Mountain Valley Pipeline Project

Docket No. CP16-__-000

Resource Report 10 – Alternatives

October 2015

Resource Report 10 Filing Requirements	
Information	**Location in Resource Report**
Minimum Filing Requirements	
Address the “no action” alternative (Sec. 380.12(l)(1)).	Section 10.2
For large projects, address the effect of energy conservation or energy alternatives to the project (Sec. 380.12(l)(1)).	Section 10.3
Identify system alternatives considered during the identification of the project and provide the rationale for rejecting each alternative (Sec. 380.12(l)(1)).	Section 10.4
Identify major and minor route alternatives considered to avoid impact on sensitive environmental areas (e.g., wetlands, parks, or residences) and provide sufficient comparative data to justify the selection of the proposed route (Sec. 380.12(l)(2)(ii)).	Section 10.5 and 10.6
Identify alternative sites considered for the location of major new aboveground facilities and provide sufficient comparative data to justify the selection of the proposed site (Sec. 380.12(l)(2)(ii)).	Section 10.7

FERC Environmental Information Request for Resource Report 10 Dated March 13, 2015	
Request	**Location in Resource Report**
1. Include a map illustrating the locations of existing pipeline systems, existing electric transmission lines, and existing major highways in the region (West Virginia and Virginia), and explain if the Mountain Valley pipeline could follow all or portions of those existing rights-of-way as route alternatives.	Appendix 10-A Figure 10.5
2. Discuss if any existing interstate pipelines in the region could be used as a system alternative for the Project. Include a table listing the current capacity of each existing system, and their potential to transport the additional volumes proposed by Mountain Valley.	Addressed by text in Section 10.4
3. Include a map and an analysis of an alternative route that would follow the existing East Tennessee Natural Gas pipeline near Blacksburg, Virginia, then proceed southeast to the existing Transco pipeline, then follow the Transco line northeast to Transco Station 165.	Section 10.5.5
4. Include an analysis regarding whether a modified Alternative 1 route is feasible, where the alternative would be collocated with an electrical transmission line route and periodically deviate away to avoid severe side slopes before resuming collocation. Additionally, consider the feasibility of a hybrid Proposed Route-Alternative 1 route, and include a complete analysis of resource impacts along the hybrid route.	Section 10.5.2.1 Section 10.5.2.2
5. Further assess the potential for collocation of the Mountain Valley pipeline with other proposed pipeline systems in the region, such as the proposed Dominion Atlantic Coast Pipeline (PF15-6), Spectra Carolina Pipeline, Dominion Supply Header Project, and Williams Appalachian Connector Project. Include a map, and consider alternative routes that would totally or partially follow any of the proposed pipeline routes. Include an analysis of each of the alternative routes that lists potential impacts on environmental resources, based on a desk-top review of existing data bases. In addition, assess the potential for two or more proposed pipelines (including the Mountain Valley pipeline and the Atlantic Coast pipeline) in the region for combination into a single pipeline alternative.	Section 10.5.6

FERC Environmental Information Request for Resource Report 10 Dated March 13, 2015		
	Request	**Location in Resource Report**
6.	Revise Sections 10.3, 10.4 and 10.5 to ensure that data categories are consistent in tables for all alternative routes considered. Data categories should include the extent of collocation, river crossings, acres of wetlands affected, miles of forest, acres of habitat for federally-listed threatened and endangered species, National Register of Historic Places listed or eligible sites, miles of steep side-slope construction, areas with landslide potential, karst geology, numbers of landowner parcels affected, and residences within 50 feet of work areas.	See renumbered Sections 10.5 and 10.6
7.	Revise Section 10.5 (page 10-9 of RR10) to include alternative locations for the crossing of the Blue Ridge Parkway, Appalachian Trail, and the Mill Creek Springs Natural Area Preserve. Include colocation of the pipeline with existing roads or utilities at alternative crossing locations, and consider ways to minimize visual impacts and impacts on forest in the vicinity of the alternative crossings.	Blue Ridge Parkway: Sections 10.5.2, 10.5.3, 10.5.5, 10.6.18. Appalachian Trail: Sections 10.5.2, 10.5.3, 10.6.4, 10.6.5, 10.6.6, 10.6.16, 10.6.17: Mill Creek: Section 10.6.8
8.	Discuss route alternatives identified by stakeholders in comments filed in this docket. Illustrate the location of each of the alternative routes on maps, and include a description and analysis of each alternative that compares impacts on environmental resources; in a manner as suggested in question 6 above.	Sections 10.5.5, 10.6.4, 10.6.7, 10.6.9, 10.6.10, 10.6.12, 10.6.14, 10.6.20
9.	Include a table that lists all minor modifications adopted into the proposed pipeline route since Mountain Valley's filing of the Summary of Alternatives in December 2014. The table should list each route modification by location (by MP), description, and rationale for why each minor route adjustment was made.	Section 10.6.20
10.	Add the location of existing communication facilities that were avoided to Figure 10.5-4 (page 10-15 of RR10).	This variation has been eliminated. See Section 10.6.9 for replacement.
11.	Revise Section 10.6 (page 10-20 of RR10) to balance consideration of alternative compressor station locations near existing roads with the desire to locate compressor stations in isolated areas away from residences. For each compressor station alternative location, evaluate site topography and existing vegetation (i.e., trees) as potential sound and visual buffers relative to the nearest noise sensitive areas and residents. Include all applicable information for the sites as described in the comparison table included in Section 10.4 of the FERC's "Guidance Manual for Environmental Report Preparation."	Section 10.7.1.1; Section 10.7.1.2; Section 10.7.1.3
12.	Include an analysis of alternative sites for all other (non-compressor station) aboveground facilities, such as meter stations and valves, that considers their potential for visual impact or noise effects upon residents in comparison to the proposed aboveground facilities locations.	MVP has not evaluated alternative sites for minor aboveground facilities
13.	Table 10.4-1 (page 10-5, RR10) stated that there are no populated areas within 0.5-mile of the proposed route. However, the proposed route would cross the community of Preston Farms. Identify all residential areas, housing tracts, or subdivisions with 0.5 mile of the proposed route and all alternative routes considered. Discuss how the proposed route and all alternative routes would avoid or minimize impacts on specific nearby residential areas, housing tracts, or subdivisions.	Reference was to densely populated areas (cities or towns). Requested information has been added to Sections 10.5 and 10.6
14.	Compare each of the new alternative routes provided in Mountain Valley's February 18, 2015 filing with the FERC, using the data categories suggesting in question 6 above. Identify and describe any associated Project changes associated with each new alternative considered, such as relocation of aboveground facilities. Discuss any environmental issues raised by stakeholders for each of the new alternative routes.	Section 10.5; Section 10.6

FERC Environmental Information Request for Resource Report 10 Dated March 13, 2015	
Request	**Location in Resource Report**
15. Describe the public outreach efforts conducted or planned for stakeholders located along the new alternative routes identified in Mountain Valley's February 18, 2015 filing.	Section 10.6.4

FERC Environmental Information Request for Resource Report 10 (Second Draft) Dated August 11, 2015		
	Request	**Location in Resource Report**
1.	Include a quantified evaluation of the facilities, equipment, and processes that would be required to transport a Project-equivalent volume of natural gas from the supply area to the destination(s) locations via alternative modes such as truck and rail.	Section 10.4
2.	Describe the ability to relocate the natural gas receipt and delivery points with planned customers to accommodate route alternatives or route variations.	Section 10.1.2
3.	As previously requested in our comments on the first draft of RRs 1 & 10 dated March 13, 2015; list, quantify current capacity, and discuss any existing interstate pipelines that could serve as system alternatives. These pipelines should include those that Mountain Valley described as "other existing interstate pipelines that have the ability to essentially move gas due east out of the basin and interconnect with other separately owned interstate pipelines that move essentially due south." In particular, examine any existing systems or combinations of systems that may connect directly or indirectly to Transco Station 165.	Section 10.4
4.	Supplement all alternative comparison data tables to also include the following parameters: forested wetlands (miles and acres affected during both construction and operation), interior forest (miles and acres affected during both construction and operation), major river crossings (number), streams with drinking water designation (number), shallow bedrock (miles), and residences within 125 and 250 feet of a work area (number).	Sections 10.5 and 10.6
5.	Discuss in section 10.4.3 the possibility of a single pipeline that could accommodate the firm transport capacity required of both the Mountain Valley and Atlantic Coast Pipeline (ACP-Docket No. PF15-6-000) projects combined, following a single route from near their points of origin in West Virginia to near the existing Transco Station 165 in Virginia. Using the environmental data available in both the Mountain Valley and ACP dockets, compare impacts for general resources (geology, soils, waterbodies, wetlands, vegetation, wildlife, cultural resources, land use, and air quality) along both the Mountain Valley and ACP routes to determine if one route would have less impacts than the other.	Section 10.4.2
6.	Include in section 10.5 actual (e.g., desktop) data to support and quantify the assertion that much of Route Alternative 1, Modified Route Alternative 1, and Hybrid Alternative 1 are located along severe side slopes and therefore are not suitable for construction and that they "represented insurmountable construction challenges." If applicable, identify substantive alternative, partial route segments that do not have excessive side slopes relative to the proposed route.	Section 10.5.2; Section 10.5.2.1 and 10.5.2.2
7.	Revise section 10.5 to further assess in detail the viability and constructability of the Northern Pipeline Alternative. Specifically, address the advantages of this alternative being collocated with existing pipelines (i.e., approximately 60 miles along Transco) and proposed pipelines (i.e., ACP).	Section 10.5.3

FERC Environmental Information Request for Resource Report 10 (Second Draft) Dated August 11, 2015		
	Request	**Location in Resource Report**
8.	Perform a more detailed analysis of the viability and constructability of the Supply Header Collocation Alternative, and support with data the generalized statement that ridgetops "in the region are not wide enough for placement of two adjacent pipelines." Include collocation with proposed rights-of-way as an additional data category for these analyses. Revise table 10.5-3 to include the number of landowner parcels crossed by the Supply Header Collocation Alternative.	Section 10.5.4
9.	Revise figure 10.5-3 to depict the latest route of the proposed Supply Header pipeline, in addition to the proposed Mountain Valley pipeline route, and the Supply Header Collocation Alternative.	Appendix 10-A, Figure 10.5-3
10.	Include individual sections within RR10 for both the Appalachian Trail and the Blue Ridge Parkway explicitly comparing all alternative crossing sites to each other and include topographic maps, aerial photography, ground-level photography, data comparison tables, and descriptive text. If geotechnical analyses indicate that an HDD or a bore of the Blue Ridge Parkway and Appalachian Trail are infeasible, describe how Mountain Valley would modify its route to find feasible crossings.	Section 10.6.17 and 10.6.18
11.	Include an analysis of a re-route and HDD of Roanoke Road.	Section 10.6.19
12.	Reformat sections 10.6.4, 10.6.5, and 10.6.6 so that the proposed route and alternate routes 110, 110J, and 110R are all collectively and simultaneously compared to each other in one section including the utilization of one comprehensive comparison table covering all four routes.	Section 10.6.4
13.	Based on stakeholder comments, include an assessment of potential designated black bear habitat and the Mountain Shadow Trail that may affect Alternative 110.	Section 10.6.4
14.	Include actual data to quantify the statement that "Alternative 135 would cross more of the easement" for the Nature Conservancy/Ducks Unlimited Conservation Easement described in section 10.6.11. Describe the setting and use of this property, and report the extent and nature of the impacts that would result from selection of the proposed route.	Section 10.6.9 Poor Mountain East Variation
15.	Based on stakeholder comments, include an assessment of whether the intermodal rail yard's status as "under construction" would affect Alternative 135.	Section 10.6.9 Poor Mountain East Variation
16.	Clarify whether the Higginbotham property is owned or managed by the Blue Ridge Nature Conservancy, describe the setting and use of this property, and report the extent and nature of the impacts that would result from selection of the proposed route.	Section 10.6.10
17.	Include data and an explanation to clarify the statement "the alternative does move the route closer to several residences" regarding Alternative 192 in section 10.6.17. That statement is not supported by data in table 10.6-17.	Alternative 192 is no longer included in RR10

FERC Environmental Information Request for Resource Report 10 (Second Draft) Dated August 11, 2015		
	Request	**Location in Resource Report**
18.	Supplement table 10.6-19 to also include data columns for individual tract/parcel numbers as well as a conclusion statement (where applicable) regarding whether a stakeholder's routing or specific resource avoidance concern (e.g., Project proximity to a home, well, spring, wetland, future residential development, etc.) expressed at any time to either to Mountain Valley directly and/or filed on the docket has been resolved (resolution including not just route or work space adjustments, but also potentially changes in construction method or other mutually agreeable mitigation). The analysis should be based on direct stakeholder discussions and on-site evaluations, if the landowner is willing, and on available desktop imagery and data if landowner access is denied. Include two additional, comparable tables with one detailing any requested route modifications/mitigation that were rejected by Mountain Valley and the other describing any such requests that are pending while under review by Mountain Valley.	New Table 10-D-2 in Appendix 10-D.
19.	Include a comparison table and map for the Columbia Gas Peters Mountain Variation in section 10.6.19.	Section 10.6.16
20.	Revise figure 10.6-10 to depict the boundaries of the Blake Preserve (Mill Creek Springs Natural Area Preserve).	Appendix 10-A, Figure 10.6-8
21.	Revise figure 10.6-14 to depict the boundaries of the Higginbotham property.	Appendix 10-A, Figure 10.6-10
22.	Revise figure 10.6-15 to depict the boundaries of the Town of Boones Mill water source treatment plant.	Appendix 10-A, Figure 10.6-12
23.	Prior to submittal of the application, file on the docket the proposed location of the Swann Compressor Station and an assessment of viable alternatives so that the public and stakeholders will have a reasonable opportunity to review and comment on that facility during the pre-filing period.	Swann Compressor Station is no longer proposed
24.	Section 10.7.1 indicates that the proposed site of the Bradshaw Compressor Station would be located directly along the proposed route, however figure 10.7-1 shows a gap in between. Clarify the apparent discrepancy in the text and/or map, and indicate whether a small section of pipe would be needed to connect the proposed Bradshaw Compressor Station with the proposed pipeline. Revise section 10.7.1 to discuss the need for an additional connecting pipe, if applicable, and discuss any additional pipeline needed in all other RRs. Further, section 10.7.1 states that Bradshaw Compressor Station alternate sites 1A and 1B are not located directly along the pipeline route. However, figure 10.7-1 depicts both locations as being directly along the pipeline route. Clarify the apparent discrepancy in the text and/or map.	Section 10.7.1
25.	As previously requested in our comments on the first draft of RRs 1 & 10 dated March 13, 2015, include applicable information for all proposed and alternate compressor station sites as described in section 10.4 of our Guidance Manual for Environmental Report Preparation. Include information on NSAs for all four directions (not just the closest), tree size and composition (hardwood or evergreen) for the vegetation buffers as well as the width of vegetative buffers in relation to NSAs, and topographic considerations for noise and visual screening for the NSAs. Include topographic maps as well as aerial photography depicting the above-mentioned features. Describe and assess in detail the "two residences in close proximity to the proposed site" of the Stallworth Compressor Station.	Section 10.7.1.1, 10.7.1.2, and 10.7.1.3, Appendix 10-A Figures 10.7.1a, 10.7.1b, 10.7.2a, 10.7.2b, 10.7.3a, and 10.7.3b

