of the waterbodies crossed by the Project are depicted with records of contaminated sediments.

As part of state water quality assessments, Section 303(d) of the federal Clean Water Act (CWA) mandates that states must prepare a list of all waters that do not meet the water quality criteria for their designated uses and develop for each criterion a Total Maximum Daily Load (TMDL), which establishes the maximum allowable discharge into a waterbody to better control pollutant levels. To determine whether impaired waterbodies will be affected by the Project, MVP reviewed the 303(d) lists for states crossed by the Project that are included in USEPA Categories 4 and 5. Category 4 lists waterbodies where TMDLs have been completed or cannot be completed due to the nature of the contamination, and Category 5 lists waterbodies where TMDLs need to be developed by the state.

A review was performed of statewide 303(d) Impaired Waters and 305(b) through WVDEP and (WVDEP 2014; VDEQ 2012) to determine crossings of impaired waterbodies. Table 2.2-9 provides a summary of impaired waterbodies crossed by the Project route. MVP will cross all streams in West Virginia and Virginia in accordance with the FERC Plan and Procedures and MVP's E&SCP.

Table 2.2-9

Impaired Waterbodies Crossed by the MVP Project

State/County	MP	Waterbody Name	Crossing Method	Causes of Impairment
West Virginia				
Wetzel	0.6	North Fork Fishing Creek	Open cut	Fecal Coliform, Iron
8Wetzel	2.3	Fallen Timber Run	Open cut	Benthic macroinvertebrates Bioassessments, Fecal Coliform, Iron
Wetzel	5.0	Price Run	Open cut	Benthic macroinvertebrates Bioassessments, Fecal Coliform, Iron
Harrison	11.2	Big Elk Creek	Open cut	Benthic macroinvertebrates Bioassessments, Iron, Manganese
Harrison	15.5	Little Tenmile Creek	Open cut	Benthic macroinvertebrates Bioassessments, Iron, Manganese
Harrison	17.8	Little Rockcamp Run	Open cut	Benthic macroinvertebrates Bioassessments, Iron, Manganese
Harrison	18.8	Rockcamp Run	Open cut	Benthic macroinvertebrates Bioassessments, Iron, Manganese
Harrison	26.0	Salem Fork	Open cut	Benthic macroinvertebrates Bioassessments
Lewis	31.3	Coburn	Open cut	Iron, Manganese, pH
Lewis	44.8	Fink Creek	Open cut	Benthic macroinvertebrates Bioassessments
Lewis	52.3	Cove Lick	Open cut	Benthic macroinvertebrates Bioassessments
Lewis	55.2	Sand Fork	Open cut	Benthic macroinvertebrates Bioassessments, Iron
Lewis	60.4	Indian Fork	Open cut	Benthic macroinvertebrates Bioassessments
Lewis	60.4	Threelick Run	Open cut	Benthic macroinvertebrates Bioassessments
Lewis	62.3	Oil Creek	Open cut	Aluminum
Nicholas	113.9	Big Beaver Creek	Open cut	Fecal Coliform
Nicholas	119.9	Little Laurel Creek	Open cut	pH
Nicholas	126.5	Hominy Creek	Open cut	Iron
Greenbrier	140.1	Meadow Creek	Open cut	Iron
Greenbrier	143.7	Meadow River	Open cut	Fecal Coliform
Greenbrier	146.7	Little Sewell Creek	Open cut	Fecal Coliform
Summers	162.6	Lick Creek	Open cut	Fecal Coliform

Table 2.2-9

Impaired Waterbodies Crossed by the MVP Project

State/County	MP	Waterbody Name	Crossing Method	Causes of Impairment
Summers	169.2, 169.7	Hungard Creek	Open cut	Fecal Coliform
Summers	170.5	Greenbrier River	Open cut	Fecal Coliform
Summers	171.8	Kelly Creek	Open cut	Fecal Coliform
Monroe	181.7	Indian Creek	Open cut	Benthic macroinvertebrates Bioassessments, Fecal Coliform
Monroe	186.7	Hans Creek	Open cut	Fecal Coliform
Monroe	191.3	Dry Creek	Open cut	Benthic macroinvertebrates Bioassessments, Fecal Coliform, Iron
Monroe	193.6	Painter Run	Open cut	Fecal Coliform
Giles	199.4	Stony Creek	Open cut	PCB(s) in Fish Tissue
Giles	209.9	Sinking Creek	Open cut	Escherichia Coli (E. Coli)
Virginia				
Montgomery	229.2	Bradshaw Creek	Open cut	E. Coli, pH
Montgomery	233.8	Roanoke River	Open cut	Temperature, Polychlorinated Biphenyls (PCBs)
Franklin	247.3	North Fork Blackwater River	Open cut	E. Coli
Franklin	255.7 – 259.9	Teels	Open cut	Benthic macroinvertebrates bioassessments, E. Coli
Franklin	259.8, 260.1, 280.8	Little Creek	Open cut	Benthic macroinvertebrates bioassessments, E. Coli
Franklin	266.5	Maggodee Creek	Open cut	Benthic macroinvertebrates bioassessments, E. Coli
Franklin	262.8, 266.3, 266.9	Blackwater River	Open cut	Benthic macroinvertebrates bioassessments, E. Coli, Mercury and PCBs in Fish Tissue
Franklin	269.5	Foul Ground Creek	Open cut	Fecal Coliform
Pittsylvania	286.3	Pigg River	Open cut	E. Coli
Pittsylvania	287.1	Harpen Creek	Open cut	E. Coli
Pittsylvania	293.7	Pole Bridge Branch	Open cut	E. Coli
Pittsylvania	298.6, 300.3	Little Cherrystone Creek	Open cut	E. Coli
Source: USEPA 2014; WVDEP 2012a; VDEQ 2012				

2.2.3 Hydrostatic Test Water

The pipeline will be hydrostatically tested to ensure that it is capable of safely operating at the design pressure. Test segments of the pipeline will be capped and filled with water. Surface water used for testing will be drawn through a screened intake. The water in the pipe will be pressurized and held for a minimum of 8 hours in accordance with the USDOT Pipeline and Hazardous Materials Safety Administration Office of Pipeline Safety (OPS) requirements identified in 49 CFR Part 192 prior to being placed in service. Any loss of pressure that cannot be attributed to other factors, such as temperature changes, will be investigated. Leaks detected will be repaired and the segment will be retested.

Upon completion of the test, the water may be pumped to the next segment for testing, or the water may be discharged. The test water will be discharged through an energy-dissipating device in compliance with NPDES permit conditions. Table 2.2-10 provides anticipated hydrostatic test water information for each pipeline segment. Hydrostatic test water surface sources are listed on Table 2.2-10, which includes the names and locations of proposed water withdrawal sources, approximate water volumes to be withdrawn from each source and discharge locations. Additional potential sources for hydrostatic test water include local Public Service District (PSD) systems. MVP will contact the PSDs to determine if there is capacity in their system (both yield and storage) to provide all or portions of water needed for specific pipeline segments. Where seasonal surface flows are limited and public supplies are not viable options, installation of groundwater supply wells may also be considered where hydrogeologic conditions are favorable.

The total volume of water used for hydrostatic testing is proposed to be approximately 60,283,880 gallons. Each construction spread will be broken down into smaller test sections. The hydrostatic test has been designed such that the water should only need to be drawn from the identified source once. From there, it will be pushed into the next test section, which has been chosen to be smaller than the first. By this method, no additional water will be needed within a construction spread, since the large volume initially drawn will be “pushed” to increasing smaller sections that require less volume. Currently, there are no plans to pump water between construction spreads. Therefore, the total volume of water needed to complete the hydrostatic test comes from summing the largest quantity needed in each spread, i.e., the numbers in bold in Table 2.2-10. Currently, hydrostatic tests are anticipated to take place in October or November of 2017 and 2018, and should be discharged within those time frames, as well. MVP will discharge within the same watershed from which water was withdrawn as much as practicable, and will avoid discharging near perennial streams.

Test water will contact only new pipe, and no chemicals will be added to the test water. An exception would be that if a municipal water source with chlorinated water is used for testing, addition of a dechlorinating agent may be required prior to discharge depending on the discharge location. Municipal water will only be used for hydrostatic testing of fabricated settings. The main pipeline will be tested with fresh water from sources indicated in Table 2.2-10.

MVP will comply with conditions of NPDES permits that would be obtained for hydrostatic test water discharge in West Virginia and Virginia, as summarized below. MVP has not applied for agency approval for the discharge of hydrostatic test water at this time, but anticipates submitting this application prior to final pipeline design.

> **West Virginia**: MVP will follow the regulations outlined in NPDES General Permit WV0113069 (Hydrostatic Testing General Permit) (WVDEP 2012b). Coverage under this permit includes effluent limitations, monitoring requirements, and other standard conditions.
>
> **Virginia:** MVP will follow the regulations outlined in VPDES General Permit 9VAC25-120 (VAG83) (Petroleum Contaminated Sites and Hydrostatic Tests). Coverage under this permit includes effluent limitations, monitoring requirements, and other standard conditions.