FERC Environmental Information Request for Resource Report 10 (Second Draft) Dated August 11, 2015		
	Request	**Location in Resource Report**
26.	Mountain Valley reported that the alternative sites described for the Bradshaw and Stallworth Compressor Stations are essentially non-viable because of site topography that would require extensive cut and fill during construction. Identify and fully assess at least one viable, constructible alternative site for those two stations as well as for the Swann Compressor Station.	Section 10.7.1.1 and 10.7.1.3. Swann Compressor Station is no longer proposed
27.	Section 10.7.2 states the need for additional pipeline to tie the Harrison Compressor Station with the WB-TCO Interconnect would be minimal. Clarify whether additional pipeline or facilities, beyond those described in the draft RRs, would be needed to tie into the proposed WB-TCO Interconnect. If so, this additional pipeline component should be discussed in all other RRs.	Section 10.7.1.2
28.	Section 10.7.3 states that the selection of the preferred Stallworth Compressor Station location would require MVP to purchase two nearby residences. Revise section 10.7.3 to discuss the landowner's willingness to sell these residences to MVP, as well as all other tracts that would be used to accommodate compressor stations. Further, report each landowner's willingness to accommodate all other aboveground facilities, such as pig launchers/receivers, meter stations, MLVs, and communication towers.	Section 10.7.1.3
29.	Include a discussion of the feasibility of using electric-motor-driven compressors at the proposed new compressor stations. Include the rate of electricity required and the number of electric motors required. Compare the size of the electric transmission line necessary under the current proposal with what would be required for the electric motors. Quantify the footprint of all facilities needed to use electric-driven compressor units.	Section 10.7.2.1
30.	Provide a discussion regarding the feasibility of using waste heat electric generation (cogeneration) for the proposed turbines at each of the new compressor stations. Provide the rate of electricity potentially generated on a kilowatt/month basis and compare this with the amount of electricity used by the compressor station(s) per month. Describe the average load factor of the facility and any impediments that would prevent the operation of the compressor station continuously at 60 percent minimum load.	Section 10.7.2.2

U.S. Environmental Protection Agency Comments on Resource Report 10		
Page/Section	**Request**	**Location in Resource Report**
General	The alternatives should describe aquatic resource impacts, condition of the resource (including any impairment), permanent and temporary impacts.	Section 10.5, 10.6, and 10.7
General	The document should clarify for the public the potential effects of alternatives to the environment.	Section 10.5, 10.6, and 10.7
General	Important or scarce resource crossings should include potential acreage affected. An example would be the crossing of the Appalachian Trail and the acres temporary and permanently affected.	Section 10.5, 10.6, and 10.7
General	Effect on residential properties should be clarified for each alternative. Description of impacts should include taking of the residence (partial loss property), or total displacement of the residents.	Section 10.5, 10.6, and 10.7, and also Resource Report 8
General	Alternatives 93 and 87 should have maps that have plot the locations of homes and major roads to help the public understand which properties will be affected with each alternative.	Appendix 10-A

U.S. Environmental Protection Agency Comments on Resource Report 10		
Page/Section	**Request**	**Location in Resource Report**
10-1	The purpose should have a location of the starting point or county where it will start and end. It should also have the clients that the pipeline will serve and their locations. This will help the public and resource agencies understand why routes were selected.	Section 10.1.2
10-1	The location of the replacement pipes should be put into the purpose and need section.	The referenced text has been removed from the final Resource Report 10
10-6	Will customer demand (company/amount) be put into resource report 10? The location of the customer's end points should also be discussed in order to confirm with the public the demands are equal to the supply.	Section 10.1.2.
10-14	The use of the term, "suitable location for placement" should be clarified with a possible diagram and a map of the location of the pipelines collocated with the Supply Header project. It should be clarified why the section along the ridge tops would not accommodate the proposed pipeline.	Section 10.5.3
10-24	The resource report should state if Alternative 110J is still under consideration pending continued evaluation or other decisions.	Section 10.6.4
10-25	The type of wetlands and the quality of the wetlands should also be considered in the alternatives. The resource reports should discuss the volume of high quality wetlands that would be affected by all the alternatives.	Resource Report 2
10-32	A discussion on the potential affect from the pipeline on reservoir water quality should be discussed in this section or in another section of the resource reports.	Resource Report 2
10-46	The report should also clarify how far (in feet) the compressor is from the pipeline for the proposed, 1A and 1B.	Section 10.7
10-46	The width of the corridor for the piping from the compressor to the pipeline should be described for Site 1A as well as the construction methods and any crossings it may have.	Section 10.7.1.1
10-47	The report should describe the type of vegetation that is between the NSA for the Harris Station and the compressor. The type of vegetation will affect the ability for noise to reach the NSA.	Section 10.7.1.2
10-48	A table explaining and comparing the amount of cut and fill that would have to be done for all the alternatives would help the reader understand how MVP made the decision on the project. Any needed disposal of soils should be described.	A table is not included, see explanation in Sections 10.7.1.1, 10.7.1.2, and 10.7.1.3.

U.S. Forest Service Comments on Resource Report 10		
Page/Section	**Request**	**Location in Resource Report**
General	The initial pages of the report refer to the project's "open season" (page 10-2) which significantly influences the alternatives (10.4.2 on page 10-6 and 10.4.3 on page 10-7). Most notably, "The results of the open seasons demonstrate the demand for more than one pipeline project in the region." Please explain what the open season is or was.	The term "open season" has been removed from Resource Report 10

U.S. Forest Service Comments on Resource Report 10		
Page/Section	**Request**	**Location in Resource Report**
10.7.4	Section 10.7.4 of the final resource reports should identify the exact location of Swann Compressor Station.	Swann Compressor Station is no longer proposed
General	The final resource reports should address effects on scenery caused by other aboveground facility site alternatives, either in section 10.8 or by reference to another appropriate section.	See Resource Report 8
General	Though difficult to provide meaningful review and comment on the route alternatives, route variations and site alternatives without the same level and type of mapping provided in DRR-1 for the proposed route, the FS identifies its concerns about alternatives below. • Route Alternative 1. Similar concerns to the Proposed Route with respect to the Appalachian National Scenic Trail and all other Land Use, Recreation, and Aesthetics considerations. • Northern Pipeline Alternative. This route appears similar to earlier proposed route of another proposed project, now discredited primarily for biophysical resource concerns. FS concerns about this route are similar to the concerns for the Proposed Route with respect to the Appalachian National Scenic Trail and all other Land Use, Recreation, and Aesthetics considerations. • Alternative 110. FS concerns about this route are similar to the concerns of the Proposed Route with respect to the Appalachian National Scenic Trail and all other Land Use, Recreation, and Aesthetics considerations. Increased concerns due to proximity to, potential impacts on, and visual impacts on three Wildernesses – Mountain Lake, Brush Mountain, and Brush Mountain East. • Alternative 110J. Concerns for this route are similar to the concerns for the Proposed Route with respect to the Appalachian National Scenic Trail and all other Land Use, Recreation, and Aesthetics considerations. Increased concerns due to proximity to, potential impacts on, and visual impacts on two Wildernesses – Mountain Lake and Brush Mountain East. • Alternative 110R. Concerns for this route are similar to the concerns for the Proposed Route with respect to the Appalachian National Scenic Trail and all other Land Use, Recreation, and Aesthetics considerations. The FS also has increased concerns due to proximity to, potential impacts on, and visual impacts on three Wildernesses – Mountain Lake, Brush Mountain, and Brush Mountain East.	Noted

U.S. Forest Service Comments on Resource Report 10		
Page/Section	**Request**	**Location in Resource Report**
General (Continued)	• Peters Mountain Variation. Figure 10.6-7 should include the labels for Peters Mountain Wilderness and the Appalachian National Scenic Trail. • Alternative 93. The final resource reports should clarify the need to impact additional NFS lands, as would result under this alternative. Concerns of the FS for this route are similar to the FS's concerns to the Proposed Route with respect to all non-ANST considerations for Land Use, Recreation, and Aesthetics. • Peters Mountain Variation. This alternative proposes to route portions of the pipeline within Peters Mountain Wilderness. Approval of this route within the Wilderness can only be approved by the President "upon his determination that such use or uses in the specific area will better serve the interests of the United States and the people thereof than will its denial;"[1] [1] Public Law 88-577 (16 U.S. C. 1131-1136) 88th Congress, Second Edition, September 3, 1964	

RESOURCE REPORT 10
ALTERNATIVES
TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

RESOURCE REPORT 10
ALTERNATIVES

LIST OF ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
Bcf/d	billion cubic feet per day
CGV	Columbia Gas of Virginia
Columbia	Columbia Gas Transmission, LLC
Dominion	Dominion Resources
East Tennessee	East Tennessee Natural Gas, LLC system
EIA	U.S. Energy Information Agency
ESRI	Environmental Systems Research Institute
ETNG	East Tennessee Natural Gas
FERC	Federal Energy Regulatory Commission
HDD	horizontal directional drill
Initial Route	Pipeline route included with the April 2015 draft Resource Reports
kV	kilovolt
LDC	local distribution company
MMDth/d	million dekatherms per day
MP	milepost
MVP	Mountain Valley Pipeline, LLC
MW	megawatt
NSA	noise sensitive area
NWI	U.S. Fish and Wildlife Service National Wetland Inventory
Project	Mountain Valley Pipeline Project
Proposed Route	Pipeline route that is the subject of this application to FERC
Tcf	trillion cubic feet
Transco	Transcontinental Gas Pipe Line Company, LLC
WVDNR	West Virginia Department of Natural Resources
WMA	Wildlife Management Area

RESOURCE REPORT 10 - ALTERNATIVES

10.1 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 (LDCs), industrial users and power generation facilities 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 (Transco) 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 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 (MMDth/d) of natural gas. Resource Report 1 provides a complete summary of the Project facilities and a general location map of the Project facilities (Figure 1.2-1).

10.1.1 Environmental Resource Report Organization

This Resource Report contains a discussion of the various alternatives to the Project that could achieve all or some portion of the Project objectives. The range of alternatives considered includes the no action alternative (Section10.2), other energy alternatives (Section 10.3), system alternatives (Section 10.4), major route alternatives (Section 10.5), route variations (Section 10.6), compressor station site alternatives (Section 10.7), and references (Section 10.8).

10.1.2 Purpose and Need

The Project is a new pipeline designed to transport up to 2.0 MMDth/d of natural gas from the Appalachian Basin to growing markets in the Mid-Atlantic and southeastern United States. The purpose of the Project is to provide timely, cost-effective access to the growing demand for natural gas for use by LDCs, industrial users, and power generation facilities in the Mid-Atlantic, southeastern, and Appalachian markets. The Project will deliver natural gas from the growing Appalachian Basin production areas, as received from MarkWest Liberty Midstream & Resources, L.L.C.'s Mobley Plant, Equitrans' Mainline System, and other future receipt points in Wetzel County, West Virginia, to an end-point at the Transco Zone 5 compressor station 165 (Transco Station 165) in Pittsylvania County, Virginia. A sizable portion of natural gas production growth is occurring in the Appalachian Basin shale region. Appalachian Basin shale gas production has increased from 2 billion cubic feet per day (Bcf/d) in 2010 to over 15 Bcf/d in July 2014. The Project will provide for transportation of these prolific natural gas supplies to Station 165, the pooling point for natural gas in Transco Zone 5 where this natural gas can serve the growing demand for natural gas for use by LDCs, industrial users, and power generation facilities all along the Eastern

seaboard. MVP's shippers requested Station 165 as the delivery point in their agreements in order to meet this growing market demand and the route was selected to meet this Project need.

The Project will also provide the opportunity for unserved and underserved markets along the route to access natural gas supplies. For example, the routing of the project through the southwest Virginia area resulted in Roanoke Gas becoming a Project shipper and requesting a specific tap location to support its LDC system growth and expansion. Roanoke Gas's involvement as a shipper and its site-specific delivery point are concrete evidence of MVP's purpose and need to provide opportunities for economic growth and development along the route of the Project.

10.2 NO ACTION ALTERNATIVE

If the Project is not authorized by the FERC, the short-term and long-term environmental impacts resulting from Project activities, as discussed in other Resource Reports, will not occur. However, the No Action Alternative would not allow the accomplishment of the Project's stated purpose and need, to provide timely, cost-effective access to natural gas to meet growing demand by LDCs, industrial users, and power generation facilities in the Mid-Atlantic and southeastern markets, as well as potential markets in the Appalachian region. Under the No Action Alternative numerous benefits will be foregone. These lost benefits include:

- Economical access to new sources of natural gas supply from the Appalachian Basin production regions by natural gas markets in the Mid-Atlantic, southeastern, and Appalachian regions of the United States;
- Access for new and existing electricity generation facilities to greater sources of clean burning natural gas supply to enhance reliability of the electric system;
- Access for new and existing electricity generation facilities to greater sources of clean burning natural gas supply which in turn will create opportunities to improve regional air quality; and

In recent years the North American natural gas market has seen enormous growth in production and demand. The U.S. Energy Information Administration (EIA) estimates that total natural gas consumption in the United States will increase from 26.2 trillion cubic feet (Tcf) in 2013 to between 29.7 Tcf and 37.4 Tcf in 2040, with a large portion of this increased demand occurring in the electric generation sector (EIA 2015a). A sizable portion of growth in natural gas production is occurring in the Appalachian Basin, with Marcellus Shale production alone increasing from 2 Bcf/d in 2010 to over 15 Bcf/d in July 2014. Likewise, the increased demand for natural gas is expected to be especially high in the southeastern United States, as new environmental regulations result in coal-fired generation plants being converted or replaced by natural gas-fired generation plants. The infrastructure design of the Project is expected to benefit these regions by connecting the production supply to the market demand. In doing so, MVP will bring clean-burning, domestically-produced natural gas supplies from the prolific Appalachian Basin and supply it to the demand markets in order to support the growing demand for cleaner-burning natural gas, provide increased supply diversity, and improve supply reliability to these growing markets. In addition, MVP is supporting additional uses of natural gas in southwest Virginia as evidenced by Roanoke Gas becoming a Project shipper and requesting a specific tap location to support its LDC system. MVP can facilitate interconnects and subsequent economic development associated with having access to affordable natural gas supplies, as the areas traversed by the Project have limited interstate pipeline capacity.

The No Action Alternative would not allow MVP to offer the growing Mid-Atlantic, southeastern, and Appalachian markets access to an abundant supply of a cleaner-burning, low-cost source of fuel, and would potentially limit the economic growth of these regions of the country by not providing improved access to a natural gas supply. In particular, the No Action Alternative would not allow MVP to bring natural gas supplies to Roanoke Gas' local customers in southwestern Virginia. Thus, the No Action alternative would have both adverse economic and environmental consequences. In addition, due to the high demand for natural gas transportation capacity in the Project area, the No Action Alternative would also likely result in a different pipeline project similar to the Project being proposed and built, thereby simply transferring the short-term and long-term environmental impacts resulting from the Project to another project.

10.3 ENERGY ALTERNATIVES

Use of certain alternative fuels to supply the needs of the market served by the Project could potentially be an alternative to the Project. The energy equivalent of the proposed 2.0 MMdth/d of natural gas being transported through MVP is 586,142 megawatt (MW) hours, assuming all the natural gas is used to generate electricity. In general, potential alternative energy sources to the Project include wind, solar power, coal, oil, nuclear, and fuel cells. The Project will transport natural gas to meet the increasing demands by existing and future electric generation plants, where the only alternative fuel for such plants is coal. The Project will also provide natural gas for heating and potentially industrial uses

In 2012, renewable energy sources contributed 8,550 trillion British thermal units to the United States' power supply (EIA 2014). This amount accounted for a 9 percent share of the total energy consumption in the United States (EIA 2014). However, none of these renewable energy sources have been fully developed in the United States or in the Project area for large-scale application or to the point where they would be viable energy alternatives to the Project (ACEEE 2005). Conversely, even if smaller-scale, or individual, renewable energy sources could be combined to meet the energy needs for the market area served by the Project, the number of such individual projects would be substantial, and land requirements will likely substantially increase compared to those required for the Project. Because the combination of these resources would require development of coordinated efforts, which would take time and would not provide the energy in time to meet the Project's market needs, it is evident that these energy options are not viable alternatives to the Project.

10.3.1 Wind

Wind power is not a viable alternative to meet the needs of existing purpose and future electric generators in the Project's market area within need of the Project timeframe. Wind power is also not generally an option for home heating and industrial demand. With respect to electric generation, a common wind turbine installation, manufactured by General Electric, being used by wind farms throughout the United States generates approximately 1.5 MW with wind speed in the range of 27-56 miles per hour. An estimated 16,281 new wind turbines would be required to generate the same energy generation capacity as the natural gas energy generation capacity equivalent proposed to be transported through MVP. The turbines require a correspondingly large area around them clear of trees and other turbines to maximize the effect of the wind and avoid interference. A design factor of 10 rotor diameters of clearance in the direction of the wind and 3 rotor diameters in every other direction is commonly used. In a line of several turbines perpendicular to the wind (as on a mountain ridge), the GE 1.5-MW model would need at least 32 acres and the Vestas V90 78 acres for each tower. In an array that can take advantage of the wind from

any direction, the GE needs 82 acres and the Vestas V90 111 acres per tower. Assuming the lower figure of 32 acres of needed operating area, an estimated 520,992 acres of land would be needed, which is far greater than the 4,556 acres of estimated disturbance associated with the MVP Project. The presented figures also do not assume a capacity factor used for wind power design. Every wind turbine has a range of wind speeds, typically around 30 to 55 mph, in which it will produce at its rated, or maximum, capacity. At slower wind speeds, the production falls off dramatically. If the wind speed decreases by half, power production decreases by a factor of eight. Thus, wind capacity is commonly lower than its design factor, with an average capacity of 33.9 percent in 2014 according to EIA (EIA 2015b).

10.3.2 Solar Power

Solar power is not a viable alternative to meet the existing and future natural gas supply needs of electric generators in the mid-Atlantic region of the United States. In addition solar may be less practical due to climactic conditions, developmental costs, reliability issues, the need for large expanses of land and the uncertainty of solar power availability at times of peak demand. Some of the largest completed utility-scale solar photovoltaic power plants have area efficiency of about 8 to 10 acres per MW on a national basis (NREL 2013). The mid-Atlantic region would require slightly more land at 11.5 acres per MW primarily due to lower solar irradiance and higher undulating terrain features than other regions of the United States where solar power development is prominent. For every 1,000 MWs of power (equivalent to an average capacity of a large scale natural gas-fired combined cycle power plant), the land requirements in the mid-Atlantic region would be approximately 11,500 acres of permanent disturbance. At 2.0 MMDth/d of capacity, MVP has the ability to serve approximately 10 large-scale combined cycle power plants. To provide equivalent electric capacity, solar would require approximately 100,000 to 120,000 acres of permanent land disturbance. As a result of these extensive land requirements, solar power is not being developed at a pace that would provide for the projected energy needs of the market.

The proposed Project may cause initial or temporary earth disturbance greater than that required for the development of a similar MW of solar power; however, the majority of the area will be restored and allowed to revert to original conditions. In addition, the permanent right-of-way will be maintained in an herbaceous condition (rather than an impervious or shaded surface that would be found in a solar field) that can provide habitat for flora and fauna in the long term. The land requirements required by solar power to generate the amount of energy equivalent to satisfy the purpose and need of the proposed Project would be prohibitive, therefore, solar power is not a viable alternative.

10.3.3 Coal

Although historically a viable alternative to natural gas for power generation, coal is not as clean-burning as natural gas. In addition, although coal can be used for home heating, it generally is not an alternative for natural gas home heating. Coal emits greater regulated pollutants (e.g., sulfur dioxide and nitrogen dioxide), greenhouse gases (e.g., carbon dioxide), and particulate matter, which require the installation of costly air pollution controls. Coal is associated with significant mine pollution control problems, reclamation issues, storage problems, and costly pollution controls at the burner. Energy generated from the burning of coal is considered a major contributor to acid rain, which continues to be an international ecological and economic problem. Coal also contributes more greenhouse gas emissions than natural gas and petroleum fuels. Further, emissions from coal-burning power plants are the primary source of airborne mercury deposition in the United States, accounting for over 50 percent of all domestic human-caused mercury emissions (USEPA 2014). The mining and transportation of coal to end users have

additional and more complex adverse environmental impacts. The relative environmental benefits and efficiency of natural gas make it an attractive alternative to oil and coal-fired generation. Compared to the average air emissions from coal-fired power generation, natural gas produces half as much carbon dioxide, less than a third as much nitrogen oxides, and one percent as much sulfur dioxides at the power plant emissions, thereby reducing climate change impacts relative to coal-based sources (USEPA 2007). Therefore, coal does not represent a preferred alternative for replacing the natural gas to be supplied by the Project.

10.3.4 Oil

Oil is not a viable alternative energy source for meeting future power generation needs in the market area served by the Project. The use of oil supplies to meet existing or future energy demands could increase reliance on overseas crude petroleum and petroleum products. The construction of an oil transmission pipeline has no advantage over natural gas pipeline transmission in regards to area requirements. In addition, oil typically necessitates transportation overseas, requires tank distribution and increased air pollutant emissions when burned. These aspects of oil use create the potential for increased adverse environmental impacts, including the increased risk of oil spills, air quality degradation, and potential impacts associated with land use development required for the construction of new, or expansion of existing, refineries to process the oil. State and federal air pollution control regulations promote the use of clean fuels to minimize adverse air quality impacts. Use of oil as an alternative energy source would unnecessarily increase adverse air quality impacts, and these increased impacts may conflict with federal and state long-term energy environmental policies aimed toward improving air quality in non-attainment areas. Electrical regional utilities and industrial users have increasingly converted power plants from oil to natural gas because oil is more expensive than natural gas and produces more emissions than natural gas. Therefore, oil does not represent a viable alternative for replacing the natural gas to be supplied by the Project.

10.3.5 Nuclear

Nuclear energy development is an option that is considered environmentally viable for electric generation, especially in terms of limiting pollutant air emissions. Nuclear power is, however, not generally an option for home heating and industrial demand. The increased use of nuclear power is seen by some as a means of reducing greenhouse gas emissions associated with the burning of fossil fuels. However, environmental and regulatory challenges concerning safety and security, the disposal of toxic materials (i.e., spent fuel), and alterations to hydrological/biological systems need to be addressed before any new nuclear power generation facilities could be constructed. Extensive regulatory requirements need to be met in the planning and building of new nuclear facilities, and there is significant uncertainty as to the timing and cost of bringing new nuclear facilities into service. Moreover, the time required to design, permit, and construct a nuclear generation facility is measured in years and would be significantly greater than the amount of time required to design, permit, and construct a pipeline to natural gas fired generation plants. Since the nuclear energy alternative would not be available to meet the timeframe required for energy demands by the market, use of nuclear energy is not a viable alternative to the Project.

10.3.6 Fuel Cells

Fuel cells are a developing alternative for generating electricity more directly and cleanly from fossil fuels or hydrogen. Small-scale fuel cell research and development is active, but reliable fuel cell systems

representing a magnitude of energy supply equivalent to the Project are not expected to be available or cost-effective in the near future. Therefore this fuel supply is not a viable alternative to the Project.

10.4 SYSTEM ALTERNATIVES

System alternatives are alternatives to the proposed action that would make use of other existing, modified, or proposed pipeline systems to meet the stated objectives of the Project. A system alternative would make it unnecessary to construct all or part of the Project, although some modifications or additions to the alternative systems may be required to increase their capacity or provide receipt and delivery capability consistent with that of the Project. These modifications or additions would result in environmental impacts that may be less than, comparable to, or greater than those associated with construction of the Project. System alternatives that would result in significantly less environmental impact might be preferable to the Project. However, a viable system alternative must also be technically and economically feasible and practicable, and must satisfy necessary contractual commitments made with shippers supporting the development of the Project.

A Project transportation alternative is to liquefy the natural gas product at the receipt points and transport the liquid volumes to the delivery points and install regasification facilities to accommodate the Shippers contracted needs. In order to liquefy and transport methane, the temperature and pressure design points are -260 degree Fahrenheit and 4 psig. Converting 2.0 MMDth/d of MVP's contracted natural gas volumes to liquid yields a production of 23,865,200 gallons per day. Transportation could then be performed using trucking on the local and interstate highways or rail to a centralized delivery and transported to the regasification facilities at the contracted delivery points. Given a truck tanker capacity of 10,850 gallons (ignoring gross capacity and using weight compared to the rail car), it would take 2,201 trucks per day to transport this volume with a truck limiting load rate of approximately 300 gallons per minute. In order to logistically transport the liquid volumes, simultaneous loading operations of 75 trucks at a time around the clock would be required (assuming some down time switching out vehicles). A rail tanker has a capacity of 30,680 gallons, so it would require 779 rail cars per day to transport this volume. Assuming a load rate triple of the trucks capacity, then 25 rail cars would be required to be loaded simultaneously around the clock. Rail and truck transportation options are not as safe and reliable as pipelines as discussed and demonstrated statistically in Resource Report 11. Installation of processing facilities to liquefy and subsequently re-gasify natural gas require extensive permit timing with corresponding large acreage impacts and along with associated air emissions from the process. Transporting the Projects natural gas volumes as a liquid through trucks and rail is not considered a viable alternative.

Existing or Modified Pipeline Systems

MVP evaluated current pipeline system alternatives by looking at the technical and economic feasibility and practicality of the alternative, the environmental advantage of the alternative, and the ability of the alternative to meet the Project's purpose and need in increased natural gas supplies to move natural gas from the supply areas for MVP to supply demand in the Mid-Atlantic, southeastern, and Appalachian markets. There are no pipelines that currently transport natural gas along the north-south corridor proposed by MVP. As discussed below, there are no existing or modified system alternatives to MVP.

The existing Columbia Gas Transmission, LLC (Columbia) system provides transportation services from supply areas in the Appalachian Basin to demand areas in the Mid-Atlantic and central and southeastern

Virginia. The existing Columbia system extends south/southwest from the Mobley area to central West Virginia, where Columbia's WB Line begins in Clay County, West Virginia and flows east and south into Virginia where it interconnects with the Transco system at Boswell's Tavern. Significant upgrades, including new compression, looping, and mainline or lateral pipelines, would be needed to transport 2.0 MMDth/d of additional natural gas on the existing Columbia system to Station 165. In addition, upgrades on the Columbia system would likely be necessary to accommodate the additional volumes to be transported by MVP. For example, Columbia would need to build approximately 224 miles of new greenfield pipeline to directly interconnect the WB Line to Station 165 (which would essentially mirror MVP's proposed facilities) or substantially expand the WB Line to Columbia's current interconnect with Transco and then build approximately 105 miles of new pipeline that parallels Transco to Station 165. The environmental impacts associated with construction of these facilities would likely be greater than those of MVP, so any theoretical modifications to the existing Columbia system would provide no environmental advantage over MVP. Moreover, absent constructing facilities similar to those proposed by MVP in southwestern Virginia, the Columbia system could not provide service to Roanoke Gas as MVP proposes and thus would not meet MVP's purpose and need. Because the modifications required in extending and expanding the Columbia system would likely result in greater environmental impacts and are not operationally or economically feasible, the Columbia system is not a viable system alternative to MVP.

Although the current East Tennessee Natural Gas, LLC system (East Tennessee) intersects MVP in the vicinity of Roanoke, Virginia, East Tennessee cannot be considered a viable system alternative as it would either need to (1) build essentially the same facilities as MVP proposes from Mobley to Station 165; or (2) require natural gas from the northern West Virginia supply regions to flow on other existing pipelines (e.g., Tennessee Gas Pipeline, LLC and/or Texas Eastern Transmission, LP) southwest for several hundred miles, to central Tennessee where such gas would enter the East Tennessee system and then flow hundreds of miles northeast back to southwest Virginia and then require new pipeline facilities to connect to Transco Station 165. Significant modifications to the East Tennessee system (and the existing pipelines interconnected to East Tennessee), including the construction of new pipeline facilities, would be necessary to flow 2.0 MMDth/d of natural gas to Station 165. Therefore, this system alternative is not a viable alternative to MVP.

10.4.1 New Pipeline Systems

It is possible that another new pipeline project constructed and operated by others could serve as a system alternative to the Project. MVP evaluated several announced or planned pipeline projects as conceptual system alternatives to the Project.

Supply Header and Atlantic Coast Pipeline Projects

On September 18, 2015, Atlantic Coast Pipeline, LLC, a joint venture comprised of subsidiaries of Dominion Resources (Dominion), Duke Energy, Piedmont Natural Gas, and AGL Resources, filed an application pursuant to Section 7 of the Natural Gas Act, as amended, and Part 157 of the regulations for a Certificate of Public Convenience and Necessity for its planned Atlantic Coast Pipeline (ACP) project (Docket No. CP15-554). The project would consist of approximately 564 miles of natural gas transmission pipeline and associated aboveground facilities in West Virginia, Virginia, and North Carolina. The purpose of the project as stated by ACP is to deliver natural gas from supply areas in West Virginia to growing markets in Virginia and North Carolina.

On September 18, 2015, Dominion filed a Section 7(c) certificate application with FERC for the Supply Header project in Docket No. CP15-555. The Supply Header project includes approximately 39 miles of natural gas pipeline and modified compression facilities in West Virginia and Pennsylvania (Docket No. PF15-5). Through a direct connection with the ACP, the Supply Header project would transport natural gas from supply areas in Ohio, Pennsylvania and West Virginia to market areas in Virginia and North Carolina.

MVP's route was designed in response to its specific customer demand for the transportation services to be provided by the Project with delivery to Transco Station 165. Transco Station 165 is an existing large interconnection on Transco's system and an active pooling point for Transco Zone 5. The ACP project does not serve Station 165. In addition, MVP has also contracted to provide service to Roanoke Gas, an LDC along the Proposed Route in southwest Virginia, a market that cannot be served by the Supply Header/Atlantic Coast Pipeline. Moreover, as stated in its application, ACP has secured customer demand for 1.44 MMDt/d of capacity on its project, or approximately 96 percent of the total capacity. Thus, ACP could not transport the volumes contracted for by MVP's shippers. See additional discussion in Section 10.4.3 of a conceptual alternative that would combine both the MVP and ACP projects as a single pipeline to transport the combined volumes of both pipelines.

Carolina Pipeline Project

Reports in the press indicate that Spectra is no longer pursuing what was called its Carolina Pipeline Project, which as originally planned would have extended from Pennsylvania to North Carolina (Cumberland Union Times 2014, The Robesonian 2014). This project also is not listed among planned or proposed new projects on Spectra's website (Spectra Energy 2015). MVP cannot evaluate collocation with Carolina Pipeline Project with no publically available routing data. MVP believes this project is no longer under consideration and therefore is not a reasonable alternative to the Project.

Appalachian Connector Project

Williams has announced a planned project called the Appalachian Connector. Williams has not begun the FERC pre-filing or application process for this project. In general the project would have start and end points similar to those of the Project; however, according to the Williams website, "the route for the project has not yet been developed. Williams is in the early stages of performing desktop analysis to identify a study area for the potential route. If the project moves forward, then Williams would begin the formal process of conducting field surveys and meeting with landowners, communities and other stakeholders to solicit feedback and further refine the route" (Williams Pipelines, http://co.williams.com/expansionprojects/appalachian-connector). MVP cannot evaluate collocation with Appalachian Connector Project with no publically available routing data. Because it has not been determined that the Appalachian Connector Project will move forward, it is not a reasonable alternative to the Project.