Table 2.2-10

Proposed Hydrostatic Test Water Use Summary

Anticipated Year of Construction	Construction Spread	Segment Name	Beginning MP	Ending MP	Length of Section	Required Water (gal)	Proposed Water Source			Proposed Test Water Discharge Location				Nearest Stream	Nearest Perennial Stream	Proposed Discharge Month
							MP	Proposed Water Source	Watershed	MP	Watershed	Volume				
2017	1	01A	0.0	12.2	12.2 mi	4,367,359 gal		Reuse from Test Section 1B	Fishing Creek	0.0	Fishing Creek	4,367,359 gal	Discharge Section 1A @ 0.0	Unnamed Stream @ 0.0	North Fork Fishing Creek @ 0.65	Oct/Nov 2017
		01B	12.2	25.9	13.7 mi	4,904,330 gal	26.0	Salem Fork Creek	Tenmile Creek	12.2	Tenmile Creek	536,970 gal	Discharge difference between Section 1B and 1A @ 12.2	S-B74 @ 12.18; Goose Run @ 12.15	S-F49 @ 12.15	
2017	2	02A	25.9	41.3	15.4 mi	5,512,896 gal	26.0	Salem Fork Creek	Tenmile Creek	25.9	Tenmile Creek			Salem Fork @ 26.0	Salem Fork @ 26.05	
		02B	41.3	48.0	6.7 mi	2,398,468 gal		Reuse from Test Section 2A		41.3	Middle West Fork River	3,114,428 gal	Discharge difference between Section 2A and 2B @ 41.3	Smoke Camp Run @ 41.0	Smoke Camp Run @ 41.38	Oct/Nov 2017
2017	3	03A	48.0	65.5	17.5 mi	6,264,655 gal	74.9	Little Kanawha River	Leading Creek	48.0	Leading Creek	2,398,468 gal	Discharge Section 2B @ 48.0	S-H170 @ 48.3	Leading Creek @ 48.5	
		03B	65.5	77.6	12.1 mi	4,331,561 gal		Reuse from Test Section 3A		65.5	Upper Little Kanawha	1,933,094 gal	Discharge difference between 3A and 3B @ 65.5	S-J41@ 66.5	Clover Fork @ 65.58	Oct/Nov 2017
2017	4	04A	77.6	87.7	10.1 mi	3,615,601 gal		Reuse from Test Section 4B		77.3	Upper Little Kanawha	7,947,162 gal	Discharge Section 3B + 4A @ 77.3	S-AA15 @ 77.4	Stonecoal Run @ 76.83	
		04B	87.7	104.7	17.0 mi	6,085,665 gal	87.4	Elk River	Middle Elk River	87.7	Middle Elk River	2,470,064 gal	Discharge difference between 4B and 4A @ 87.7	S-H113 @ 87.64	S-H113 @ 87.64	Oct/Nov 2017
2017	5	05A	104.7	120.1	15.4 mi	5,512,896 gal	120.0	Little Laurel Creek	Birch Creek	104.7	Birch Creek					
		05B	120.1	127.8	7.7 mi	2,756,448 gal		Reuse from Test Section 5A		120.1	Outlet Gauley River	2,756,448 gal	Discharge difference between 5A and 5B @ 120.1	Unnamed Stream @ 104.7	S-F36 @ 104.7	Oct/Nov 2017
2017	6	06A	127.8	143.7	15.9 mi	5,691,886 gal	143.7	Meadow River	Hominy Creek	127.8	Hominy Creek	2,756,448 gal	Discharge Section 5B @ 127.8	S-I31 @ 127.8	Hominy Creek @ 126.54	
		06B	143.7	154.5	10.8 mi	3,866,187 gal		Reuse from Test Section 6A		143.7	Meadow River	1,825,699 gal	Discharge difference between 6B and 6A @ 143.7	Meadow River @ 143.72	Meadow River @ 143.72	Oct/Nov 2017
2017	7	07A	154.5	170.6	16.1 mi	5,763,483 gal	170.6	Greenbrier River	Meadow Rive	154.5	Meadow River	3,866,187 gal	Discharge Section 6B @ 154.5	S-K25 @ 154.48	Buffalo Creek @ 154.57	
		07B	170.6	181.8	11.2 mi	4,009,379 gal		Reuse from Test Section 7A		170.6	Wolf Creek – Greenbrier River	5,763,483 gal	Discharge Sections 7A and 7B @ 170.6	Greenbrier River @ 170.6	Greenbrier River @ 170.6	Oct/Nov 2017

Table 2.2-10

Proposed Hydrostatic Test Water Use Summary

Anticipated Year of Construction	Construction Spread	Segment Name	Beginning MP	Ending MP	Length of Section	Required Water (gal)	Proposed Water Source			Proposed Test Water Discharge Location				Nearest Stream	Nearest Perennial Stream	Proposed Discharge Month
							MP	Proposed Water Source	Watershed	MP	Watershed	Volume				
2018	8	08A	181.8	191.0	9.2 mi	3,293,419 gal		Reuse from Test Section 8B		181.8	Indian Creek	3,293,419 gal	Discharge Section 8A @ 181.8	Indian Creek @ 181.89	Indian Creek @ 181.89	
		08B	191.0	204.7	13.7 mi	4,904,330 gal	181.9	Indian Creek	East River – New River	191.0	East River – New River	1,610,911 gal	Discharge difference between 8B and 8A @ 191.0	Dry Creek @ 191.08	Dry Creek @ 191.08	Oct/Nov 2018
	9	09A	204.7	218.1	13.4 mi	4,796,936 gal		Reuse from Test Section 9B		204.7	Sinking Creek – New River	4,796,936 gal	Discharge Section 9A @ 204.7	Unnamed Creek @ 204.06	Doe Creek @ 205.65	
		09B	218.1	234.0	15.9 mi	5,691,886 gal	233.8	Roanoke River	Upper Craig Creek	218.1	Upper Craig Creek	894,951 gal	Discharge difference between 9B and 9A @ 218.1	Greenbrier Branch @ 211.66	Sinking Creek @ 209.9	Oct/Nov 2018
2018	10	10A	234.0	247.1	13.1 mi	4,689,542 gal	262.8	Blackwater River		234.0	Mason Creek-Roanoke River					
		10B	247.1	256.9	9.8 mi	3,508,207 gal		Reuse from Test Section 10A		247.1	Upper Blackwater	1,181,335 gal	Discharge difference between 10A and 10B @ 247.1	S-D10 @ 247.3	North Fork Blackwater @ 247.34	
		10C	256.9	262.7	5.8 mi	2,076,286 gal		Reuse from Test Section 10B		256.9	Upper Blackwater	1,431,921 gal	Discharge difference between 10B and 10C @ 256.9	Teels Creek @ 256.9	Teels Creek @ 256.9	Oct/Nov 2018
2018	11	11A	262.7	265.2	2.5 mi	894,951 gal		Reuse from Test Section 11B		262.7	Upper Blackwater					
		11B	265.2	279.9	14.7 mi	5,262,310 gal	262.1	Blackwater River	Upper Blackwater	265.2	Upper Blackwater	715,961 gal	Discharge difference between 11B and 11A + 11C @ 265.2	S-F3 @ 265.22	S-F7 @ 265.58	
		11C	279.9	292.6	12.7 mi	4,546,350 gal		Reuse from Test Section 11B		279.9	Upper Pigg River	1,539,315 gal	Discharge difference between 11C and 11D @ 292.6	S-G15 @ 279.83	Parrot Branch @ 280.17	
		11D	292.6	301.0	8.4 mi	3,007,034 gal		Reuse from Test Section 11C		292.6	Cherrystone Creek – Banister River	3,007,034 gal	Discharge Section 11D @ 301 (EOL)	S-CC3 @ 292.51/S-H42 @ 300.8	S-CC3 @ 292.51/S-H44 @ 300.7	Oct/Nov 2018
Gross Water Required (add all required water):						107,752,065 gal										
Proposed Water Usage for 2017 (only bold quantities from 2017):						39,735,811 gal										
Proposed Water Usage for 2018 (only bold quantities from 2018):						20,548,068 gal										
Actual Water Required (all bold quantities):						60,283,880 gal										

Test water will be drawn from various sources and, after testing, will be discharged to upland areas, typically in the same watershed as the source from which it was obtained. Anticipated discharge locations are provided in Table 2.2-10. Water discharged over land will be directed through containment structures such as hay bale structures and filter bags. The discharge rate will be regulated using valves and energy dissipation devices to prevent erosion. Discharge rate will be 225 gpm, as regulated by the states.

Once a segment of pipe has been successfully tested and dried, the test cap and manifold will be removed, and the pipe will be connected to the remainder of the pipeline. No desiccant or chemical additives will be used to dry the pipe. MVP will implement Section VII of the FERC Procedures regarding hydrostatic testing, as well as any specifications in individual state permit guidelines.

MVP will install filters on the inlet of the hydrostatic test and the discharge of the hydrostatic test. Mitigation for the potential transfer of aquatic invasive species in hydrostatic test water between watersheds is discussed in Resource Report 3.

2.2.4 Dust Control

While it is not possible to know how much water would be needed for dust suppression on the pipeline construction right-of-way, during dry seasons, MVP estimates that there would be approximately five 1,000-gallon water trucks per construction spread on a given day. MVP anticipates using 11 construction spreads, which would total 55,000 gallons for 55 water trucks per day. Watering trucks would spray only enough water to control the dust or to reach the optimum soil moisture content to create a surface crust. Runoff should not be generated during this procedure. Water may be obtained through municipal sources or withdrawn from surface water or groundwater sources. The locations and amount of disbursement of water will be decided by the spread lead environmental inspector. All appropriate permits/approvals would be obtained prior to withdrawal.

MVP will implement a Fugitive Dust Control Plan during construction. See additional discussion in Resource Report 9.

2.2.5 Construction and Operation Impacts and Mitigation

The construction method utilized at each waterbody crossing will vary with the characteristics of the specific waterbody and will be performed consistent with permit conditions outlined in the regulatory permit approvals.

The preferred crossing method of intermediate waterbodies (between 10 and 100 feet wide at water's edge) and minor waterbodies (less than 10 feet wide at water's edge) at the time of crossing will be open-cut or dry ditch crossing methods as described in the FERC's Procedures and summarized in Resource Report 1.

Implementation of the FERC Plan and Procedures and MVP's Project-specific E&SCP, specifically with respect to construction time windows, erosion and sedimentation control, bank stabilization, and bank revegetation, will minimize short- and long-term impacts on the waterbodies crossed by the Project route. MVP will continue to consult with state agencies during the permitting process to identify additional site-specific mitigation measures.

ATWS will be located at least 50 feet away from the water's edge, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land or as noted with a site specific explanation of the conditions. MVP will limit the amount of vegetation cleared between the waterbody and the ATWS and minimize the amount of extra work space to the greatest extent possible. MVP has identified some ATWS that would be closer than 50 feet, and these are listed in Appendix 2-A (Table 2-A-3) along with explanation for the need for that variance from the FERC Procedures.

Crossings will be aligned as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions allow. If the pipeline route parallels a waterbody, MVP will attempt to maintain at least 15 feet of undisturbed vegetation between the waterbody (and adjacent wetland, if present) and the construction right-of-way. However, there are 5 locations where the pipeline route parallels a waterbody within 15 feet as listed in Table 2-A-4 in Appendix 2A. Therefore, MVP will request a modification from FERC Procedures for all of these locations.

Impacts to Waterbodies from Crossings and Mitigation Measures

Construction of the pipeline could result in minor, short-term impacts to waterbodies. These impacts could occur because of in-stream construction activities, use of access roads, or construction on slopes and riparian areas adjacent to stream channels. Clearing and grading of stream banks, removal of riparian vegetation, in stream trenching, trench dewatering, and backfilling could result in stream bank modification, increased sedimentation, turbidity, increase in temperature, and decreased dissolved oxygen concentrations. An increase in soil compaction and vegetation clearing could potentially increase runoff and subsequent stream flow or peak flows. In the unlikely event of a leak or breach in the pipeline, the natural gas will rise to the ground surface and dissipate in the air. There are no liquids in the pipeline that would be released to groundwater or surface water in the unlikely event of a leak. Pipeline leaks are further discussed in Resource Report 11.

The following is a description of potential impacts due to the different waterbody crossing methods. Descriptions of waterbody crossing methods are summarized in Section 2.2.1.4 above, and described in more detail in Resource Report 1.

Open-cut: As described in Resource Report 1, if there is no flow in the stream, the pipeline will be installed via open-cut crossing method using upland techniques. For minor or intermediate waterbodies with low flow, unless a dry ditch method is required, an open-cut crossing method with restrictions as stated in the FERC's Procedures will be used. The pipeline will be installed at a depth below the streambed, below scour levels. Water quantity will not be impacted post-construction. All spoil from waterbody crossings will be placed at least 10 feet from the water's edge or in ATWS. Temporary impacts from crossing a flowing waterbody can include a short-term increase in the sediment load in the waterbody during the period of trenching and backfilling, increased vulnerability of stream banks to erosion, streambank sloughing, increased turbidity and sedimentation downstream of the crossing location, and without proper mitigation, increased potential for sediment input from the construction right-of-way. Sustained periods of exposure to high levels of suspended solids can cause loss of fish egg and fry, reduced natural fish movements, fish vacating areas of high suspended solids, and other adverse impacts on fisheries resources. (Sedimentation-related impacts to fisheries and other aquatic resources are discussed in greater detail in Resource Report 3.) Additionally, fine silts and colloids that cloud waterbodies could result in diminished visual aesthetics for anglers and other recreational users; these materials could also impact potable water supplies drawn from surface water intakes. Temporary increases in turbidity will be minimized with the use of BMPs/temporary erosion and sediment controls (sediment barriers). As described in the FERC's Procedures, waterbody banks will be stabilized and temporary sediment barriers will be installed within 24 hours of completing in stream construction activities. Monitoring of BMPs will be conducted during construction by an environmental Inspector to ensure compliance with state 401 water quality certifications obtained for construction. Monitoring of surface water quality will be conducted if the surface water is used for drinking water and if required by the water authority responsible for the surface water supply. Once construction is completed, the pipeline will be below the streambed by at least 4 feet and will not restrict stream flows. Stream beds will be recontoured as closely as possible to pre-construction conditions. MVP will implement the FERC Plan such that restoration shall be considered successful if the right-of-way surface condition is similar to adjacent undisturbed lands, revegetation is successful, and proper drainage has been restored.

Dry crossing methods (Dam, and Pump and Flume): Temporary construction-related impacts would be limited primarily to short periods of increased turbidity during the installation of temporary upstream and downstream dams prior to pipeline installation, and following installation of the pipeline when the dams are removed, and flow across the restored work area is re-established. Streambed and bank stabilization will be completed before returning flow to the waterbody channel.

Specific measures to minimize or avoid impacts to waterbodies for the different waterbody crossing methods proposed include:

Wet Open-cut

- In-stream construction activities (including trenching, pipe installation, backfilling, and streambed restoration) will be completed within 24 to 48 hours, except for areas that require blasting or other rock-breaking measures; and
- Operation of equipment in the waterbody will be limited to that needed to construct the crossing.

Dam and Pump

- Sufficient pumps, including on-site backup pumps, will be used to maintain downstream flows;
- Pumps will be properly aligned to prevent streambed scour at pump discharge;
- Dams will be constructed with materials that prevent sediment and other pollutants from entering the waterbody;
- Pump intakes will be screened to minimize entrainment of fish; and
- Dams and pumps will be continuously monitored to ensure proper operation throughout the waterbody crossing.

Flume

- Sand bags, sand bag and plastic sheeting diversion structures, or the equivalent will be used to develop an effective seal and to divert stream flow through the flume pipe;
- Flume pipes will be installed after blasting (if necessary), but before trenching;
- Flume pipes will remain in place until trenching, pipe laying, backfilling, and initial streambed restoration efforts are complete;
- Flume pipes will be properly aligned to prevent bank erosion and streambed scour; and
- All flume pipes and dams that are not part of the equipment bridge will be removed as soon as final cleanup of the streambed and bank is complete.

Impacts to Waterbodies from Potential Releases of Fuels, Lubricants, and Coolants, and Mitigation Measures

The use of heavy equipment to complete pipeline installation across waterbodies may increase the potential for accidental releases of fuels, lubricants, and coolants. Such releases could adversely affect aquatic species and contaminate public water supplies that rely on surface water intakes located downstream of the waterbody crossing.

To mitigate these potential impacts, construction equipment, vehicles, hazardous materials, chemicals, fuels lubricating oils, and petroleum products would not be parked, stored, or serviced within a 100-foot radius of any waterbody. MVP will install signs along the right-of-way to identify such areas.

MVP will develop a Project-specific SPCC Plan for implementation during construction. The SPCC Plan will describe preventive measures such as personnel training, equipment inspection, and refueling procedures to reduce the likelihood of spills. It will also include mitigation measures, such as containment and cleanup, to minimize potential impacts if a spill occurs. MVP will minimize the potential impacts of spills of hazardous materials by adhering to this Project-specific SPCC Plan, which will be available in the field during construction. A copy of the SPCC Plan will be filed with FERC when available. The SPCC Plan would address hazardous materials, and stormwater would be addressed following FERC's Procedures and BMPs.

Typically, unless requested by a land management agency or landowner, it is MVP's policy not to use herbicides or pesticides to maintain the right-of-way or Project facilities.

MVP will provide advance notification to the operators of surface water intakes regarding waterbody construction schedules and will notify the operators of any accidental releases of hazardous materials during construction that may affect their water supply.

Impacts to Waterbodies from Turbidity and Sediment Runoff and Mitigation Measures

Pipeline construction across waterbodies and disturbance within the construction footprint for other facilities could result in increased potential for turbidity and sediment runoff from the construction right-of-way. Following FERC's Procedures, temporary erosion controls would be installed during construction to reduce sediment runoff into waterbodies. Permanent erosion controls would be installed within the pipeline right-of-way for operation and maintenance to reduce stormwater flow into streams.

To reduce turbidity and sedimentation caused by construction and vehicular traffic crossing waterbodies for access to the Project right-of-way, MVP will install temporary equipment bridges within the approved construction right-of-way that would remain in place throughout construction. Equipment bridges would be constructed using methods and materials such as clean rock or gravel and culverts, timber mats, portable prefabricated bridges, and railcars. If excessively soft soils are encountered in the streambed, or if high water flows occur, portable bridges may be utilized at minor stream crossings in lieu of flume pipes. Equipment bridges would be designed to accommodate normal to high stream flow during the period of construction.

To minimize turbidity caused by erosion, trench spoil excavated from within streams flowing at the time of construction would be stored at least 10 feet from the top of the bank, unless impractical due to topography. If extra work areas (beyond the nominal construction right-of-way) are required to be closer than 50 feet from a waterbody or wetland, then MVP would file a site-specific construction plan with FERC for review and written approval, as well as with appropriate agencies. Sediment barriers such as silt fences and straw/hay bales will be placed around the spoil piles to prevent spoil flow into the waterbody.

Once the pipe is placed in the trench, the excavated material would be replaced and the stream banks and streambed would be restored to their pre-construction contours. Stream banks and riparian areas will be stabilized by using erosion-control devices and appropriate seed mixtures approved by the landowner/agency.

Riparian canopy or stabilizing vegetation would not be removed if possible. Crushing or shearing streamside woody vegetation is preferable to complete removal. Any area where vegetation is removed in conjunction with stream crossings would be stabilized immediately following the completion of the crossing.

Minimizing effects on public surface water intakes downstream from crossings include the erosion and sediment control practices described above. Implementation of these practices will minimize the volume of sediment entering into waterbodies at the time of construction. Restoration and replanting of vegetation along the banks will minimize erosion and sedimentation during operation of the pipeline, thereby minimizing the volume of sediment that may pass through public surface water supply intakes.

Riparian areas and floodplains will not be used as staging or refueling areas. Chemicals, solvents, and fuels will be kept at least 100 feet from streams and riparian areas and will be placed within secondary containment. Any section of pipeline that parallels drainages may be located within the 100-year floodplain. Secondary containment consisting of materials that are impervious to the material being stored (e.g., diking and/or earthen berms with liner) will be used around liquids materials handling and storage areas to prevent spilled material from reaching the waters of the state. Areas which require containment structures include: (i) liquid and hazardous waste drum storage areas, (ii) bulk storage tanks, and (iii) tanker trucks if parked at one location for more than two days. No chemicals or fuel will be transferred within 100 feet of stream banks. Drip pans or other suitable containment devices will be installed to collect all vehicle fluids when performing on-site maintenance. All waste fluids will be removed from the site and disposed of properly.

To minimize and/or mitigate potential impacts from pipeline construction and disturbance from other facilities, MVP will implement the FERC Plan and Procedures and our E&SCP, specifically with respect to erosion and sedimentation control, bank stabilization, and bank revegetation, which will minimize impacts related to turbidity and sediment transport into adjacent waterbodies.