10.4.2 Single Pipeline Alternative

A conceptual alternative might include two or more proposed pipelines combined into a single pipeline project. MVP evaluated combining the MVP Project and the ACP project into one pipeline along the proposed MVP route since both projects have applied for a Certificate of Public Convenience and Necessity with FERC and are proposing to transport natural gas from West Virginia to mid-Atlantic demand markets.

ACP is a more expansive project as defined above in Section 10.4.2 and has different market customers north, east, and south of Transco Station 165, where MVP will terminate. MVP has considered as an alternative a single pipeline to transport the combined volumes of both projects through West Virginia and part of Virginia from MVP's initiation point at Mobley to Station 165. In its application to FERC, ACP identifies one compression station in West Virginia and one compression station in Virginia. MVP is not knowledgeable of ACP's specific design analysis for these stations, yet for comparative purposes, only these two compression stations were used in the single pipe alternative analysis.

In order to transport MVP's 2.0 MMDth/d (equivalent to approximately 2.0 billion cubic feet per day (Bcf/d)) and ACP's 1.5 Bcf/d for a combined volume of 3.5 Bcf/d in a single 42 inch pipeline with 1,480 pounds per square inch maximum allowable operating pressure, compression requirements increase significantly to overcome the higher frictional losses generated with more volume in the pipeline. Six compressor stations, in addition to MVP's proposed three compressor station design, would be required. A comparison of compression required for a single pipeline alternative are presented in Table 10.4-1. The single pipeline alternative would require 3.6 times the amount of compression horsepower versus the sum of the two individual projects, and 3.1 times the amount of air emissions. The alternative analysis of a single pipeline option, to transport combined MVP Project and ACP volumes to Station 165, yields significantly more air quality and greater acreage and environmental impacts on the compressor stations compared to the sum of the individual projects. Therefore, the single pipeline alternative is not considered a viable alternative.

Table 10.4-1

Comparison of Compression Required for Conceptual Single Pipeline Alternative

Alternative	Compressor units	Acreage impact	Total Horsepower	CO2e, tons
MVP Project Proposed Compression	8	70.1	171,600	742,346
ACP Proposed Compression, WV and VA Only	8	82.5	95,730	597,375
Single Pipe Alternative Compression (ACP and MVP combined proposed volumes to Station 165)	57	587.8	970,596	4,293,038.68

10.5 ROUTE ALTERNATIVES

10.5.1 Pipeline Routing

During Project development, MVP conducted an extensive review of potential pipeline routes to identify potential pipeline corridors, and then further refined the review to determine the most feasible route within the most favorable corridor. One of MVP's primary objectives with respect to pipeline routing was to avoid (if possible) or minimize crossings of major population centers and significant natural resources, especially crossings of National Forests, National Parks, the Appalachian National Scenic Trail, and the Blue Ridge Parkway.

Analysis began with the identification of a study area which encompassed the Project interconnect points to the north (beginning) in the Mobley area and the south (end) at Transco Station 165 and was wide enough to cover a reasonable range of corridor locations. The review encompassed enough area to be able to avoid exclusion areas (e.g. cities and towns), as necessary. Using publicly available data from state, Federal, and private entities, a geodatabase was developed within which data was categorized based on

the character of the resources relative to its compatibility with pipeline construction and operation. Resources were classified as being either a compatible use or one of two types of constraints – sensitive area or exclusion area. A combination of spatial data, existing information, published reports, local knowledge, and prior experience was used to review the study area and identify individual corridor segments, with an emphasis on use of existing utility and transportation corridors. It should be noted that there are no existing natural gas transmission pipelines in the general area and direction of the Proposed Route of the Project (i.e. north to south); nor are there existing major highways suitable for collocation. Therefore, the primary opportunities for use of existing linear corridors were overhead electric transmission lines.

Although a straight line between the Project's start and end point would result in the shortest route and lowest possible acreage of disturbance, a straight line route does not allow for consideration of constructability or avoidance of sensitive areas, both primary criteria for MVP. MVP also evaluated existing highways and linear utilities in the region to determine if these existing rights-of-way would provide opportunities for collocation with the Project (Figure 10.5). Existing major pipelines in the region traverse generally from the southwest-to-northeast and do not provide a north-south option for collocation. Major highways in the region generally traverse either southwest-northeast, or east-west, providing limited opportunities for significant collocation. Similarly, major electric transmission lines traverse primarily east-west, although some sections of electric transmission lines were identified for possible collocation, as discussed below.

During corridor identification, special consideration was given to avoiding population centers (i.e. cities and towns) and, where possible, National Forests, National Parks, the Appalachian National Scenic Trail, and the Blue Ridge Parkway (and if avoidance was not possible finding an optimal location for the crossings). This refined analysis resulted in a network of 94 corridor segments, consisting of approximately 2,362 miles of potential pipeline routes, which could be pieced together to create end-to-end routes between the Project's beginning and end points. Based on a review of desktop constructability, prior easement agreements, use of existing rights-of-way, and length, a set of corridor segments that together created an end-to-end route was identified as the highest ranking corridor and was initially selected for further study.

A more detailed analysis of site-specific data was then applied to the selected corridor to identify the most logical pipeline route (centerline) within that corridor. Analysis at this level included identification of ridge lines, and topography at road and waterbody crossings. Special consideration was also given to residential areas, which were avoided whenever possible. The potential route was sited to minimize or avoid potential impacts on known sensitive biological and cultural resources, protected lands, wetlands and waterbodies, and floodplains. The route identified after this initial review was considered MVP's initial preferred route and is considered in this Summary of Alternatives as Route Alternative 1.

Based on the desktop analysis of publicly available data, MVP identified no issues that would have precluded siting of the Project along Route Alternative 1. However, at the completion of the initial routing process using desktop data, Route Alternative 1 was flown to further evaluate the feasibility of construction. Additionally, land personnel were engaged to contact landowners to request land access and GPS survey permission to further evaluate the pipeline route from the ground. Initial flight reconnaissance and ground check revealed that much of the route that followed existing overhead electric transmission line rights-of-way was along severe side slopes. While the overhead transmission lines span

significant areas of slide slope, these areas would be required to be crossed directly by the pipeline. As a result of this next phase of route analysis, MVP determined that Route Alternative 1 represented insurmountable construction challenges, as well as a high risk of slope failure and pipeline slips, once the pipeline was in operation. From aerial flyover and reconnaissance survey, approximately one-half (105 miles) of the first 200 miles of Route Alternative 1 would be on severe side slopes.

As a result, MVP conducted additional routing evaluations to identify the most suitable route. That evaluation ultimately resulted in identification of the preferred pipeline route (Proposed Route) included in this Resource Report and MVP's certificate application. Because the siting of Route Alternative 1 focused on use of existing rights-of-way and much of the existing right-of-way was ultimately found unsuitable for pipeline construction, the Proposed Route differs substantially from Route Alternative 1. Route Alternative 1 is compared to the Proposed Route in Table 10.5-1 below. In addition, during the second routing evaluation, a number of possible route modifications were identified and evaluated in order to identify the preferred route. These modifications are identified below in Section 10.5 as Route Variations and compared to the corresponding segments of the Proposed Route. Route alternatives and variations evaluated in this resource report are shown on the pipeline alternatives overview map, Figure 10.5-a included in Appendix 10-A.

10.5.2 Route Alternative 1

Route Alternative 1 (Figure 10.5-1) is approximately 324 miles in length and is collocated with existing utilities for approximately 101 miles (31 percent). Route Alternative 1 is located in a predominantly forested, low-density rural area with several small towns and patches of hay and pasture land. Route Alternative 1 crosses the Blue Ridge Parkway, the George Washington and Jefferson National Forests, and the Appalachian National Scenic Trail adjacent to existing 138-kilovolt (kV) overhead electric transmission lines, and avoids crossing significant parcels within the U.S. Forest Service's jurisdictional boundary of the Monongahela National Forest. Based on desktop analysis of publically available data, Route Alternative 1 crosses within one-half mile of the political boundary of 11 cities or towns and crosses 1.6 miles of National Forest System lands. The alternative crosses approximately 237.6 miles of forested lands, including 1,657 feet of forested wetland as mapped by the National Wetland Inventory (NWI), and 136 perennial waterbodies. Table 10.5-1 includes a comparison of major environmental features crossed by Route Alternative 1 and the Proposed Route.

Table 10.5-1

Comparison of Route Alternative 1 and the Proposed Route

Feature	Route Alternative 1	Proposed Route
General		
Total length (miles)	323.8	301.0
Length adjacent to existing ROW (miles)	101	22
Land disturbed within construction ROW (acres) a/	4,892	4,556
Land Use		
Populated areas b/ within ½ mile (number)	11	8
National Forest System lands crossed (miles)	1.6	3.4
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	1	1
Blue Ridge Parkway crossings (number)	1	1
NRHP designated or eligible historic districts crossed (miles)	5.0	10.1
Landowner parcels crossed (number)	1,609 c/	1,495
Residences within 50 feet of construction work space (number)	65	63
Resources		
Forested land crossed (miles)	237.6	245.2
Forested land affected during construction (acres)	3,608.7	3,720.0
Forested land affected during operation (acres)	1,441.2	1,486.0
Wetlands (NWI) crossed (feet) d/	5,525	3,299
Forested wetlands crossed (feet) d	1,657	1,721
Forested wetlands affected by construction (acres)	2.9	3.0
Forested wetlands affected by operation (acres)	1.9	2.0
Perennial waterbody crossings (number) d/	133	97
New River crossings (number)	2	0
Shallow bedrock crossed (miles)	217.3	214.9
Steep slope (>20 percent) crossed (miles)	171.4	120.0
Karst area crossed (miles)	56.2	53.3

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ estimated assuming similar size and number of landowner parcels would be crossed by the alternative as those crossed by the corresponding segment of Proposed Route.
d/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

Route Alternative 1 would be adjacent to existing rights-of-way for 101 miles (31 percent) of the route, compared to 22.0 miles (7 percent) for the Proposed Route. Route Alternative 1 would be 23 miles longer than the Proposed Route, resulting in about 335 more acres of construction impact, assuming a 125-foot-wide construction right-of-way for each. However, in areas where Route Alternative 1 follows side-slopes (approximately 105 miles), the construction right-of-way would need to be significantly wider than 125 feet to accommodate significant cut-and-fill that would be required for construction, which would result in an even greater area of construction impact. Route Alternative 1 would cross about 1.6 miles of National Forest System lands and 5.0 miles of designated historic district, compared to about 3.4 miles and 10.1 miles, respectively, by the corresponding segment of Proposed Route. Route Alternative 1 would cross about 171.4 miles of steep slopes, including 105 miles of side slope, and 56.2 miles of karst terrain, compared to about 120 miles of steep slope and 53.3 miles of karst terrain crossed by the corresponding segment of Proposed Route.

Route Alternative 1 avoids the following concerns that have been identified as crossed by or in close proximity of the Proposed Route in Giles and Montgomery Counties, Virginia:

- Areas of karst geology in the Pembroke and Newport, Virginia areas, including areas surrounding Little Stony Creek and Sinking Creek, several mapped caves (including Pig Hole Cave, Smoke Hole Cave, Tawney Cave, and Cascade Waterfalls), and groundwater supply concerns expressed by residents in this area;
- Greater Newport Rural Historic District;
- North Fork Historic District;
- The Nature Conservancy's Blake Preserve, also known as Mill Creek Springs Natural Area Preserve;
- The Mercer Angler's Club;
- James Monroe High School in Monroe County, West Virginia and Eastern Elementary School in Giles County, Virginia;
- The area of concern for the Red Sulphur Public Service District and the water supply for Peterstown, West Virginia;
- Moves the route to the edge of the Pembroke Fault Zone;
- Big Stony Creek Road (Virginia Scenic Byway); and
- Moves the route to the edge of a threatened and endangered species buffer area in Monroe County.

Route Alternative 1 would avoid crossing the Greater Newport Rural Historic District, added to the National Register of Historic Places in 2000 (National Register of Historic Places 2014), which is crossed by the Proposed Route. However, the Alternative would cross the Holly River State Park Historic District. See Resource Report 4 for discussion of measures that MVP would implement to minimize impact on the Greater Newport Rural Historic District.

While Route Alternative 1 would avoid some areas of karst along the Proposed Route, it would actually cross more karst area than the Proposed Route. Route Alternative 1 would cross about 50 miles more steep terrain than the Proposed Route.

Route Alternative 1 would include an approximately 300-foot-wide crossing of the Gauley River within the Monongahela National Forest and two crossings of the New River, all of which are avoided by the Proposed Route. Route Alternative 1 would also cross the Radford University Conservancy and be in close proximity to the Radford Army Ammunition Plant, which are both avoided by the Proposed Route.

In addition to crossing about 171.4 miles of steep slopes, Route Alternative 1 would also cross about 105 miles of severe side slope, which represent insurmountable construction challenges as well as a high risk of slope failure and pipeline slips once the pipeline is in operation. Because of the significant length of severe side slope crossed by Alternative 1 and the associated increased footprint in these areas, together with the other impacts identified above, MVP does not consider Route Alternative 1 to be environmentally preferable for pipeline construction.

10.5.2.1 Modified Route Alternative 1

Modifications of Route Alternative 1 are possible, including specifically deviating away from existing electric transmission lines periodically to avoid areas of severe side slope and then returning to collocate with the transmission lines after passing the areas of side slope. However, as described above, approximately 105 miles of Route Alternative 1 follows existing rights-of-way which are adjacent to overhead electric transmission line rights-of-way that are along severe side slopes. Therefore modifying this route by avoiding severe side slopes retracts the benefit of collocation, offering no environmental advantage over the Proposed Route.

10.5.2.2 Hybrid Alternative 1/Proposed Route

A hybrid that combines portions of Route Alternative 1 and the Proposed Route is possible. Because the two routes cross near the middle (about milepost [MP] 135 of the Proposed Route, see Figure 10.5-1), the most logical option for creating hybrid routes is the northern one-half of Route Alternative 1 combined with the southern one-half of the Proposed Route, or the reverse. As described above, MVP has identified concerns crossed by Route Alternative 1 that are on both the northern one-half and the southern one-half. The significant length of severe side slope crossed by Route Alternative 1, approximately 105 total miles, is roughly split between both the northern and southern sections of this route. Therefore, a hybrid route would not avoid this concern. MVP believes that a hybrid using portions of Route Alternative 1 and the Proposed Route would not provide an environmental advantage over the Proposed Route.

10.5.3 Northern Pipeline Alternative

MVP evaluated a pipeline route alternative (Northern Pipeline Alternative) that would be parallel to a project planned by ACP. On September 18, 2015, ACP filed an application with the FERC (FERC Docket CP15-554) for a project that would include approximately 564 miles of natural gas pipeline and associated aboveground facilities in West Virginia, Virginia, and North Carolina. According to the filing, that project will deliver natural gas from supply areas in West Virginia to growing markets in Virginia and North Carolina. Based on publicly available information filed with FERC, the ACP would begin near approximately MP 36.7 of the MVP Project and then traverse generally in a southeast direction, crossing into Virginia and then North Carolina. At about MP 180 of the ACP it would cross the Transco pipeline system, approximately 60 miles north of the end point of the MVP Project (Transco Station 165). In concept, the Northern Pipeline Alternative would be adjacent to the northernmost 180 miles of the ACP route, and then follow the existing Transco pipeline south for about another 60 miles to Transco Station 165 (Figure 10.5-2). Table 10.5-2 includes a comparison of major environmental features crossed by the Northern Pipeline Alternative and the corresponding segment of the Proposed Route.