MVP will continue to consult with agencies during the permitting process to identify additional appropriate site-specific mitigation measures relating to sediment runoff potential. WVDEP and VDEQ have the authority to permit work within Waters of the US via the Section 401 permit. VDEQ has the authority to enact Virginia Water Protection permit regulations given by § 62.1-44.15:20 of the Code of Virginia. The over-arching regulation for the permit program is the Virginia Water Protection (VWP) Permit Program Regulation, 9 VAC 25-210. VWP General Permit WP2 is for Facilities and Activities of Utility and Public Service Companies Regulated by the FERC or the State Corporation Commission and Other Utility Line Activities (9 VAC 25-670). The general permit is given if a Nation Wide Permit from USACE would apply to the project rather than an Individual Permit for working in Waters of the US. The general permit provided by VDEQ includes requirements for minimization of affects to waterbodies and wetlands, monitoring, and compensation. MVP will comply with all federal, state, and local permit requirements.

Impacts to Waterbodies from Hydrostatic Testing Discharges and Mitigation Measures

Potential exists for scour, erosion and potential for sediment transport to adjacent waterbodies from hydrostatic testing discharges.

To mitigate these potential impacts, water discharged over land will be directed into energy dissipation devices, filter bags, or straw bale structures, which will be removed upon completion of testing. Typical drawings provided in MVP's E&SCP will include a drawing of a typical hydrostatic test dewatering structure; the actual methodology will be confirmed based upon field conditions. The hydrostatic test dewatering structure will be placed on a vegetated upland site that will allow water to flow away from the structure and any nearby work areas. The discharge rate will be regulated using valves and energy dissipation devices to prevent erosion and sediment transport. These measures will minimize scour, erosion, and sediment transport from hydrostatic testing.

Impacts to Waterbodies from Rock Blasting and Mitigation Measures

Temporary impacts from blasting of rock to excavate the pipeline trench in an open-cut crossing of a flowing waterbody can include a short-term increase in the sediment load in the waterbody during the period of trenching and injury to fish and mussels from the shock wave created by the blast. Exposure to high levels of suspended solids can cause loss of fish egg and fry, reduced natural fish movements, fish vacating areas of high suspended solids, and other adverse impacts on fisheries resources. Table 2.2-11 identifies waterbodies that will be crossed in areas where existing data shows potential for bedrock to be encountered within the trench depth (i.e., shallow bedrock) and where blasting could be required to excavate the trench.

Table 2.2-11

Waterbodies Crossed by the Pipeline in Areas of Shallow Bedrock

State/County	Milepost	Waterbody Name	Flow Type
West Virginia			
Wetzel	5.1	Price Run	Perennial
Wetzel	5.1	UNT/Price Run	Intermittent
Wetzel	8.0	Sams Run	Perennial
Wetzel	8.9	Manion Run	Perennial
Harrison	15.5	Little Tenmile Creek	Perennial
Harrison	26.0	Salem Fork	Perennial
Doddridge	35.0	Laurel Run	Perennial
Lewis	42.7	Right Fork Freemans Creek	Perennial
Lewis	44.8	Fink Creek	Perennial
Lewis	46.0	Left Fork Freemans Creek	Perennial
Lewis	55.2	Sand Fork	Ephemeral
Lewis	58.6	Indian Fork	Perennial
Lewis	62.3	Oil Creek	Perennial
Lewis	65.6	Clover Fork	Perennial
Braxton	67.5	Barbecue Run	Perennial
Braxton	68.8	Left Fork Knawl Creek	Perennial
Braxton	71.8	Keith Run	Intermittent
Braxton	72.6	Falls Run	Perennial

Table 2.2-11

Waterbodies Crossed by the Pipeline in Areas of Shallow Bedrock

State/County	Milepost	Waterbody Name	Flow Type
Braxton	75.0	Little Kanawha River	Perennial
Braxton	76.8	Stonecoal Run	Perennial
Braxton	77.7	UNT/Laurel Run	Perennial
Braxton	79.8	Mudlick Run	Perennial
Webster	81.7	Left Fork Holly River	Perennial
Webster	82.4	Oldlick Creek	Perennial
Webster	84.2	Right Fork Holly River	Perennial
Webster	87.6	Cow Run	Perennial
Webster	92.5	UNT/Camp Creek	Perennial
Webster	93.1	Lower Laurel Fork	Perennial
Webster	93.2	Camp Creek	Perennial
Webster	97.7	Amos Run	Perennial
Webster	98.7	Lost Run	Perennial
Webster	98.9	Laurel Creek	Perennial
Webster	104.7	UNT/Birch River	Perennial
Webster	109.9	Strouds Creek	Perennial
Nicholas	111.0	Barn Run	Perennial
Nicholas	114.0	Big Beaver Creek	Perennial
Nicholas	114.2	UNT/Big Beaver Creek	Perennial
Nicholas	116.4	UNT/Granny Run	Intermittent
Nicholas	118.6	Gauley River	Perennial
Nicholas	119.9	UNT/Little Laurel Creek	Perennial
Nicholas	123.1	Jims Creek	Ephemeral
Nicholas	126.5	Hominy Creek	Perennial
Nicholas	130.1	Sugar Branch	Perennial
Nicholas	132.0	UNT/Hominy Creek	Perennial
Greenbrier	140.1	Meadow Creek	Perennial
Greenbrier	143.7	Meadow River	Perennial
Greenbrier	154.6	Buffalo Creek	Perennial
Greenbrier	154.9	UNT/Buffalo Creek	Perennial
Greenbrier	156.4	UNT/Meadow River	Perennial
Summers	162.6	Lick Creek	Perennial
Summers	169.8	Hungard Creek	Perennial
Summers	171.8	Kelly Creek	Perennial
Monroe	181.4	UNT/Slate Run	Perennial
Monroe	181.6	Slate Run	Perennial
Monroe	181.9	Indian Creek	Perennial
Monroe	186.7	Hans Creek	Perennial

Table 2.2-11

Waterbodies Crossed by the Pipeline in Areas of Shallow Bedrock

State/County	Milepost	Waterbody Name	Flow Type
Virginia			
Giles	198.0	Kimballton Branch	Perennial
Giles	199.4	Stony Creek	Perennial
Giles	202.5	UNT/Little Stony Creek	Perennial
Giles	203.4	Little Stony Creek	Perennial
Giles	204.8	UNT/Doe Creek	Perennial
Giles	205.7	Doe Creek	Perennial
Giles	206.7	UNT/Sinking Creek	Perennial
Giles	209.9	Sinking Creek	Artificial Path
Montgomery	218.3	UNT/Craig Creek	Intermittent
Montgomery	218.6	Craig Creek	Perennial
Montgomery	220.1	UNT/Mill Creek	Intermittent
Montgomery	227.6	UNT/Flatwoods Branch	Perennial
Montgomery	229.2	Bradshaw Creek	Perennial
Montgomery	233.8	Roanoke River	Artificial Path
Montgomery	234.0	UNT/Roanoke River	Intermittent
Roanoke County	238.8	UNT/Bottom Creek	Perennial
Roanoke County	243.0	Mill Creek	Perennial
Franklin County	244.8	UNT/Green Creek	Perennial
Franklin County	246.9	UNT/North Fork Blackwater River	Perennial
Franklin County	247.3	North Fork Blackwater River	Perennial
Franklin County	253.9	UNT/Little Creek	Intermittent
Franklin County	258.5	Teels Creek	Perennial
Franklin County	259.6	UNT/Teels Creek	Perennial
Franklin County	260.8	Little Creek	Artificial Path
Franklin County	264.5	UNT/Blackwater River	Perennial
Franklin County	266.1	UNT/Maggodee Creek	Perennial
Franklin County	266.6	Maggodee Creek	Perennial
Franklin County	266.9	Blackwater River	Perennial
Franklin County	268.6	UNT/Foul Ground Creek	Ephemeral
Franklin County	269.6	Foul Ground Creek	Intermittent
Franklin County	271.4	UNT/Poplar Camp Creek	Perennial
Franklin County	271.6	Poplar Camp Creek	Perennial
Franklin County	274.6	UNT/Jacks Creek	Perennial
Franklin County	277.2	UNT/Little Jacks Creek	Perennial
Franklin County	279.4	Owens Creek	Intermittent
Pittsylvania	281.6	UNT/Jonnikin Creek	Perennial
Pittsylvania	282.0	Jonnikin Creek	Perennial
Pittsylvania	284.3	UNT/Rocky Creek	Perennial
Pittsylvania	286.3	Pigg River	Perennial
Pittsylvania	289.2	Harpen Creek	Perennial

Table 2.2-11 Waterbodies Crossed by the Pipeline in Areas of Shallow Bedrock			
State/County	**Milepost**	**Waterbody Name**	**Flow Type**
Pittsylvania	289.6	UNT/Harpen Creek	Perennial
Pittsylvania	292.0	UNT/Cherrystone Creek	Perennial
Pittsylvania	292.4	Cherrystone Creek	Perennial
Pittsylvania	293.8	UNT/Pole Bridge Branch	Perennial
Pittsylvania	298.6	UNT/Little Cherrystone Creek	Perennial

To avoid these potential impacts, the following mitigation measures will be implemented by MVP:

- MVP will adhere to the FERC Plan and Procedures and will develop a Project-specific Blasting Plan to follow when blasting rock in an open-cut crossing of a waterbody. Blasting for trench excavation will be considered only after all other reasonable means of excavation are determined to be unlikely to achieve the required results. Blasting in smaller (generally less than 20 feet wide) or intermittent streams, would be avoided during high flow events, and/or done during dry periods to the extent possible.

Waterbodies in Karst Areas

Working under or through streams in karst areas could provide direct conduits for rapid surface water flow into subsurface karst features and potentially impact subsurface karst features and the stream. However, additional study and mitigation measures and procedures described in the Karst Mitigation Plan included in Resource Report 6 would be employed to avoid impacts to streams in karst areas. Waterbodies that are crossed by the pipeline within karst areas are included in Table 2.2-12.

Table 2.2-12 Waterbodies Crossed in Karst Areas			
State/County	**Milepost**	**Waterbody Name**	**Flow Type**
West Virginia			
Monroe	191.1	Dry Creek	Perennial
Monroe	191.1	UNT/Dry Creek	Ephemeral
Monroe	194.2	UNT/Painter Run	Intermittent
Virginia			
Giles	198.0	Kimballton Branch	Perennial
Giles	198.0	UNT/Kimballton Branch	Ephemeral
Giles	199.1	UNT/Stony Creek	Ephemeral
Giles	199.4	Stony Creek	Perennial
Giles	201.7	Pond	NR
Giles	201.7	UNT/Dry Branch	Perennial
Giles	203.4	Little Stony Creek	Perennial
Giles	203.5	UNT/Little Stony Creek	Intermittent
Giles	204.8	UNT/Doe Creek	Perennial
Giles	205.7	Doe Creek	Perennial

Table 2.2-12 Waterbodies Crossed in Karst Areas			
State/County	**Milepost**	**Waterbody Name**	**Flow Type**
Giles	206.7	UNT/Sinking Creek	Perennial
Giles	209.9	Sinking Creek	Artificial Path
Giles	211.7	Greenbrier Branch	Perennial
Montgomery	222.9	UNT/Mosey Spring Branch	Intermittent
Montgomery	223.9	Mill Creek	Perennial
Montgomery	223.9	UNT/Mill Creek	Intermittent
Montgomery	225.8	North Fork Roanoke River	Perennial
Montgomery	226.2	UNT/North Fork Roanoke River	Perennial
Montgomery	232.6	UNT/Roanoke River	Intermittent

Alternative Measures to the FERC Procedures

In most instances, proposed locations of ATWS are beyond 50 feet of a waterbody. However, there are locations where MVP has located ATWS within 50 feet of waterbodies, primarily due to topography. The list of ATWS located within 50 feet of waterbodies is included in Appendix 2-A (Table 2-A-3).

2.3 WETLAND RESOURCES

The USACE and USEPA jointly define wetlands as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Environmental Laboratory 1987). The FERC defines wetlands as any area that is not in actively cultivated or rotated cropland and that satisfies the requirements of the current federal methodology for identifying and delineating wetlands. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands are regulated at the federal, state, and local level.

At the federal level, wetlands may be deemed Waters of the United States. The USACE regulates activities in Waters of the United States under Section 404 of the CWA (33 U.S.C. §1344), Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. §403), and Section 103 of the Marine Protection Research and Sanctuaries Act of 1972 (33 U.S.C. §1413). Sections 401 and 404 of the CWA were created specifically with the intent "to restore and maintain the chemical, physical, and biological integrity of our Nation's waters." The USACE has authority under Section 404 of the CWA to review and issue permits for activities that would result in the discharge of dredged or fill material into wetlands or other jurisdictional waterbodies. Section 401 of the CWA requires that proposed dredge and fill activities under Section 404 be reviewed and certified by the designated state agency and that the Project meet state water quality standards. In this case, the WVDEP and VDEQ have been delegated this authority and are charged with verifying that the project meets state water quality standards.

EPA and USACE published in the Federal Register on June 29, 2015 The Clean Water Rule: Definition of "Waters of the United States". The rule became effective on August 28, 2015. The Clean Water Rule more clearly identified waters protected under the CWA. The rule does not create any new permitting requirements. Although, on October 9, 2015 the United States Court of Appeals for the Sixth Circuit issued a stay against enforcement under the Clean Water Rule. MVP will continue to coordinate with the USACE to determine application requirements, or other requests, to ensure the Project is in compliance with legislation as it develops. A separate wetland delineation report will be completed for submittal to the USACE for permitting requirements. Wetlands included in the wetland delineation report are included in Resource Report 2 for consistency.

MVP will coordinate with the appropriate local, state, and federal resource agencies during the permitting process for planning, approval, implementation, and maintenance phases of pipeline construction and operation.

The wetland permitting requirements for the MVP Project will be handled by each of the three USACE Districts crossed separately (Pittsburgh, Huntington, and Norfolk). The basic process of obtaining wetland permits from Norfolk District and Huntington District for the MVP Project includes a pre-application meeting and submittal of an individual permit application. Because of the short distance crossed in the Pittsburgh District, no pre-application meeting is anticipated. West Virginia uses separate applications for Section 401 Water Quality Certification and individual permits under Section 404. Virginia uses a joint permit application for Sections 401 and 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. The process for each state is briefly described below.

West Virginia Permitting

A Nationwide Permit application will be submitted to the USACE, Huntington and Pittsburgh Districts to apply for permits for work in the Waters of the United States (including wetlands) in West Virginia. In addition to the FERC process for public notification, the Huntington and Pittsburgh Districts may require a separate 30-day notification process. Section 401 Water Quality Certification is required for each permit or license issued by a federal agency to ensure that projects will not violate the state's water quality standards or stream designated uses. States are authorized to issue Certification under Section 401 of the Federal Clean Water Act. The Division of Water and Waste Management may grant, grant with conditions, waive, or deny 401 Water Quality Certification. A request for CWA Section 401 Individual State Water Quality Certification from the WVDEP is submitted via the application form to Division of Water and Waste Management, Section 401 Program. An application must be completed for any activity involving a discharge into federally non-jurisdictional waters of the State which requires a West Virginia State Waters Permit from the WVDEP.

Virginia Permitting

A Nationwide Permit application will be submitted to the Norfolk District USACE for work in the Waters of the United States (including wetlands) within Virginia. The Nationwide permit application will be submitted to the USACE, the Virginia Marine Resources Commission (VMRC), and the VDEQ for permitting purposes. Permits are submitted to the VMRC, Habitat Management Division and distributed accordingly. The VMRC regulates activities on State-owned submerged lands, tidal wetlands, and dunes/beaches under Code of Virginia Title 28.2, Chapters 12, 13, and 14. The VDEQ regulates activities in state waters and wetlands under Section 401 of the Clean Water Act (33 U.S.C. §1341), under State Water Control Law (Code of Virginia Title 62.1), and Virginia Administrative Code Regulations 9VAC25-210 et seq., 9VAC25-660 et seq., 9VAC25-670 et seq., 9VAC25-680 et seq., and 9VAC25-690 et seq.

2.3.1 Wetland Crossings

MVP conducted wetland delineations in accordance with the 1987 USACE Wetlands Delineation Manual (Environmental Laboratory 1987) and the regional USACE supplements applicable to the Project. The Eastern Mountains and Piedmont Regional Supplement was used for the Project facilities (USACE 2012). Wetland data discussed in this section of Resource Report 2 is based on National Wetlands Inventory (NWI) data (USFWS 2009) and field delineations. According to surveyed field data collected through July 31, 2015 where right-of-way access has been obtained and NWI for all other non-surveyed areas, 127 wetlands would be crossed by the proposed pipeline and 661 wetlands would be crossed by all other construction and operation areas including the pipeline right-of-way, ATWS, aboveground facilities, contractor yards, and access roads. In Appendix 2-B, Table 2-B-1 lists the wetland crossings for NWI and survey field data. Resource Report 2 includes results from field delineations along approximately 211.2 miles (70 percent) of the Pipeline. Wetlands crossed by the remaining 89.7 miles were determined using NWI data. Micrositing of Project facilities may reduce the acres of wetlands impacted, however the pipeline route was designed based on resources and constraints identified in Resource Report 10, and all wetlands could not be avoided due to topography and other constraints. Table 2.3-1 is a summary of wetlands crossed by the Project. Wetland Maps are provided in Appendix 2-C, Figure 2-C-1 of this report.

2.3.2 Types of Wetlands

The wetland classification system used follows the naming convention found in Classification of Wetlands and Deepwater Habitats of the United States (Cowardin 1979). This classification includes five major systems, including marine, estuarine, riverine, lacustrine, and palustrine. The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, emergents, mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 ppm.

Five wetland classes are located in the Project survey corridor: palustrine emergent (PEM), palustrine scrub/shrub (PSS), palustrine forested (PFO), palustrine unconsolidated bottom (PUB), and Riverine unconsolidated bottom (R5UB). However, the dominant wetland system delineated within the survey area is Palustrine, with 82 percent PEM, 10 percent PFO, and 8 percent PSS. Classes describe the general appearance of the habitat in terms of either the dominant life form of the vegetation or the physiography and composition of the substrate. Life-forms (e.g., trees, shrubs, and emergents) are used to define classes because they are easily recognizable, do not change distribution rapidly, and have traditionally been used to classify wetlands. The four classes are as follows:

Palustrine Emergent (PEM) – Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. PEM wetlands within the study corridor were typically dominated by sedges (e.g. *Carex lurida*, *Carex vulpinoidea*, *Carex scoparia*), jewelweed (*Impatiens capensis*), Japanese stiltgrass (*Microstegium vimineum*), Fowl managrass (*Glyceria striata*), soft rush (*Juncus effusus*), dark green bulrush (*Scirpus atrovirens*), false nettle (*Boehmeria cylindrica*), sensitive fern (*Onoclea sensibilis*), wingstem (*Verbesina alternifolia*), arrow-leaved tearthumb (*Persicaria sagittata*), woolgrass (*Scirpus cyperinus*), chuffa (*Cyperus esculentas*), and reed canary grass (*Phalaris arundinacea*).