Table 10.5-2

Comparison of the Northern Pipeline Alternative and the Proposed Route

Feature	Northern Alternative	Proposed Route
General		
Total length (miles)	239.2	264.2
Length adjacent to existing ROW (miles)	73.4	20.7
Land disturbed within construction ROW (acres) a/	3,624.4	4,000.8
Land Use		
Populated areas b/ within ½ mile (number)	4	7
National Forest System lands crossed – Total (miles)	29.2	3.4
Monongahela National Forest (miles)	16.8	0
George Washington and Jefferson National Forests	12.4	3.4
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	1	1
Blue Ridge Parkway crossings (number)	1	1
NRHP designated or eligible historic districts crossed (miles)	0	10.1
Landowner parcels crossed (number)	1,151 c/	1,271
Residences within 50 feet of construction work space (number)	55	41
Resources		
Forested land crossed (miles)	163.1	211.1
Forested land affected during construction (acres)	2,474	3,203.4
Forested land affected during operation (acres)	988.9	1,279.4
Wetlands (NWI) crossed (feet) d/	10,032	3,227
Forested wetlands crossed (feet) d/	5,535	1,721
Forested wetlands affected by construction (acres)	9.5	3.0
Forested wetlands affected by operation (acres)	6.4	2.0
Perennial waterbody crossings (number) d/	109	86
Shallow bedrock crossed (miles)	124.5	180.6
Steep slope (>20 percent) crossed (miles)	95.6	101.9
Karst area crossed (miles)	47.9	53.3

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ estimated assuming similar size and number of landowner parcels would be crossed by the alternative as those crossed by the corresponding segment of Proposed Route.
d/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

The Northern Pipeline Alternative would be about 25 miles shorter than the corresponding segment of Proposed Route, and result in about 376 acres less land disturbance during construction than the corresponding segment of Proposed Route. The Northern Pipeline Alternative would be adjacent to existing rights-of-way for about 73 miles, mostly along the last 60 miles which would be adjacent to the Transco pipeline, compared to about 21 miles along the Proposed Route. The Northern Pipeline Alternative would also be collocated with another proposed pipeline, the ACP, for about 180 miles. The Northern Pipeline Alternative would cross about 29.2 miles of National Forest Service lands within the Monongahela National Forest and George Washington National Forest, compared to about 3.4 miles crossed by the corresponding segment of the Proposed Route within the Jefferson National Forest. Both the Northern Pipeline Alternative and Proposed Route would cross the Appalachian National Scenic Trail and Blue Ridge Parkway. The Northern Pipeline Alternative would cross about 110 perennial waterbodies, compared to 204 perennial waterbodies crossed by the corresponding segment of the Proposed Route. The alternative would cross over twice as much NWI-mapped wetland, including over one mile of forested wetland, compared to the corresponding segment of Proposed Route.

Although the Northern Pipeline Alternative would avoid crossing those areas of concern crossed by the Proposed Route in Giles and Montgomery Counties as described above for Route Alternative 1, the Northern Pipeline Alternative presents its own areas of concern. The Northern Pipeline Alternative also includes alternative crossing locations for the Appalachian National Scenic Trail and Blue Ridge Parkway.

The Northern Pipeline Alternative would cross a significantly greater length of National Forest Service lands, and cross about 6,800 feet more wetlands (as mapped by NWI), including 3,800 feet of forested wetland, than the corresponding segment of the Proposed Route. In addition, using the Northern Pipeline Alternative route for the Project would require installing two pipelines along the first 180 miles of the ACP route. An additional major impediment for this Alternative is that the mountainous terrain along portions of the route, particularly in northern West Virginia, would not allow for construction of two large diameter pipelines in a common corridor. Much of the route in northern West Virginia follows ridgelines with narrow crests and steep side-slopes. Significant mountaintop removal and material excavation would be required to obtain a proper level construction surface to work on during the pipeline installation phase. The routing on the ridgetops is necessary to avoid water features, homes, roads, and wetlands typically located in the valleys. There is insufficient space along the tops of the ridgelines for two adjacent, large diameter pipelines in these areas. Constructing two large diameter pipelines in the mountainous terrain would add significant construction personnel risk with the amount of equipment necessary to move and install both pipelines in the steep terrain. Sidebooms do not have enough weight capacity or levered distance to hold or move a second pipe over the first pipe trench. Erosion and sediment control risks significantly increase with the amount of soil and steep slope disturbance required for the two 42-inch pipelines ditch excavation and soil control. Use of this alternative would then greatly increase the area of impact and the duration of construction-related disturbance where the two pipelines are collocated, including across 29 miles of National Forest lands and the crossing of the Appalachian National Scenic Trail and Blue Ridge Parkway. Finally, MVP will also serve Roanoke Gas which is located along its Proposed Route in southwest Virginia; a market that cannot be served by moving to the Northern Pipeline Alternative route. For these reasons, MVP does not consider the Northern Pipeline Alternative to be environmentally preferable and to meet its purpose and need.

10.5.4 Dominion Supply Header Pipeline

On September 18, 2015, Dominion filed an application with FERC for its proposed Supply Header project which includes approximately 39 miles of 36-inch-diameter natural gas pipeline and modified compression facilities in West Virginia and Pennsylvania (Docket No. CP15-555). Through a direct connection with the ACP, the Supply Header project would transport natural gas from supply areas in Ohio, Pennsylvania and West Virginia to market areas in Virginia and North Carolina. The Supply Header pipeline begins near MP 36.7 of the MVP Pipeline and runs generally parallel and four to eight miles to the west of the northern end of the MVP Pipeline. In concept, a portion of the two projects could be collocated, and as requested by FERC, MVP evaluated a pipeline route that would collocate about the northern 36.7 miles of the MVP Project with the Supply Header pipeline (Supply Header Collocation Alternative).

This alternative would begin at MP 0.0 of the Proposed Route and continue southwest along an existing pipeline for about 4.5 miles until intersecting the route of the Supply Header pipeline. The alternative would then follow adjacent to the Supply Header pipeline route for about 28.5 miles until rejoining the Proposed Route at about MP 36.7 (Figure 10.5-3).

MVP has access to the route of the Supply Header project as shown in general mapping available included in Dominion's Application. Based on this mapping MVP has evaluated potential impacts of the portion of the Supply Header Project that would be collocated with the Project. Table 10.5-3 includes a comparison of environmental features crossed by the Supply Header Collocation Alternative and the corresponding segment of the Proposed Route using available desktop data.

Table 10.5-3

Comparison of Collocation with the Supply Header Collocation Alternative and the Proposed Route

Feature	Supply Header Collocation Alternative	Proposed Route
General		
Total length (miles)	33.0	36.7
Length adjacent to existing ROW (miles)	4.5	1.3
Land disturbed within construction ROW (acres) a/	499.5	555.3
Land Use		
Populated areas b/ within ½ mile (number)	0	1
National Forest System lands crossed (miles)	0	0
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number)	199 c/	223
Residences within 50 feet of construction work space (number)	3	22
Resources		
Forested land crossed (miles)	30.6	34.1
Forested land affected during construction (acres)	462.9	516.5
Forested land affected during operation (acres)	185.3	206.6
Wetlands (NWI) crossed (feet)	295	72
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number) d/	14	11
Shallow bedrock crossed (miles)	30.2	34.3
Steep slope (>20 percent) crossed (miles)	29.4	18.1
Karst area crossed (miles)	0	0

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ estimated assuming similar size and number of landowner parcels would be crossed by the alternative as those crossed by the corresponding segment of Proposed Route.
d/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

The Supply Header Collocation Alternative would be about 3.7 miles shorter than the corresponding segment of Proposed Route and result in about 56 acres less land disturbance during construction than the corresponding segment of Proposed Route. Based on the mapping available to MVP, the Alternative would cross about 220 feet more NWI mapped wetland and would cross about 3.5 less miles for forest land and would be within 50 feet of fewer residences than the Proposed Route. The alternative would cross about 29.4 miles of steep terrain, compared to 18.1 miles by the corresponding segment of Proposed Route. An advantage of the Supply Header Collocation Alternative would be combining impacts from the two projects into a single corridor, although only about 4.5 miles of the alternative would follow currently existing cleared right-of-way.

The primary disadvantage of the Supply Header Collocation Alternative would be the lack of suitable construction area for the construction of two adjacent pipelines in much of the steep terrain crossed by the alternative route. The only suitable location for placement of a large diameter pipeline in the areas of steep terrain crossed are along ridge tops, which in the region are commonly less than 50 feet wide, which is not wide enough for placement of two large diameter adjacent pipelines without significant earth movement to level the ridgetops. Collocation of two large diameter pipelines along the steep ridgelines would require significant cut and fill, significantly increasing the area of impact, and side-slope installation of at least one of the pipelines. See also discussion of the Folsom East Variation in Section 10.6.1 below. For this reason, the Supply Header Collocation Alternative is not a reasonable alternative.

10.5.5 East Tennessee Natural Gas (ETNG) Alternative

In an information request dated March 13, 2015, FERC asked MVP to evaluate an alternative that would follow the existing East Tennessee Natural Gas (ETNG) pipeline near Blacksburg, Virginia, then proceed southeast to the existing Transco pipeline, and then follow the Transco pipeline northeast to Transco Station 165. The Proposed Route crosses the existing ETNG pipeline near MP 235.2 about 1 mile west of where the ETNG pipeline crosses under Spring Hollow Reservoir. To utilize the existing ETNG right-of-way, this alternative would turn southwest at MP 235.2 and follow the ETNG pipeline for about 50 miles to Wytheville, Virginia, then turn south and southeast following the ETNG pipeline for about 90 miles before joining the Transco pipeline near the Virginia/North Carolina state line. The alternative would then turn northeast and follow the Transco pipeline for about 30 miles before ending at Station 165 at MP 300.97 of the Proposed Route (Figure 10.5-4).

MVP has evaluated potential impacts of placing the MVP Pipeline adjacent to the ETNG pipeline in this area using publicly available mapping and data. Table 10.5-4 includes a comparison of environmental features crossed by the ETNG Alternative and the corresponding segment of the Proposed Route.

The ETNG Alternative would be adjacent to existing pipeline right-of-way for nearly its entire length, or about 171 miles, compared to 3.8 miles of the corresponding segment of Proposed Route. However, the alternative would cross about 5 miles of the Jefferson National Forest, require two crossings of the New River, would be about 106 miles longer and result in about 1,607 more acres of land disturbance during construction than the corresponding segment of Proposed Route. The ETNG would cross a significantly greater length of forest area and NWI mapped wetlands than the Proposed Route. The ETNG Alternative would cross 13 city or town limits, identified as populated areas, as shown in ESRI data compared to 2 crossed by the corresponding segment of Proposed Route. The ETNG alternative would require construction within 50 feet of approximately 46 residences, compared to 8 for the corresponding segment of Proposed Route.

Table 10.5-4

Comparison of ETNG Alternative and the Proposed Route

Feature	ETNG Alternative	Proposed Route
General		
Total length (miles)	171.8	65.7
Length adjacent to existing ROW (miles)	170.8	3.8
Land disturbed within construction ROW (acres) a/	2,602.8	995.2
Land Use		
Populated areas b/ within ½ mile (number)	13	2
National Forest System lands crossed (miles)	5.0	0
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	1	1
NRHP designated or eligible historic districts crossed (miles)	0.2	0
Landowner parcels crossed (number)	941 c/	361
Residences within 50 feet of construction work space (number)	46	8
New River crossings (number)	2	0
Resources		
Forested land crossed (miles)	89.7	41.4
Forested land affected during construction (acres)	1,360.6	628.8
Forested land affected during operation (acres)	543.7	250.6
Wetlands (NWI) crossed (feet) d	7,688	1,701
Forested wetlands crossed (feet)	1,285	1,236
Forested wetlands affected by construction (acres)	2.2	2.1
Forested wetlands affected by operation (acres)	1.5	1.4
Perennial waterbody crossings (number) d/	85	35
Shallow bedrock crossed (miles)	67.7	17.1
Steep slope (>20 percent) crossed (miles)	52.6	13.7
Karst area crossed (miles)	59.6	1.2

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ estimated assuming similar size and number of landowner parcels would be crossed by the alternative as those crossed by the corresponding segment of Proposed Route.
d/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

In addition, because the ETNG is an older pipeline, there are a number of areas along the existing pipeline where residential and commercial development has built up adjacent to the right-of-way, including the communities of Christiansburg, Fairlawn, and Dublin, Virginia, and Meadow Summit, North Carolina. In some locations, it is likely that there is not enough room adjacent to the existing right-of-way for a new pipeline, and in these locations, the MVP pipeline would need to be moved away from the existing right-of-way to avoid the developed areas.

Because of the significant additional length and increase in communities that would be crossed, the ETNG Alternative is not a reasonable alternative.

10.5.6 Collocation with Other Proposed or Planned Pipeline Projects

MVP considered whether construction of the MVP Project adjacent to, and in addition to, other planned major pipeline projects would be reasonable route alternatives.

Reports in the press indicate that Spectra is no longer pursuing what was called its Carolina Pipeline Project, which as originally planned would have extended from Pennsylvania to North Carolina (Cumberland Union Times 2014, The Robisonian 2014). This project also is not listed among planned or proposed new projects on Spectra's website (Spectra Energy 2015). Therefore, MVP believes that constructing MVP adjacent to the Carolina Pipeline Project is not a reasonable alternative.

Williams has announced the possibility of a pipeline in the same general region known as the Appalachian Connector Project. In general the project has start and end points similar to those of the Project; however according to the Williams website, "the route for the project has not yet been developed. Williams is in the early stages of performing desktop analysis to identify a study area for the potential route. If the project moves forward, then the company would begin the formal process of conducting field surveys and meeting with landowners, communities and other stakeholders to solicit feedback and further refine the route" (Williams Pipelines, http://co.williams.com/expansionprojects/appalachian-connector). Because a route for the Appalachian Connector project has not been identified it is not possible to evaluate collocation of the MVP with the Appalachian Connector project.

10.6 ROUTE VARIATIONS

As described in Section 10.5.1, during the initial pipeline routing process MVP evaluated a number of route variations along its Proposed Route. Since the initial routing process, MVP has continued to identify route variations as a result of ongoing consultations with landowners, local representatives, and land management agencies, including during MVP's 14 open house meetings held along the pipeline route in December 2014 and January 2015. An update on route variations was filed with the Commission on February 18, 2015; a pipeline route and alternatives were filed with FERC in draft Resource Report 10 on April 14, 2015; and an update on a potential alternative near Newport, Virginia was filed with FERC on August 26, 2015. Additionally, on the ground surveys have been conducted since the route filed with FERC in April 2015, and minor route modifications and route variations have been identified to avoid or minimize possible impacts on various resources including public lands, areas of visual concern, waterbody crossings, karst topography, structures, and roadways. Minor route modifications that have been incorporated into the Proposed Route are discussed in Section 10.6.20 and listed in Appendix 10-D. Route variations are described below, including a comparison with the corresponding segments of the Proposed Route. Information on environmental features used to compare each variation with the Proposed

Route is based on desk-top analysis of publicly available information, and data from field surveys where access to the Proposed Route and some alternatives was obtained. Where access was obtained, MVP conducted field surveys along the Proposed Route and some variations.