Table 2.3-1 Summary of Wetlands Crossed by the MVP Project (acres) a/														
State/County	**Impact b/**	**Facility**	**PEM**	**PEM/ PFO**	**PEM/ PSS**	**PSS**	**PSS/ PEM**	**PSS/ PFO**	**PFO**	**PFO/ PSS**	**PUB**	**Riverine**	**Not Reported**	**Total Impact (Acres)**
West Virginia														
Braxton	Permanent	Access Roads	0.01	0	0	0	0	0	0	0	0	0	0	0.01
Braxton	Permanent	Pipeline ROW	0.07	0	0	0.003	0	0	0	0	0	0	0	0.07
Braxton	Temporary	Access Roads Temporary Work Space	0.04	0	0	0	0	0	0	0	0	0	0	0.04
Braxton	Temporary	Ancillary Sites Temporary	0.01	0	0	0	0	0	0	0	0	0	0	0.01
Braxton	Temporary	ROW Temporary Work Space	0.11	0	0	0.01	0	0	0	0	0	0	0	0.12
Braxton	Temporary	ATWS	0.04	0	0	0	0	0	0	0	0	0	0	0.04
Doddridge	Permanent	Access Roads	0.01	0	0	0	0	0	0	0	0	0	0	0.01
Doddridge	Permanent	Pipeline ROW	0.17	0	0	0	0	0	0	0	0	0	0	0.17
Doddridge	Temporary	Access Roads Temporary Work Space	0.01	0	0	0	0	0	0	0	0	0	0	0.01
Doddridge	Temporary	ROW Temporary Work Space	0.25	0	0	0	0	0	0	0	0	0	0	0.25
Doddridge	Temporary	ATWS	0.37	0	0	0	0	0	0	0	0	0	0	0.37
Fayette	Temporary	Access Roads Temporary Work Space	0.00	0	0	0	0	0	0	0	0	0	0	0.00
Greenbrier	Permanent	Access Roads	0.11	0	0	0	0	0	0	0	0	0	0	0.11
Greenbrier	Permanent	Pipeline ROW	1.03	0	0	0.002	0	0.05	0	0	0	0	0	1.08
Greenbrier	Temporary	Access Roads Temporary Work Space	0.35	0	0	0	0	0	0	0	0	0	0	0.35
Greenbrier	Temporary	Ancillary Sites Temporary	0.00	0	0	0	0	0	0	0	0	0	0	0.00
Greenbrier	Temporary	ROW Temporary Work Space	1.57	0	0	0.01	0	0.07	0	0	0	0	0	1.65
Greenbrier	Temporary	ATWS	2.07	0	0	0	0	0	0	0	0.07	0	0	2.14
Harrison	Permanent	Access Roads	0.08	0	0	0	0	0	0	0	0	0	0.01	0.09

Table 2.3-1

Summary of Wetlands Crossed by the MVP Project (acres) a/

State/County	Impact b/	Facility	PEM	PEM/ PFO	PEM/ PSS	PSS	PSS/ PEM	PSS/ PFO	PFO	PFO/ PSS	PUB	Riverine	Not Reported	Total Impact (Acres)
Harrison	Permanent	Pipeline ROW	0.40	0	0	0	0	0	0	0	0	0	0	0.40
Harrison	Temporary	Access Roads Temporary Work Space	0.35	0	0	0	0	0	0	0	0	0	0.02	0.37
Harrison	Temporary	ROW Temporary Work Space	0.64	0	0	0	0	0	0	0	0	0	0	0.64
Harrison	Temporary	ATWS	0.29	0	0	0	0	0	0	0	0	0	0	0.29
Lewis	Permanent	Access Roads	0.10	0	0	0.00	0	0	0	0	0	0	0	0.10
Lewis	Permanent	Pipeline ROW	0.90	0	0	0.05	0	0	0	0	0	0	0	0.95
Lewis	Temporary	Access Roads Temporary Work Space	0.51	0	0	0.01	0	0	0	0	0	0	0	0.52
Lewis	Temporary	ROW Temporary Work Space	1.51	0	0	0.08	0	0	0	0	0	0	0	1.59
Lewis	Temporary	ATWS	1.03	0	0	0.002	0	0	0	0	0	0	0	1.04
Monroe	Permanent	Access Roads	0.02	0	0	0	0	0	0	0	0	0	0	0.02
Monroe	Permanent	Pipeline ROW	0.42	0	0	0	0	0	0	0	0	0	0	0.42
Monroe	Temporary	Access Roads Temporary Work Space	0.07	0	0	0	0	0	0	0	0	0	0	0.07
Monroe	Temporary	ROW Temporary Work Space	0.64	0	0	0	0	0	0	0	0	0	0	0.64
Monroe	Temporary	ATWS	0	0	0	0	0	0	0	0	0.03	0	0	0.03
Nicholas	Permanent	Access Roads	0.00	0	0	0.00	0	0	0	0	0	0	0	0.00
Nicholas	Permanent	Pipeline ROW	0.64	0	0	0.13	0	0	0.18	0	0	0	0.03	0.97
Nicholas	Temporary	Access Roads Temporary Work Space	0.28	0.002	0	0.04	0	0	0.001		0	0	0	0.32
Nicholas	Temporary	Ancillary Sites Temporary	1.19	0	0	0	0	0	0	0	0	0	0	1.19
Nicholas	Temporary	ROW Temporary Work Space	1.01	0	0	0.19	0	0	0.26		0	0	0.03	1.49
Nicholas	Temporary	ATWS	0.11	0	0	0	0	0	0	0	0	0	0	0.11

Table 2.3-1

Summary of Wetlands Crossed by the MVP Project (acres) a/

State/County	Impact b/	Facility	PEM	PEM/ PFO	PEM/ PSS	PSS	PSS/ PEM	PSS/ PFO	PFO	PFO/ PSS	PUB	Riverine	Not Reported	Total Impact (Acres)
Summers	Permanent	Access Roads	0.06	0	0	0	0	0	0	0	0	0	0	0.06
Summers	Permanent	Pipeline ROW	0.15	0	0	0	0	0	0.39	0	0	0	0	0.54
Summers	Temporary	Access Roads Temporary Work Space	0.07	0	0	0	0	0	0.04	0	0	0	0	0.11
Summers	Temporary	ROW Temporary Work Space	0.24	0	0	0	0	0	0.61	0	0	0	0	0.84
Webster	Permanent	Access Roads	0.17	0	0	0.01	0	0	0.00	0	0	0	0	0.18
Webster	Permanent	Pipeline ROW	0.37	0	0	0.08	0	0	0.30	0	0	0	0	0.75
Webster	Temporary	Access Roads Temporary Work Space	1.01	0	0	0.02	0	0	0.01	0	0	0	0.05	1.09
Webster	Temporary	ROW Temporary Work Space	0.67	0	0	0.11	0	0	0.41	0	0	0	0	1.19
Wetzel	Permanent	Access Roads	0.14	0	0	0	0	0	0	0	0	0	0	0.14
Wetzel	Permanent	Pipeline ROW	0.13	0.07	0	0	0	0	0	0	0	0	0	0.20
Wetzel	Temporary	Access Roads Temporary Work Space	0.77	0.0003	0	0	0	0	0	0	0	0	0.01	0.78
Wetzel	Temporary	Ancillary Sites Temporary	0	0	0	0	0	0	0	0	0	0.03	0	0.03
Wetzel	Temporary	ROW Temporary Work Space	0.19	0.10	0	0	0	0	0	0	0	0	0	0.29
Wetzel	Temporary	ATWS	0.22	0	0	0	0	0	0	0	0	0	0	0.22
West Virginia Total of Temporary Impacts			15.63	0.11	0.00	0.46	0.00	0.07	1.32	0.00	0.09	0.03	0.12	17.84
West Virginia Total of Permanent Impacts			4.99	0.07	0.00	0.27	0.00	0.05	0.87	0.00	0.00	0.00	0.04	6.28
Virginia														
Franklin	Permanent	Pipeline ROW	0.36	0	0.03	0.29	0	0	0.10	0	0.02	0	0	0.79
Franklin	Temporary	ROW Temporary Work Space	1.15	0	0.03	0.57	0	0	0.18	0	0.02	0	0	1.95
Franklin	Temporary	ATWS	0.01	0	0	0	0	0	0	0	0	0	0	0.01
Giles	Permanent	Pipeline ROW	0.02	0	0	0	0	0.02	0	0	0	0	0	0.04

Table 2.3-1

Summary of Wetlands Crossed by the MVP Project (acres) a/

State/County	Impact b/	Facility	PEM	PEM/ PFO	PEM/ PSS	PSS	PSS/ PEM	PSS/ PFO	PFO	PFO/ PSS	PUB	Riverine	Not Reported	Total Impact (Acres)
Giles	Temporary	ROW Temporary Work Space	0.03	0	0	0	0	0.03	0	0	0	0	0	0.05
Montgomery	Permanent	Pipeline ROW	0.11	0	0	0.00	0	0	0.02	0	0	0.10	0	0.24
Montgomery	Temporary	Ancillary Sites Temporary	0	0	0	0	0	0	0	0	0.24	0	0	0.24
Montgomery	Temporary	ROW Temporary Work Space	0.23	0	0	0.01	0	0	0.04	0	0	0.15	0	0.44
Pittsylvania	Permanent	Pipeline ROW	0.89	0	0	0.00	0	0	0.50	0	0	0	0	1.39
Pittsylvania	Temporary	ROW Temporary Work Space	1.36	0	0	0.00	0	0	0.88	0	0	0	0	2.24
Pittsylvania	Temporary	ATWS	0	0	0	0	0	0	0.16	0	0	0	0	0.16
Roanoke	Permanent	Access Roads	0	0	0	0	0	0	0.00	0	0	0	0	0.00
Roanoke	Permanent	Pipeline ROW	0.21	0	0	0.47	0	0	0	0	0	0	0	0.68
Roanoke	Temporary	Access Roads Temporary Work Space	0	0	0	0	0	0	0	0.06	0.01	0	0	0.07
Roanoke	Temporary	ROW Temporary Work Space	0.30	0	0	0.70	0.06	0	0	0	0	0	0	1.07
Virginia Total of Temporary Impacts			3.08	0	0.03	1.29	0.06	0.03	1.26	0.06	0.26	0.15	0	6.23
Virginia Total of Permanent Impacts			1.59	0	0.03	0.76	0.00	0.02	0.63	0.00	0.02	0.10	0	3.14

Notes:
a/ Table populated with Field survey data through July 31, 2015 and USFWS 2009 NWI data.
b/ Temporary (construction) impacts include the permanent (operational) footprint
Access Roads Temporary Work Space includes the permanent access road footprint
ROW Temporary Work Space includes the permanent pipeline ROW footprint
ATWS - Additional Temporary Work Space is the construction disturbance including the permanent disturbance for all facilities outside of the ROW Temporary Work Space
c/ Cowardin wetland classification
PEM - Palustrine Emergent
PSS - Palustrine Scrub/Shrub
PFO - Palustrine Forested
PUB - Palustrine Unconsolidated Bottom

Palustrine Scrub/Shrub (PSS) – Scrub/shrub wetlands are characterized by woody vegetation that is generally less than 6 meters (~20 feet) tall. The woody angiosperms (i.e., small trees or shrubs) in this broad leaved deciduous community have relatively wide, flat leaves that are shed annually during the cold or dry season. PSS wetlands within the study corridor are typically dominated by black willow (*Salix nigra*), black elderberry (*Sambucus nigra*), green ash (*Fraxinus pennsylvanica*), spicebush (*Lindera benzoin*), silky dogwood (*Cornus amomum)*, nannyberry (*Viburnum lentago*), sedges (e.g. *Carex lurida*, *Carex scoparia*), false nettle, sensitive fern, soft rush, Japanese stiltgrass, jewelweed, and golden ragwort (*Packera aurea*).