10.6.1 Folsom East Variation (MPs 2.7-9.1)

MVP identified the Folsom East Variation as a result of constructability review of a segment of the pipeline in Wetzel County, West Virginia near the community of Folsom. The Proposed Route between MPs 2.7 and 9.1 generally follows ridgelines, and the Folsom East Variation also follows ridgelines generally along the next ridge to the east of the Proposed Route. The Folsom East Variation was the original route selected in this area. However, during site review, it was determined that the previously constructed Columbia Gas 1360 pipeline also follows this ridgeline, and the narrow ridgeline is not suitable for construction of a second pipeline. MVP subsequently identified the current Proposed Route in this location to avoid the existing pipeline and is including the original route here as the Folsom East Variation.

The variation would begin at MP 2.7 of the Proposed Route where it would turn southeast and then south following ridgelines for 5.9 miles, generally parallel and about one half to one mile east of the Proposed Route, before rejoining the Proposed Route at MP 9.1 (Figure 10.6-1).

Table 10.6-1 includes a comparison of environmental features crossed by the Folsom East Variation and the corresponding segment of the Proposed Route.

The Folsom East Variation would be slightly shorter (0.4 mile) and cross one less perennial waterbody than the corresponding segment of the Proposed Route. The variation would be adjacent to an existing pipeline right-of-way (Columbia Line 1360) for about 1.3 miles, compared to 0.5 miles for the Proposed Route. However, as noted, the existing pipeline is placed along a narrow ridgeline which greatly limits the physical space available for construction activity and installation of a second pipeline. A new pipeline and corresponding construction right-of-way would have to be offset from the existing pipeline, which would place the pipeline and much of the work space along the very steep side slope for much of the distance. This would require significant cut and fill for side slope construction. The Proposed Route in this location avoids the need for significant side slope construction. Impact on other environmental features would be similar between the variation and the Proposed Route. Because the Folsom East Variation would require significant side slope construction, MVP does not consider the variation to be environmentally preferable to the corresponding segment of the Proposed Route.

Table 10.6-1

Comparison of The Folsom East Variation and the Proposed Route

Feature	Folsom East Variation	Proposed Route
General		
Total length (miles)	5.9	6.3
Length adjacent to existing ROW (miles)	1.3	0.5
Land disturbed within construction ROW (acres) a/	89.9	95.9
Land Use		
Populated areas b/ within ½ mile (number)	0	0
National Forest System lands crossed (miles)	0	0
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number)	33	23
Residences within 50 feet of construction work space (number)	0	0
Resources		
Forested land crossed (miles)	5.9	6.0
Forested land affected during construction (acres)	88.9	91.1
Forested land affected during operation (acres)	35.6	36.5
Wetlands (NWI) crossed (feet) c/	0	0
Forested wetlands crossed (feet) c/	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number) c/	1	2
Shallow bedrock crossed (miles)	5.8	6.0
Steep slope (>20 percent) crossed (miles)	4.4	3.7
Karst area crossed (miles)	0	0

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

10.6.2 Burnsville Lake Wildlife Management Area Variation (MPs 65.3-69.6)

The Burnsville Lake Wildlife Management Area Variation was the route initially identified by MVP to cross the eastern portion of the Burnsville Lake Wildlife Management Area (WMA) in Braxton, County, West Virginia. The WMA is managed by West Virginia Department of Natural Resources (WVDNR). The WMA is part of the WVDNR's statewide wildlife management program which is designed to conserve and manage high quality habitats for a variety of wildlife species and to improve public access to these resources (WVDNR 2014). During analysis of the original route (which is now the variation), MVP identified a preferred route further to the east that would avoid the WMA except for a narrow crossing of approximately 175 feet at the eastern edge. The variation would begin at MP 65.3, where it would turn southwest from the Proposed Route along a ridge line for about 0.2 mile, then turn south for about 3.5 miles, crossing Clover Fork, the eastern edge of the Burnsville Lake WMA, and Left Fork, before rejoining the Proposed Route at MP 69.6 (Figure 10.6-2).

Table 10.6-2 includes a comparison of environmental features crossed by the Burnsville Lake Wildlife Management Area Variation and the corresponding segment of the Proposed Route.

The Burnsville Lake Wildlife Management Area Variation would be slightly shorter (0.2 mile) and cross two less perennial waterbodies than the corresponding segment of the Proposed Route. However the variation would cross about 1.8 miles of the Burnsville Lake WMA, compared to less-than 0.1 mile crossed by the corresponding segment of the Proposed Route at the crossing of Left Fork and Knawl Creeks. Impact on other environmental features would be similar between the variation and the Proposed Route. Because the variation would cross high quality wildlife habitat managed by the WVDNR within the Burnsville Lake WMA, MVP does not consider the variation to be environmentally preferable to the corresponding segment of the Proposed Route.

Table 10.6-2

Comparison of The Burnsville Lake Wildlife Management Area Variation and the Proposed Route

Feature	Burnsville Lake WMA Variation	Proposed Route
General		
Total length (miles)	4.1	4.3
Length adjacent to existing ROW (miles)	0	0
Land disturbed within construction ROW (acres) a/	61.7	65.0
Land Use		
Populated areas b/ within ½ mile (number)	0	0
National Forest System lands crossed (miles)	0	0
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number)	15	20
Residences within 50 feet of construction work space (number)	0	0
WMA lands crossed (miles)	1.8	<0.1
Resources		
Forested land crossed (miles)	4.0	4.
Forested land affected during construction (acres)	61.1	60.9
Forested land affected during operation (acres)	24.5	24.3
Wetlands (NWI) crossed (feet) c/	0	0
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number)	2	4
Shallow bedrock crossed (miles)	4.0	3.9
Steep slope (>20 percent) crossed (miles)	2.9	2.2
Karst area crossed (miles)	0	0

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ NWI data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

10.6.3 Elk River Wildlife Management Area Variation (MPs 76.2-94.0)

The Elk River Wildlife Management Area Variation was the route initially identified by MVP to cross the eastern portion of the Elk River WMA in Braxton, County, West Virginia. The WMA is in shared ownership by the U.S. Army Corps of Engineers and WVDNR and is managed by the WVDNR. The WMA is part of the WVDNR's statewide wildlife management program which is designed to conserve and manage high quality habitats for a variety of wildlife species and to improve public access to these resources (WVDNR 2014). During further analysis of the route, MVP identified a preferred route further to the east that would avoid the WMA entirely. The variation would begin at MP 76.2, where it would continue generally south for 16.9 miles, crossing two segments of the Elk River WMA, including the Holly and Elk Rivers, before rejoining the Proposed Route at MP 94.0 (Figure 10.6-3).

Table 10.6-3 includes a comparison of environmental features crossed by the Elk River Wildlife Management Area Variation and the corresponding segment of the Proposed Route.

The variation would be about 0.7 mile shorter and cross four perennial waterbodies compared to eight along the corresponding segment of the Proposed Route. No residences would be within 50 feet of the construction work space for the variation, compared to eight along the corresponding segment of Proposed Route. The variation would cross about 3.2 miles of the Elk River WMA, which would be avoided entirely by the corresponding segment of the Proposed Route. Impact on other environmental features would be similar between the variation and the Proposed Route. Because the variation would cross high quality wildlife habitat managed by the WVDNR within the Elk River WMA, MVP does not consider the variation to be environmentally preferable to the corresponding segment of the Proposed Route.

Table 10.6-3

Comparison of The Elk River Wildlife Management Area Variation and the Proposed Route

Feature	Elk River WMA Variation	Proposed Route
General		
Total length (miles)	16.9	17.6
Length adjacent to existing ROW (miles)	0.8	0.2
Land disturbed within construction ROW (acres) a/	256.0	266.2
Land Use		
Populated areas b/ within ½ mile (number)	0	0
National Forest System lands crossed (miles)	0	0
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number)	39	62
Residences within 50 feet of construction work space (number)	7	8
WMA lands crossed (miles)	3.2	0
Resources		
Forested land crossed (miles)	16.3	16.7
Forested land affected during construction (acres)	246.7	253.3
Forested land affected during operation (acres)	98.7	101.4
Wetlands (NWI) crossed (feet) c/	135	102
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number)	4	8
Shallow bedrock crossed (miles)	15.4	15.8
Steep slope (>20 percent) crossed (miles)	11.5	10.0
Karst area crossed (miles)	0	0

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ NWI data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

10.6.4 Variations 110, 110J, and 110R (MPs 174.8-227.5)

MVP identified Variation 110 and modifications to Variation 110 called Variation 110J and 110R as possible alternatives that include a different crossing location of both the Appalachian National Scenic Trail and Jefferson National Forest. These variations would also avoid a number of resources and areas of concern which are crossed along the Proposed Route in Giles and Montgomery Counties, Virginia that were identified during open houses as well as in comments filed with FERC. Variations 110, 110J, and 110R begin at MP 174.8 of the Proposed Route in Monroe County, West Virginia, where they would turn east and then continue generally southeast crossing the ridgeline of Peters Mountain, passing near the hamlet of Waiteville, West Virginia, then crossing the WV-VA state line, John's Creek, then over the ridgeline of John's Creek Mountain to a point just north of Virginia Rt. 42. From this point Variation 110 and 110R would continue south across the valley near Simmonsville, Virginia, cross the Appalachian National Scenic Trail and the ridgeline of Singing Creek Mountain. Variations 110 and 110R would take slightly different routes between Singing Creek Mountain and Brush Mountain, with Variation 110R turning south and then sharply east adjacent to an existing power line corridor between Brush Mountain East and Brush Mountain West Wilderness Areas, then joining the same route as Variation 110 at Brush Mountain.

From the point just north of Virginia Rt. 42, Variation 110J would turn east then southeast, crossing Sinking Creek Mountain about 3.5 miles northeast of Variation 110 and 110R, where it would continue southeast crossing Brush Mountain and the Appalachian National Scenic Trail, then turn south and southwest to join the same route as Variation 110 and 110R just south of Brush Mountain. South of Brush Mountain, the three variations would share the same route, continuing south across Paris Mountain and rejoin the Proposed Route at MP 227.5 just south of the crossing of I-81 (Figure 10.6-4).

Table 10.6-4 includes a comparison of environmental features crossed by Variations 110, 110J, 110R, and the corresponding segment of the Proposed Route.

Table 10.6-4

Comparison of Variations 110, 110R, and 110J and the Proposed Route

Feature	Variation 110	Variation 110R	Variation 110J	Proposed Route
General				
Total length (miles)	43.4	44.3	49.5	57.8
Length adjacent to existing ROW (miles)	0.6	0.6	1.3	11.3
Land disturbed within construction ROW (acres) a/	656.5	670.5	749.6	875.5
Land Use				
Populated areas b/ within ½ mile (number)	1	1	1	1
National Forest lands crossed (miles)	6.2	6.2	5.3	3.4
National Forest Wilderness crossed (miles)	1.1	0	0.04	0
Appalachian National Scenic Trail crossings (number)	1	1	1	1
Blue Ridge Parkway crossings (number)	0	0	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0	0	10.1
Landowner parcels crossed (number)	181	198	250	252
Residences within 50 feet of construction work space (number)	0	3	9	8
Resources				
Forested land crossed (miles)	31.8	32.2	35.3	44.4
Forested land affected during construction (acres)	482.0	487.6	535.2	675.2
Forested land affected during operation (acres)	192.9	195.2	214.1	269.5
Old growth forest crossed within National Forest (miles)	0.9	0.8	0.8	0.3
Wetlands (NWI) crossed (feet) c/	446	446	765	44
Forested wetlands crossed (feet)	223	223	223	0
Forested wetlands affected by construction (acres)	0.4	0.4	0.4	0
Forested wetlands affected by operation (acres)	0.3	0.3	0.3	0
Perennial waterbody crossings (number) d/	19	19	25	22
Shallow bedrock crossed (miles)	26.6	27.9	28.1	36.6
Steep slope (>20 percent) crossed (miles)	0	0	0	0
Karst area crossed (miles)	26.3	25.8	32.0	40.9

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

Variations 110, 110R, and 110J avoid the following concerns that have been identified as crossed by or in the proximity of the Proposed Route:

- Areas of karst geology in the Pembroke and Newport, Virginia areas, including areas surrounding Little Stony Creek and Sinking Creek, several mapped caves (including Pig Hole Cave, Smoke Hole Cave, Tawney Cave, and Cascade Waterfalls), and groundwater supply concerns expressed by residents in this area;
- Greater Newport Rural Historic District;
- North Fork Historic District;
- Residential areas;
- The Nature Conservancy's Blake Preserve, also known as Mill Creek Springs Natural Area Preserve;
- The Mercer Angler's Club;
- James Monroe High School in Monroe County, West Virginia and Eastern Elementary School in Giles County, Virginia;
- The area of concern for the Red Sulphur Public Service District and the water supply for Peterstown, West Virginia;
- Big Stony Creek Road (Virginia Scenic Byway);
- Moves the route to the edge of a threatened and endangered species buffer area in Monroe County; and
- Peters Mountain Wilderness Area and Mountain Lake Wilderness Area.

Variation 110 crosses 6.2 miles of the Jefferson National Forest, including about 1.1 miles of designated wilderness area. Although the alternative is about 14.5 miles shorter it crosses about 2.8 more miles and impacts an additional 42 acres of the Jefferson National Forest than the corresponding segment of the Proposed Route, including about 1.1 mile of designated wilderness area that would not be crossed by the Proposed Route. Variation 110 would cross the South Fork of Potts Creek, in Monroe County, West Virginia, which contains the only known population of the federally endangered James spinymussel within West Virginia. Along the portion of the variation within Virginia, the variation would cross the largest known populations of the James spinymussel where it crosses John's Creek, Dick's Creek, and Little Oregon Creek in Craig County, Virginia. Variation 110 would also cross about 0.9 miles of mapped old growth forest within the Jefferson National Forest, compared to 0.3 miles crossed by the corresponding segment of Proposed Route. During site surveys of the variations two Forest Service sensitive plants, American barberry and Rock Skullcap, were also found along Variation 110.

Alternative 110 is collocated with existing rights-of-way for only 0.6 miles compared to 11.3 miles for the corresponding segment of the Proposed Route. Where Variation 110 crosses over Peters Mountain it would cross the Allegheny Trail, a 330-mile-long, north-south hiking trail that runs from the Pennsylvania-West Virginia border to an intersection with the Appalachian National Scenic Trail on Peters Mountain at the Virginia-West Virginia border. The Proposed Route would not cross the Allegheny Trail. Variation 110 includes an alternative crossing location of the Appalachian National Scenic Trail, crossing the trail along the ridgeline of Sinking Creek Mountain, which is about 25 miles east of the proposed crossing location on Peters Mountain (see Figure 10.6-4). The variation would cross

no designated historic districts and be within one-half mile of one populated area, compared to 10.1 miles of designated historic districts crossed and one area within one-half mile of the corresponding segment of Proposed Route. A number of comments were received concerned about the potential impact that variations 110, 110R, and 110J would have on the historic nature of the areas crossed by the variations, although none are designated as historic districts. Commenters noted history associated with the Potts Valley Branch Railroad and Tri-State Incline Lumber Operation, and the Waiteville, Laurel Branch, and Paintbank train depots and remains of old wooden trestles.

Variation 110R crosses 6.2 miles of the Jefferson National Forest. Although the alternative is about 13.5 miles shorter it crosses approximately 2.8 more miles and impacts an additional 42 acres of the Jefferson National Forest than the corresponding segment of the Proposed Route. Variation 110R would also cross about 0.8 miles of mapped old growth forest within the Jefferson National Forest, compared to 0.3 miles crossed by the corresponding segment of Proposed Route. Variation 110R is collocated with existing rights-of-way for only 0.6 miles compared to 11.3 miles for the corresponding segment of Proposed Route. Variation 110R crosses the Appalachian National Scenic Trail at the same location as Variation 110, but includes a different crossing of the Brush Mountain Wilderness Area (Figure 10.6-4).