Palustrine Forested (PFO) – Forested wetlands are characterized by woody vegetation that is 6 meters in height or taller. The woody angiosperms (i.e., trees or shrubs) in this broad leaved deciduous community have relatively wide, flat leaves that are shed annually during the cold or dry season. PFO wetlands within the study corridor are typically dominated by black willow, black elderberry, red maple (*Acer rubrum*), green ash, ironwood (*Carpinus caroliniana*), yellow birch (*Betula allegheniensis*), American elm (*Ulmus americana*), Japanese stiltgrass, sensitive fern, jewelweed, and golden ragwort.

Palustrine Unconsolidated Bottom (PUB)– Open water communities generally have water depths of less than 6.6 feet (2 meters) and remain permanently inundated. PUB wetlands within the study corridor are typically dominated by ponded water and little to no emergent vegetation, typically around the pond edge. The substrate of the PUB wetlands typically consist of decaying organic matter and unconsolidated sand, clay, silt and cobble.

Riverine – Wetland habitats contained within a channel and does not include wetlands dominated by trees, shrubs, or persistent emergent vegetation. The Riverine wetlands are bounded by uplands and the river channel.

2.3.3 Wetland Crossing Methods

Crossing of jurisdictional wetlands will be completed in accordance with state and federal permits and the FERC Plan and Procedures. The FERC Plan and Procedures were developed to provide a standard set of wetland crossing methods that allow practical installation of a pipeline while avoiding and minimizing short and long-term impacts on wetlands to the greatest extent practical. Application of measures from the FERC Plan and Procedures avoids the need for site-specific crossing plans. However, MVP will prepare additional plans if required by other Federal or state permitting.

Operation of construction equipment in wetlands will be limited to that needed to clear the right-of-way, dig the trench, fabricate the pipe, install the pipe, backfill the trench, and restore the right-of-way. MVP will segregate the topsoil up to one foot in depth over the trench line in wetlands where hydrologic conditions permit this practice (where soils are not saturated).

Restoration and monitoring of wetland crossings will be conducted in accordance with the FERC Plan and Procedures to ensure successful wetland revegetation. Other Federal and State permit seeding requirements as well as Wildlife Habitat Council recommendations will be considered where applicable. MVP is committed to increase conservation and biodiversity in the region by using native grasses and wildflowers.

Hydrological conditions in wetlands will likely dictate the use of either wet or dry open ditch lay, or open ditch push/pull lay methods. Selection of the most appropriate method will depend on site-specific weather conditions, inundation, soil saturation, and soil stability at the time of construction. The wet or dry open ditch lay method will be the most frequently used technique for installation of the pipeline in wetlands. In general, the push/pull lay method will be used in long wetland crossings that are inundated or saturated with groundwater at or near the surface at the time of the crossing. Selection of the push/pull method will be decided during construction by the construction supervisor and/or the MVP representative depending on the conditions at the time of construction.

MVP has considered the avoidance of potential impacts to wetlands in selecting its proposed route. Where wetlands cannot be avoided, MVP will seek to minimize impacts through the use of wetland construction procedures. In accordance with FERC Procedures, fuel will not be stored within 100 feet of wetlands or other waterbodies during construction. MVP is committed to constructing the Project in accordance with FERC Plan and Procedures and MVP's E&SCP to the maximum extent practicable. MVP will request site-specific variances, if necessary, to Section VI.B.1 (location of extra workspaces in wetlands) of FERC Procedures providing a location-specific justification for each requested variance. General wetland crossing methods are described below; actual crossing methods will be dependent upon actual conditions in the field and agency requirements.

Unsaturated Wetland Crossings

In crossing unsaturated wetlands (wetlands without standing water or saturated soils), construction will be similar to the typical upland construction described in Resource Report 1, with some exceptions. One exception is that only one traffic lane will be provided for construction equipment in unsaturated wetlands to minimize disturbance acreage within the wetland. However, another exception is MVP may identify specific locations where it would use a wider construction right-of-way in wetlands than the nominal 75-foot construction right-of-way required by the FERC Procedures. If this is necessary, MVP will request a variance from Section VI of the FERC Procedures and will provide site-specific reasoning for the request. If normal construction equipment activity causes rutting or mixing of wetland topsoil and subsoil, low-ground-pressure equipment will be used, or temporary equipment mats will be installed to allow passage of equipment with minimal disturbance of the surface and vegetation. Trees will be cut to grade, but stumps will only be removed within 15 feet of the edge of the pipe trench, or where safety concerns dictate otherwise. Topsoil over the pipe trench will be segregated from subsoils. A vegetation buffer zone will be left between the wetland and the upland construction areas, except for the pipe trench and travel lane. Erosion control measures such as silt fences, interceptor dikes, and hay bale structures will be installed and maintained to minimize sedimentation within the wetland. Trench plugs will be installed where necessary to prevent the unintentional draining of water from the wetland. Upon completion of construction, the right-of-way will be restored, and a 10-foot wide strip centered on the pipeline will be maintained in an herbaceous state.

Saturated Wetland Crossings

For the purposes of this report, saturated wetlands include wetlands with standing water or highly saturated soils at the time of construction, but not those wetlands that are constantly or regularly completely submerged. Topsoil segregation will not be practical in saturated wetlands. Otherwise, construction will be similar as described for unsaturated wetlands to provide for anticipated widths of the pipeline trench and trench spoil areas. Equipment mats or timbers will be used to facilitate equipment movement through and work within the wetland. Equipment not associated with the pipeline construction within the wetland will be allowed to pass through the wetland when there is no other reasonable access, as provided in the FERC

Procedures. For long wetland crossings with standing water or groundwater levels at or near the surface, MVP may use the open ditch push/pull technique (see above).

2.3.4 Construction and Operation Impacts and Mitigation

Temporary construction impacts in wetlands may include loss of herbaceous and scrub/shrub vegetation; wildlife habitat disruption; soil disturbance associated with grading, trenching, and stump removal; soil compaction; sedimentation and turbidity increases; and hydrological profile changes. Impacts to forested wetlands may include long-term conversion to emergent and/or scrub/shrub wetland types as a result of tree removal within the construction and operational right-of-way. Operation of construction equipment through wetlands will be limited to only that necessary for each stage of pipeline installation. Topsoil segregation techniques will be used in unsaturated wetlands to preserve the seed bank and to facilitate successful restoration. Wetland crossing methods will be determined based on site-specific conditions. Wetlands with soils that can support construction equipment may be crossed using the open-ditch method, as described above, with the use of timber mats to prevent soil rutting. In forested wetlands, MVP will minimize tree clearing to the extent practicable while maintaining safe construction conditions. A typical right-of-way cross section drawing for wetland crossings is provided in Resource Report 1.

Wetland soils (hydric soils) are susceptible to compaction with operation of construction equipment over wet soils, thereby reducing the porosity and moisture-holding capacity of the soils and interfering with the hydrology of the wetland. In order to minimize compaction, MVP will limit construction traffic to only that required to accomplish the construction. Low-ground-pressure equipment will be used, or temporary equipment mats will be installed to allow passage of equipment with minimal disturbance of the surface soils and vegetation. Compacted areas will be tilled as necessary. Further discussion of soil compaction, construction activities in hydric soils, and restoration is included in Resource Report 7.

Fuel will not be stored or equipment refueled within 100 feet of wetlands or other waterbodies. Additionally, MVP will obtain and adhere to the requirements of the permits related to wetland impacts for the Project.

In general, it is not possible to locate a 300-mile-long linear project entirely in uplands, therefore some wetlands impacts are unavoidable. The alternatives analysis in in Resource Report 10 provides a comparison of alternative pipeline routes evaluated by MVP, including a comparison of the length and acreage of wetlands crossed by various pipeline alternatives. Resource Report 10 describes how the pipeline route was selected and the evaluation of impacts on waters, wetlands, and other environmental factors in selecting the proposed route.

Outside of wetland areas, the width of the permanent right-of-way will be maintained in accordance with the FERC Procedures, utilizing both mowing equipment and hand-cutting at least every three years; however, a ten-foot wide section directly over the pipeline may be maintained more regularly. In wetland areas, routine vegetation, mowing, or clearing will not occur over the entire permanent right-of-way. Woody vegetation with roots within 15 feet of the pipeline will be selectively cut and removed. Herbicides will not be used unless required by the respective land management agency.

General Wetland Mitigation Strategies

- In addition to wetlands crossing avoidance or minimization during route design and selection of appropriate crossing techniques, MVP will limit wetland impacts by adherence to the FERC Plan and Procedures and applicable permit requirements.
- Trees will be cut to grade, but stumps will only be removed directly over the trenchline, or where safety concerns dictate otherwise. This will allow existing vegetation to recover more rapidly in the remainder of the right-of-way once the equipment mats and spoil piles have been removed.
- Operation of construction equipment in wetlands will be limited to that needed to clear the right-of-way, excavate the trench, fabricate the pipe, install the pipe, backfill the trench, and restore the right-of-way.
- After the pipeline is installed in the trench, MVP will backfill the ditch with the spoil excavated from the wetland. If dewatering of the trench is necessary, it will be conducted in a manner designed to prevent heavily silt-laden water from entering a waterbody or undisturbed portions of the wetland. Following backfilling, the segregated topsoil will be spread over the area from which it was stripped and restored to approximate pre-construction contour. MVP will remove any timber riprap, timber mats, or other material from the wetland after construction.
- No herbicides, pesticides, lime, fertilizer, or mulch will be used in wetland areas unless required in writing by the appropriate land management or state agency.
- As described in the FERC Plan and Procedures, and in connection with the Wildlife Habitat Council, MVP will develop a project-specific wetland restoration plan where needed in consultation with the appropriate land management or state agencies. In general, MVP will seed wetland areas that are not inundated with standing water with an annual seed mix following the written recommendations for seed mixes, rates, and dates obtained from the appropriate soil conservation authorities. Topsoil segregation in unsaturated wetlands will preserve the native seed source, which will facilitate regrowth of wetland herbaceous and/or woody plant species through natural succession. MVP will document communications with the USACE and appropriate state agencies regarding the development of any additional wetland mitigation measures that may be required as conditions of specific permits.

Impacts to Forested Wetlands and Mitigation Measures

After the pipeline is constructed, MVP will periodically remove woody species from forested wetlands to facilitate post-construction inspections along the permanently maintained pipeline right-of-way. USDOT regulations limit the re-growth of trees over the pipeline. This operational requirement would result in the long-term conversion of some forested wetlands to emergent and/or scrub/shrub wetland types.

Crossing of the pipeline through forested wetlands has been minimized to the maximum extent practicable through Project siting. Clearing for construction within forested wetlands and vegetation maintenance during pipeline operation will be limited per the FERC Procedures, such that only the minimum width needed for pipeline protection and surveillance is maintained, in an effort to reduce permanent impacts to forested wetlands.

As required by the FERC Procedures, MVP will maintain no more than a 10-foot-wide strip centered over the pipeline in an herbaceous state and will only remove woody vegetation within a 30-foot-wide strip centered over the pipeline. This will result in a 10-foot wide strip of herbaceous vegetation centered over the pipeline flanked by a potential shrub (PSS wetland type) strip of 10-foot width on either side.

Impacts to Adjacent Wetlands from Hydrological Profile Changes and Mitigation Measures

Hydrological profile changes from construction activities could adversely affect undisturbed wetlands adjacent to the construction right-of-way. In order to avoid these impacts, pre-construction wetland conditions including contours in the construction right-of-way will be restored to the extent possible. Hydric soils are susceptible to compaction and rutting depending on the saturation levels. MVP will minimize compaction and rutting of hydric soils by limiting access during wet periods, use low-ground pressure equipment, or temporary equipment mats to allow passage of equipment with minimal disturbance of the surface and vegetation. Further discussion of impacts to soil saturation and mitigation is addressed in Resource Report 7. Construction in wetlands will follow the measures included in the FERC's Procedures to minimize effects.

MVP will follow FERC's Procedures requiring the use of trench breakers or installation of trench plugs in areas of shallow groundwater and on slopes. Trench breakers (or plugs) would prevent local shallow groundwater and recharge (via precipitation) from flowing along the pipeline trench and away from wetlands. Trench plugs are installed after the pipeline is installed in the trench and prior to trench backfilling.

Impacts to Adjacent Wetlands from Accidental Spills and Mitigation Measures

During construction, accidental spills of fuels, oils or other hazardous materials during wetland crossings could adversely affect adjacent undisturbed wetlands or reduce the successful restoration of wetlands in the construction right-of-way.

In order to avoid these impacts, MVP will develop a Project-specific SPCC Plan for implementation during construction. The SPCC Plan will describe preventive measures such as personnel training, equipment inspection, and refueling procedures to reduce the likelihood of spills. It also includes mitigation measures, such as containment and cleanup, to minimize potential impacts should a spill occur. MVP will minimize the potential impact of spills of hazardous materials by adhering to this Project-specific SPCC Plan, which will be available in the field during construction. Fuel will not be stored or equipment refueled within 100 feet of wetlands or other waterbodies. A copy of the SPCC plan will be filed with FERC when available.

Alternative Measures to the FERC Procedures

ATWS areas may be required on either side of wetland crossings to stage construction, fabricate the pipeline, and store materials. ATWS areas will, to the extent practicable, be located in upland areas a minimum of 50 feet from the wetland edge. In most instances our ATWS is located beyond 50 feet of the wetland. However, there are locations where MVP has located ATWS within 50 feet of the wetland due to topography or other constraints. The list of ATWS located within 50 feet of wetlands, along with the reasoning for siting within 50 feet of a wetland is included in Appendix 2-B (Table 2-B-2).

2.4 JEFFERSON NATIONAL FOREST

MVP will cross approximately 3.4 miles of the Jefferson National Forest (JNF) where it crosses Peters Mountain between MPs 195.3 and 196.9 (1.6 miles), Sinking Creek Mountain between MPs 217.2 and 218.0 (0.8 mile), and Brush Mountain between MPs 218.4 and 219.4 (1.0 mile). Waterbodies that would be affected by the pipeline and construction access road along the 3.4 miles within JNF are listed in Table 2.4.1. Figure 2-C-6 in Appendix 2-C shows the pipeline route in the Jefferson National Forest. Construction methods, impacts, and measures to avoid or minimize impacts on waterbodies crossed within JNF will be identical to that described above, except as may be specified for JNF lands under the terms and conditions included with the Right-of-Way Grant. MVP will work with the FS and appropriate agencies to develop a stream monitoring plan to be implemented during operation of the pipeline on JNF, and the monitoring plan will be included in the Plan of Development prepared to support the application for a Right-of-Way Grant.

For the route within the JNF, wetlands were delineated according to the USACE publications including the USACE Wetland Delineation Manual, 1987, and the new standards clarified by the Clean Water Rule under the Clean Water Act, finalized by the EPA on May 27, 2015. Although, on October 9, 2015 the United States Court of Appeals for the Sixth Circuit issued a stay against enforcement under the Clean Water Rule. MVP will continue to coordinate with the USACE to determine application requirements, or other requests, to ensure the Project is in compliance with legislation as it develops. Where site access was not yet obtained prior to preparation of this application, wetlands were determined using NWI data. Based on the currently available information, no wetlands would be affected by the Project within JNF lands.

There would be no hydrostatic test water withdrawals or discharges within the JNF (see Table 2.2-9.)

The Jefferson National Forest is managed under the 2004 Revised Land and Resource Management Plan (Forest Plan), which includes specific goals, objectives, and standards related to resources, including water resources. MVP has prepared a Forest Plan consistency analysis for the portion of the proposed MVP Project that crosses the JNF, including for water resources. Results of that consistency analysis are included in Appendix 8-F of Resource Report 8.

In comments included with the FERC's August 11, 2015 information request, the USFS requested that MVP include an analysis and monitoring plan of potential water contamination and in-stream effects resulting from long-term operation and maintenance of the proposed pipeline. Long term operation and maintenance of the buried natural gas pipeline will not result in water contamination within the waterbodies crossed. The natural gas pipeline will not transport liquids or liquid products, and MVP has committed to not using herbicides or pesticides for routine vegetation maintenance of the pipeline right-of-way, unless specifically requested by a land management agency.

Table 2.4-1

Waterbodies Crossed on the Jefferson National Forest

State/ County	Waterbody Name	Milepost	Impact Type	Facility	Length of Pipeline Crossing (Feet) a/	Area of Crossing (Acres)
VA/ Giles	Kimballton Branch	195.8	Permanent	Access Road		0.007
	Kimballton Branch	195.8	Temporary	Access Road		0.012
	UNT/Kimballton Branch	195.8	Permanent	Access Road		0.004
	UNT/Kimballton Branch	195.8	Temporary	Access Road		0.006
	UNT/Kimballton Branch	195.8	Permanent	Work Space		0.0002
	UNT/Kimballton Branch	195.8	Temporary	Work Space		0.013
	UNT/Kimballton Branch	196.7	Permanent	Access Road		0.005
	UNT/Kimballton Branch	196.7	Temporary	Access Road		0.008
	Curve Branch	196.9	Permanent	Access Road		0.005
	Curve Branch	196.9	Temporary	Access Road		0.009
	UNT/New River	196.9	Permanent	Access Road		0.003
	UNT/New River	196.9	Permanent	Access Road		0.007
	UNT/New River	196.9	Temporary	Access Road		0.005
	UNT/New River	196.9	Temporary	Access Road		0.011
	UNT/Curve Branch	198.5	Permanent	Access Road		0.009
	UNT/Curve Branch	198.5	Temporary	Access Road		0.015
	Clendennin Creek	198.8	Permanent	Access Road		0.008
	Clendennin Creek	198.8	Temporary	Access Road		0.013
	UNT/Clendennin Creek	198.8	Permanent	Access Road		0.007
	UNT/Clendennin Creek	198.8	Temporary	Access Road		0.012
	UNT/Clendennin Creek	198.9	Permanent	Access Road		0.011
	UNT/Clendennin Creek	198.9	Temporary	Access Road		0.02
VA/ Montgomery	UNT/Craig Creek	217.8	Permanent	Pipeline	14.7	0.014
	UNT/Craig Creek	217.8	Temporary	Work Space		0.03
	Craig Creek	218.5	Permanent	Pipeline	22.5	0.03
	Craig Creek	218.5	Temporary	Work Space		0.07
	Craig Creek	218.6	Permanent	Pipeline	12.1	0.014
	Craig Creek	218.6	Temporary	Work Space		0.001
	Craig Creek	218.6	Temporary	Work Space		0.035

a/ If no pipeline crossing length is shown the water would not be crossed by the pipeline centerline, but would be within the construction work space for the pipeline or access roads.

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Resource Report 2

Appendix 2-A
Waterbody Crossing Tables

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Appendix 2-B
Wetland Crossing Tables

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Appendix 2-C
Waterbody and Wetland Maps

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Appendix 2-D
Identified Sites of Potential Contamination Concern within 0.5 Mile of the Proposed MVP Project Work Space

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Appendix 2-E
Water Resources Identification and Testing Plan