Variation 110J crosses 5.3 miles of the Jefferson National Forest. Although the alternative is about 8.3 miles shorter, it crosses about 1.9 more miles and impacts an additional 29 acres of the Jefferson National Forest than the corresponding segment of the Proposed Route. Variation 110J would also cross about 0.8 miles of mapped old growth forest within the Jefferson National Forest, compared to 0.3 miles crossed by the corresponding segment of Proposed Route. Variation 110J is collocated with existing rights-of-way for only 1.3 miles compared to 11.3 miles for the corresponding segment of Proposed Route. Variation 110J includes an alternative crossing location of the Appalachian National Scenic Trail, crossing the trail along the ridgeline of Brush Mountain, which is about 30 miles east of the proposed crossing location on Peters Mountain and about 5 miles east of the crossing by Variation 110 and 110R on Sinking Creek Mountain (see Figure 10.6-4). The alternative would cross no designated historic districts and be within one-half mile of one populated area, compared to 10.1 miles of designated historic districts crossed and one areas within one-half mile of the corresponding segment of the Proposed Route.

Variations 110, 110R, and 110J would each cross designated black bear habitat management areas within the Jefferson National Forest. The Proposed Route would avoid crossing any designated black bear habitat management areas.

Comments were received about the potential impacts of Variations 110, 110R, and 110J on the Mountain Shadow Trail, a one lane road that runs generally parallel and to the north of Peters Mountain. The Mountain Shadow Trail would be crossed by these variations where they share a common route north of Peters Mountain. The Proposed Route would also cross the Mountain Valley Trail at about MP 194. At any crossing location, the pipeline would cross the trail in a manner to avoid or minimize impact on traffic on the road, and the road would be restored to pre-construction conditions. Therefore there would be no difference in impact on the Mountain Shadow Trail between Variations 110, 110R, and 110J or the Proposed Route.

A number of comments have been received concerned about impacts from use of these variations on private properties that would be crossed, including concerns about impact on private water supplies. Concerns about impacts on private properties crossed by the variations were very similar to concerns expressed along the Proposed Route.

A number of comments were received expressing concern about visual impacts of the pipeline if it were located along variations 110, 110R, or 110J. Areas of potential visual concern included Pembroke Waterfall, Dragon's Tooth, Allegheny Trail, Potts Valley Rail Trail, Orvis Fly Fishing School, and the Hanging Rock Raptor Observatory.

Because of additional impact on Forest Service lands, including designated habitat, old growth, and Forest Service sensitive species; potential impact on the federally listed James spineymussel; and concerns expressed regarding historic properties along the variations, variations 110, 110R, and 110J provide no environmental advantage over the Proposed Route. In response to concerns about the pipeline along the Initial Route (as filed with FERC in April 2015), and ongoing agency consultations and on-site evaluations, the Proposed Route incorporates route changes along the segment of the route that avoids some of the areas of concern identified above that would also be avoided by use of Variations 110, 110R, and 110J. For example, the Proposed Route has been modified at the crossing of Peters Mountain, including the Appalachian National Scenic Trail (see discussion of Peters Mountain East and Peters Mountain. West variations), and in the area of Newport and the crossing of Brush Mountain (see discussion of AEP-Newport Variation).

10.6.5 Peters Mountain East Variation (MPs 190.2-197.7)

The Peters Mountain East Variation was a route initially identified by MVP to cross the Jefferson National Forest. This section of pipeline also crosses the West Virginia-Virginia state line, the Appalachian National Scenic Trail, and the designated Peters Mountain Wilderness Area within the National Forest. During further route analysis, MVP identified two other route options in this area (the Proposed Route and Peters Mountain West Variation), slightly west of this variation, to minimize various environmental impacts. The Initial Route in this location is evaluated here as the Peters Mountain East Variation. The variation would begin at MP 190.2 of the Proposed Route near the crossing of U.S. Route 219 and continue south for about 2.0 miles before turning sharply southwest along the lower shoulder of Peters Mountain for about 2.0 miles. The variation then turns sharply south-southeast and continues over Peters Mountain for about 2.2 miles, entering the Jefferson National Forest, and crossing the state line, Appalachian National Scenic Trail, and the southwestern edge of the Peters Mountain Wilderness. The variation then turns south and continues for another 2.6 miles before rejoining the Proposed Route at MP 197.7 (Figure 10.6.5).

Table 10.6-5 includes a comparison of environmental features crossed by the Peters Mountain Variation and the corresponding segment of the Proposed Route.

The environmental impacts of the variation would be similar to the corresponding segment of the Proposed Route. Both the variation and the Proposed Route would cross the Appalachian National Scenic Trail and a portion of the Jefferson National Forest. However, the corresponding segment of the Proposed Route would avoid crossing the designated Peters Mountain Wilderness Area. Because of the additional impact on National Forest lands, including designated wilderness area, MVP does not consider the Peters Mountain East Variation to be environmentally preferable to the corresponding segment of the Proposed Route.

Table 10.6-5

Comparison of Peters Mountain East Variation and the Proposed Route

Feature	Peters East Mountain Variation	Proposed Route
General		
Total length (miles)	7.1	7.4
Length adjacent to existing ROW (miles)	0.0	0
Land disturbed within construction ROW (acres) a/	106.9	112.3
Land Use		
Populated areas b/ within ½ mile (number)	0	0
National Forest System lands crossed (miles)	1.6	1.6
National Forest Wilderness crossed (miles)	0.6	0
Appalachian National Scenic Trail crossings (number)	1	1
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number) c/	29	13
Residences within 50 feet of construction work space (number)	0	1
Resources		
Forested land crossed (miles)	5.1	6.4
Forested land affected during construction (acres)	77.2	96.6
Forested land affected during operation (acres)	31.0	38.7
Wetlands (NWI) crossed (feet) d/	65	133
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number) d/	2	3
Shallow bedrock crossed (miles)	3.4	5.2
Steep slope (>20 percent) crossed (miles)	3.9	4.0
Karst area crossed (miles)	4.8	3.7

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ estimated assuming similar size and number of landowner parcels would be crossed by the alternative as those crossed by the corresponding segment of Proposed Route.
d/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

10.6.6 Peters Mountain West Variation (MPs 194.2-197.2)

The Peters Mountain West Variation was a route identified by MVP to cross the Jefferson National Forest and identified as the preferred route in its April 2015 filing with FERC. This section of pipeline also crosses the West Virginia-Virginia state line and the Appalachian National Scenic Trail. During further route analysis, MVP identified the Proposed Route, slightly east of this variation, to minimize various environmental impacts. The April 2015 route in this location is evaluated here as the Peters Mountain West Variation. The variation would begin at MP 194.2 of the Proposed Route on the lower shoulder of Peters Mountain, continue southwest and then south for about 3.0 miles, crossing over Peters Mountain, the West Virginia-Virginia State line, entering the Jefferson National Forest, and crossing the Appalachian National Scenic Trail, before rejoining the Proposed Route at MP 197.2 (Figure 10.6.6).

Table 10.6-6 includes a comparison of environmental features crossed by the Peters Mountain West Variation and the corresponding segment of the Proposed Route.

Both the Peters Mountain West Variation and the Proposed Route would cross the Appalachian National Scenic Trail and a portion of the Jefferson National Forest. During onsite reviews, MVP identified several issues with the variation, including occurrences of two rare species and closer proximity to Rich Creek and Wilson Spring which are the water source for a fish hatchery located about 0.2 mile downslope of the variation on the north side of Peters Mountain. MVP also identified concerns with topography along the variation. The steep slope along the northern side of Peters Mountain would require several sections where heavy construction equipment would need to be secured to other equipment by cables during pipeline construction (referred to as "winch hills"). In addition, MVP is proposing measures to minimize visual impact at the crossing of the Appalachian National Scenic Trail, including by boring underneath the trail, leaving un-cleared vegetation buffer on either side of the trail, and incorporating a "dogleg" into the pipeline alignment to avoid potential long views of the cleared right-of-way. At the trail crossing by the variation, topography is not as conducive to the measures to reduce visual impact as for the Proposed Route. Because of steeper topography a bored crossing of the trail along the variation would not include as much vegetation buffer on either side of the trail and would not allow for a dogleg to be incorporated into the alignment. Finally, the location of the extra work space for the bore at the north side of the Proposed Route crossing of the trail is within an old orchard area which will minimize forest clearing, whereas the extra work space for the bore at the variation would be entirely forested. Because of potential impact on rare species, constructability concerns, and potentially greater visual impact on the Appalachian National Scenic Trail, MVP does not consider the Peters Mountain West Variation to be environmentally preferable to the corresponding segment of the Proposed Route.

Table 10.6-6

Comparison of Peters Mountain West Variation and the Proposed Route

Feature	Peters Mountain West Variation	Proposed Route
General		
Total length (miles)	3.0	3.0
Length adjacent to existing ROW (miles)	0	0
Land disturbed within construction ROW (acres) a/	45.4	45.3
Land Use		
Populated areas b/ within ½ mile (number)	0	0
National Forest System lands crossed (miles)	1.4	1.5
National Forest Wilderness crossed (miles)	0.0	0.0
Appalachian National Scenic Trail crossings (number)	1	1
National Park Service lands crossed (miles)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number) c/	13	8
Residences within 50 feet of construction work space (number)	0	0
Resources		
Forested land crossed (miles)	2.9	2.8
Forested land affected during construction (acres)	44.3	41.9
Forested land affected during operation (acres)	17.7	16.8
Wetlands (NWI) crossed (feet) d	0	0
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number)	0	0
Shallow bedrock crossed (miles)	1.5	1.5
Steep slope (>20 percent) crossed (miles)	2.1	1.6
Karst area crossed (miles)	2.2	2.1

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ estimated assuming similar size and number of landowner parcels would be crossed by the alternative as those crossed by the corresponding segment of Proposed Route.
d/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

10.6.7 AEP-Newport Variation (MPs 207.6–222.3)

The AEP-Newport Variation is the route initially identified by MVP in the Newport, Virginia and Brush Mountain area. This variation was the preferred pipeline route in MVP's April 2015 filing with FERC. Since April 2015, in response to stakeholder concerns in the Newport area and Giles and Montgomery Counties, including concerns about pipeline construction in karst areas and impacts to residences in the Preston Forest neighborhood, MVP identified a revised route that is incorporated into the Proposed Route. The revised (and now proposed) route at this location was identified as Alternative 200 in an August 26, 2015 filing to FERC. The April 2015 route in this area is evaluated here as the AEP-Newport Variation.

The AEP-Newport Variation would begin at MP 207.6 where it would continue southeast adjacent to the existing AEP electric transmission line right-of-way for 10.6 miles before rejoining the Proposed Route at MP 222.3. The variation would deviate from the AEP right-of-way for a short distance at two locations to avoid multiple road and stream crossings (Figure 10.6-7).

Table 10.6-7 includes a comparison of environmental features crossed by the AEP-Newport Variation and the corresponding segment of the Proposed Route.

The AEP-Newport Variation would be about 4.1 miles shorter, resulting in about 62.1 acres less disturbance during construction than the Proposed Route. The variation would be adjacent to existing right-of-way for 8.2 miles (77 percent of its length), compared to 0.6 miles (< 1 percent) for the Proposed Route, and would cross 6.3 miles of karst terrain compared to 10.6 miles along the Proposed Route, and one less mile of historic district than the Proposed Route.

However, the AEP-Newport Variation would be within 50 feet of about eight residences, all of which are also adjacent to the existing transmission line right-of-way, most within the Preston Forest area, compared to one residence within 50 feet of an access road associated with the corresponding segment of Proposed Route. The AEP-Newport Variation would also cross along the edge of the Newport Recreation Area athletic fields, and about 0.2 mile of a parcel protected under easement to the Virginia Outdoors Foundation. These properties are avoided by the corresponding segment of Proposed Route.

The Proposed Route has also been modified near MP 210 to move the pipeline farther from several cave openings, including Tawney Cave, while also maintaining as much distance as possible from the historic Link Farm covered bridge. The AEP-Newport variation deviates to the north of the AEP right-of-way in this area, closer to the Tawney Cave opening, while the Proposed Route is south of the AEP right-of-way and then deviates farther to the south to move further from the Tawney and other cave openings. However, this also moves the Proposed Route closer to the Link Farm covered bridge, which would be about 380 feet from the construction work space, compared to about 550 feet for the variation. MVP evaluated moving the pipeline farther from the covered bridge to the southwest, but that was determined to be not feasible due to multiple crossings of Route 460 which would be required. MVP met with the property owner of the covered bridge, who desired that if necessary, the pipeline pass on the east side of an existing concrete bridge, which is closer to Tawney Cave.

Table 10.6-7

Comparison of AEP-Newport Variation and the Proposed Route

Feature	AEP-Newport Variation	Proposed Route
General		
Total length (miles)	10.6	14.7
Length adjacent to existing ROW (miles)	8.2	0.6
Land disturbed within construction ROW (acres) a/	160.2	222.3
Land Use		
Populated areas b/ within ½ mile (number)	0	0
National Forest System lands crossed (miles)	1.2	1.9
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	3.3	4.3
Landowner parcels crossed (number)	73	64
Residences within 50 feet of construction work space (number)	8	0
Distance from work space to Link Farm Covered Bridge (feet)	550	60
Virginia Outdoors Foundation property crossed (miles)	0.2	0
Resources		
Forested land crossed (miles)	7.6	9.9
Forested land affected during construction (acres)	115.5	151.5
Forested land affected during operation (acres)	46.2	60.0
Wetlands crossed (feet)	78	0
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number)	1	6
Shallow bedrock crossed (miles)	5.8	5.5
Steep slope (>20 percent) crossed (miles)	5.6	6.3
Karst area crossed (miles)	6.3	10.6

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ estimated assuming similar size and number of landowner parcels would be crossed by the alternative as those crossed by the corresponding segment of Proposed Route.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

Because the AEP-Newport Variation would require construction within 50 feet of 8 residences, including through the Preston Forest area, and would be closer to the opening of Tawney Cave, MVP does not consider the variation to be environmentally preferable to the corresponding segment of Proposed Route.

10.6.8 Blake Preserve Variation (MPs 223.1-223.9)

MVP identified this variation as a potential route to avoid crossing the Blake Preserve, also known as the Mill Creek Springs Natural Area Preserve, which is owned by The Nature Conservancy, and is crossed by the Proposed Route at MP 223.5 (approximately 350 feet) and is adjacent at MP 223.8 (approximately 450 feet). The Initial Route has been modified in this area so the current Proposed Route deviates away from an existing right-of-way to minimize the crossing of the preserve. The variation would begin at MP 223.1 of the Proposed Route where it would leave the existing transmission line right-of-way and turn southeast, avoid the crossing of Blake Preserve/Mill Creek Springs Natural Area Preserve, turn northeast and rejoin the existing transmission line right-of-way and the Proposed Route at MP 223.9 just west of Mill Creek Road (Figure 10.6-8).

Table 10.6-8 includes a comparison of environmental features crossed by the Blake Preserve Variation and the corresponding segment of the Proposed Route.

The Blake Preserve Variation would be about the same length and disturb the same area during construction than the corresponding segment of the Proposed Route. The variation would avoid crossing about 800 feet of Blake Preserve (Mill Creek Springs Natural Area Preserve) that is crossed by the Proposed Route. The variation would be located on entirely new right-of-way whereas roughly one-half of the corresponding segment of Proposed Route would be located adjacent to an existing overhead electric transmission right-of-way. Other environmental impacts would be similar between the alternative and the Proposed Route. MVP has modified the Proposed Route slightly in this location to minimize the crossing length of the preserve lands, while maintaining as much of the route as possible adjacent to the existing right-of-way, to minimize creation of new right-of-way. MVP does not consider the Blake Preserve Variation to be environmentally preferable to the corresponding segment of the Proposed Route.

Table 10.6-8

Comparison of Blake Preserve (Mill Creek Springs Natural Area Preserve) Variation and the Proposed Route

Feature	Blake Preserve Variation	Proposed Route
General		
Total length (miles)	0.9	0.9
Length adjacent to existing ROW (miles)	0.1	0.5
Land disturbed within construction ROW (acres) a/	13.4	13.1
Land Use		
Populated areas b/ within ½ mile (number)	0	0
National Forest System lands crossed (miles)	0	0
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0.6
Blake Preserve (Mill Creek Springs Preserve) crossing (feet)	0	800
Landowner parcels crossed (number)	7	5
Residences within 50 feet of construction work space (number)	0	0
Resources		
Forested land crossed (miles)	0.8	0.8
Forested land affected during construction (acres)	12.1	11.7
Forested land affected during operation (acres)	4.8	4.7
Wetlands (NWI) crossed (feet) c/	0	0
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number)	1	1
Shallow bedrock crossed (miles)	0.8	0.7
Steep slope (>20 percent) crossed (miles)	0.5	0.4
Karst area crossed (miles)	0.9	0.9

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ NWI data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

10.6.9 Poor Mountain East Variation (MPs 233.9–239.6)

The Poor Mountain East Variation is the pipeline route in the area east of Spring Hollow Reservoir, identified as the preferred route in MVP's April 2015 filing with FERC. Spring Hollow Reservoir is the main source of water supply for customers of the Western Virginia Water Authority in Roanoke County, Virginia. Concerns were raised during meetings with local officials, open house meetings, and in comments filed with the FERC about the pipeline's potential impact on the Spring Hollow Reservoir water supply. Concerns were also raised about the proximity of the April 2015 route to Camp Roanoke. Since April 2015, based on stakeholder issues and on-site ground review where access was obtained, MVP has incorporated into the Proposed Route the pipeline alignment previously identified as Alternative 135, which moves the pipeline further west and south of Spring Hollow Reservoir and Camp Roanoke. The April 2015 preferred route is evaluated here as the Poor Mountain East Variation.

The Poor Mountain East Variation would begin at MP 233.9 and turn east from the Proposed Route, then turn south generally along the western side of Spring Hollow Reservoir, then continuing southeast mostly following ridgelines, cross over Poor Mountain, and rejoin the Proposed Route at MP 239.6 (Figure 10.6-9).

Table 10.6-9 includes a comparison of environmental features crossed by the Poor Mountain East Variation and the corresponding segment of the Proposed Route.

The Poor Mountain East Variation is about 0.2 mile shorter and would cross five more perennial waterbodies than the corresponding segment of the Proposed Route. At two locations, the variation would be about 0.1 mile west of Spring Hollow Reservoir, while at the closest point, the Proposed Route would be about 0.9 mile west of the reservoir. At its closest point, the variation is about 0.4 mile southwest of Camp Roanoke, while the Proposed Route at its closest point (approximately MP 236) is about 1.5 miles west of Camp Roanoke. Both the Proposed Route and the variation cross a Nature Conservancy/Ducks Unlimited Conservation Easement on the flanks of Poor Mountain (see Figure 10.6-9), with the Proposed Route crossing about 1.1 miles and the variation crossing about 0.25 mile.

Near where the Poor Mountain East Variation diverges from the Proposed Route, both the variation and Proposed Route (near MP 234.0) would cross a 65-acre site on the south side of Roanoke Road that has been identified as a possible location of an intermodal yard. The purpose of the yard would be for transfer of rail-to-truck and truck-to-rail. Potential plans for this intermodal yard have been studied, but it is not approved or funded, and it is unclear if the intermodal yard will ever be built, as there are a number of obstacles and some local opposition to such a project (Roanoke.com 2014).

Because the variation would be closer to Spring Hollow Reservoir and Camp Roanoke, MVP does not consider the Poor Mountain East Variation environmentally preferable to the corresponding segment of Proposed Route.

Table 10.6-9

Comparison of Poor Mountain East Variation and the Proposed Route

Feature	Poor Mt. East Variation	Proposed Route
General		
Total length (miles)	5.5	5.7
Length adjacent to existing ROW (miles)	0	0
Land disturbed within construction ROW (acres) a/	82.8	86.0
Land Use		
Populated areas b/ within ½ mile (number)	1	1
National Forest System lands crossed (miles)	0	0
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number)	40	23
Residences within 50 feet of construction work space (number)	0	0
Resources		
Forested land crossed (miles)	4.8	5.1
Forested land affected during construction (acres)	72.0	77.0
Forested land affected during operation (acres)	28.9	30.7
Wetlands crossed (feet)	10	0
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number)	6	1
Shallow bedrock crossed (miles)	4.7	5.1
Steep slope (>20 percent) crossed (miles)	0	0
Karst area crossed (miles)	2.5	2.2

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

10.6.10 Higginbotham East Variation (MPs 240.3-241.8)

The April 2015 pipeline route filed with FERC crossed private land parcels (Higginbotham parcels) that are under conservation agreements with the Blue Ridge Land Conservancy. At the request of the Blue Ridge Land Conservancy MVP identified a route modification that would avoid the parcels (identified in the April 2015 filing as the Higginbotham Alternative), and has since incorporated that modification into its Proposed Route. The April 2015 preferred route is evaluated here as the Higginbotham East Variation.

The variation would begin at MP 240.3 of the Proposed Route where it would continue south and run parallel to and less than 0.2 mile east of the Proposed Route for 1.1 mile before rejoining the Proposed Route at MP 241.8 just south of the crossing of Bottom Creek Road (Figure 10.6-10).

Table 10.6-10 includes a comparison of environmental features crossed by the Higginbotham East Variation and the corresponding segment of the Proposed Route.

The Higginbotham East Variation would be 0.2 mile shorter and impact about 2.9 acres less area during construction than the corresponding segment of the Proposed Route. The variation would cross slightly more NWI-mapped wetland, but less NWI-mapped forested wetland than the Proposed Route. Other environmental impacts of the variation would be similar to those of the corresponding segment of Proposed Route. The primary difference between the variation and corresponding segment of Proposed Route is the variation would cross about 1,900 feet of Blue Ridge Conservancy lands, which would be avoided by the Proposed Route. Because the variation would cross portions of the Higginbotham parcels that are under Blue Ridge Conservation easements, while the Proposed Route would avoid these parcels, MVP does not consider the variation to be environmentally preferable to the corresponding segment of the Proposed Route.

Table 10.6-10

Comparison of Higginbotham East Variation and the Proposed Route

Feature	Higginbotham East Variation	Proposed Route
General		
Total length (miles)	1.3	1.5
Length adjacent to existing ROW (miles)	0	0
Land disturbed within construction ROW (acres) a/	19.1	22.0
Land Use		
Populated areas b/ within ½ mile (number)	0	0
National Forest System lands crossed (miles)	0	0
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0
Blue Ridge Conservancy Lands crossed (feet)	1,900	0
Landowner parcels crossed (number)	8	11
Residences within 50 feet of construction work space (number)	0	0
Resources		
Forested land crossed (miles)	0.8	0.9
Forested land affected during construction (acres)	11.9	13.9
Forested land affected during operation (acres)	4.7	5.6
Wetlands (NWI) crossed (feet) d	191	102
Forested wetlands crossed (feet)	0	102
Forested wetlands affected by construction (acres)	0	0.2
Forested wetlands affected by operation (acres)	0	0.1
Perennial waterbody crossings (number)	2	2
Shallow bedrock crossed (miles)	0.1	0
Steep slope (>20 percent) crossed (miles)	0.5	0.4
Karst area crossed (miles)	0	0

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ NWI data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

10.6.11 Blue Ridge Parkway Variation (MPs 244.5-245.8)

MVP evaluated routing options near the crossing of the Blue Ridge Parkway in an attempt to minimize vegetation clearing and long-term visual impact from travelers along the parkway. The Proposed Route crosses the Blue Ridge Parkway near MP 244.4 where there are open farm fields on both sides of the parkway. The Blue Ridge Parkway variation would begin at MP 244.5, just south of the proposed Blue Ridge Parkway crossing. The variation would turn south from the Proposed Route up a steady incline for about 0.6 mile, turn sharply east for about 0.4 mile, and then northeast for another 0.9 mile before rejoining the Proposed Route at MP 245.8 (Figure 10.6-11).

Table 10.6-11 includes a comparison of environmental features crossed by the Blue Ridge Parkway Variation and the corresponding segment of the Proposed Route.

The Blue Ridge Parkway Variation would be 0.6 mile longer than the corresponding segment of the Proposed Route, resulting in slightly more land affected during construction, including forest clearing. Other environmental impacts would generally be similar between the variation and corresponding segment of Proposed Route. The orientation of the variation where it would climb the wooded slope about 2.5 miles south of the Blue Ridge Parkway crossing would generally be perpendicular to the crossing of the Blue Ridge Parkway and would be visible to travelers along the parkway. The corresponding segment of the Proposed Route south of the Blue Ridge Parkway crossing would be generally parallel to the roadway and at a lower elevation, therefore limiting visibility of the pipeline right-of-way from the Blue Ridge Parkway. Therefore, MVP does not consider the variation to be environmentally preferable to the corresponding segment of the Proposed Route.

Table 10.6-11

Comparison of Blue Ridge Parkway Variation and the Proposed Route

Feature	Blue Ridge Parkway Variation	Proposed Route
General		
Total length (miles)	1.9	1.3
Length adjacent to existing ROW (miles)	0	0
Land disturbed within construction ROW (acres) a/	28.6	19.0
Land Use		
Populated areas b/ within ½ mile (number)	0	0
National Forest System lands crossed (miles)	0	0
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	1	1
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number)	9	4
Residences within 50 feet of construction work space (number)	0	0
Resources		
Forested land crossed (miles)	1.6	1.1
Forested land affected during construction (acres)	22.8	16.5
Forested land affected during operation (acres)	9.1	6.6
Wetlands (NWI) crossed (feet) c/	0	0
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number) c/	0	0
Shallow bedrock crossed (miles)	1.8	1.1
Steep slope (>20 percent) crossed (miles)	1.3	0.8
Karst area crossed (miles)	0	0

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

10.6.12 Cahas Mountain Variation (MPs 242.1-250.4)

The Cahas Mountain Variation is the pipeline route that follows the ridgeline of Cahas Mountain, near Boones Mill, Franklin County, Virginia and that was identified as the preferred route in MVP's April 2015 filing with FERC. MVP identified a route modification, called Alternative 210 in the April 2015 filing, as a route that avoids Cahas Mountain and is down gradient from the Town of Boones Mill's water source treatment plant. Since April 2015, MVP has incorporated Alternative 210 into the Proposed Route. The April 2015 preferred route is evaluated here as the Cahas Mountain Variation.

The Cahas Mountain Variation would leave the Proposed Route at MP 247.8, where it would cross Wades Gap Road and then climb the west side of Cahas Mountain and traverse the ridgeline of Cahas Mountain, including a portion of the Cahas Mountain Rural Historic District, for about 5 miles, then begin to turn south down the eastern side of the mountain, west of Boones Mill, for about 3.2 miles before rejoining the Proposed Route south of Boones Mill at MP 256.3 (Figure 10.6-12). Concerns were raised during meetings with local officials, open house meetings, and in comments filed with the FERC about the visual impact of the pipeline along Cahas Mountain impacts of the pipeline crossing on the Rural Historic District, and impacts from a pipeline running up slope from the Boones Mill water supply wells and source treatment plant. The Proposed Route runs to the south of Cahas Mountain, avoiding construction along the ridge top and avoiding a crossing of the Rural Historic District, and passing down slope of the Boones Mill wells and water source treatment plant.

Table 10.6-12 includes a comparison of environmental features crossed by the Cahas Mountain Variation and the corresponding segment of the Proposed Route.

The Cahas Mountain Variation is about 0.2 mile shorter and would affect about 2.6 acres less during construction than the corresponding segment of the Proposed Route. The variation would cross four perennial waterbodies compared to six waterbodies crossed by the corresponding segment of the Proposed Route. The variation would create new cleared right-of-way along the ridgeline of Cahas Mountain, including across a portion of the Cahas Mountain Rural Historic District. The Town of Boones Mill has expressed concern over possible impact to their water supply wells and treatment facilities, and the variation would also be closer and up slope to the Boones Mill water treatment plant (Figure 10.6-12). MVP believes that the pipeline could be constructed along either route and successfully avoid any impact on the Boones Mill water treatment facilities. However, because the variation would likely have a greater visual impact as a result of crossing along the ridgeline of Cahas Mountain and it would cross the Cahas Mountain Rural Historic District, and would be up slope of the Boones Mill wells and treatment facility, MVP does not consider the variation to be environmentally preferable to the corresponding segment of Proposed Route.

Table 10.6-12

Comparison of Cahas Mountain Variation and the Proposed Route

Feature	Cahas Mountain Variation	Proposed Route
General		
Total length (miles)	8.3	8.5
Length adjacent to existing ROW (miles)	0	0
Land disturbed within construction ROW (acres) a/	125.9	128.5
Land Use		
Populated areas b/ within ½ mile (number)	1	0
National Forest System lands crossed (miles)	0	0
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number)	35	48
Residences within 50 feet of construction work space (number)	0	0
Resources		
Forested land crossed (miles)	7.7	6.5
Forested land affected during construction (acres)		
Forested land affected during operation (acres)		
Wetlands crossed (feet)	20	14
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number)	4	6
Shallow bedrock crossed (miles)	1.8	1.1
Steep slope (>20 percent) crossed (miles)	6.3	2.7
Karst area crossed (miles)	0	0

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

10.6.13 Foggy Ridge Road Variation (MPs 260.8-261.8)

The Foggy Ridge Road Variation is an approximately one-mile-long segment of the April 2015 pipeline route filed with FERC, south of Wirtz, Virginia. Since that time, as a result of additional review, MVP identified a modification that moves the pipeline further from several homes and avoids one residential street crossing. Accordingly, MVP has incorporated that modification into the Proposed Route. The April 2015 preferred route is evaluated here as the Foggy Ridge Road Variation.

The variation would begin at MP 260.8 of the Proposed Route where it would continue south for about 0.5 miles, then turn east along an existing transmission line right-of-way for about 0.7 miles, cross Morris Flora Lane and Foggy Ridge Road about 800 feet south of the Proposed Route, and then rejoin the Proposed Route at MP 261.8 (Figure 10.6-13).

Table 10.6-13 includes a comparison of environmental features crossed by Foggy Bottom Road Variation and the corresponding segment of the Proposed Route.

The Foggy Ridge Road Variation is 0.2 mile longer than the corresponding segment of the Proposed Route. The variation would include construction within 50 feet of two residences and also cross Morris Flora Lane, a dead end road that is the single point of access for two additional residences. The corresponding segment of Proposed Route would avoid construction within 50 feet of residences and would avoid crossing Morris Flora Lane. For these reasons MVP does not consider the variation environmentally preferable to the Proposed Route.

Table 10.6-13

Comparison of Foggy Ridge Road Variation and the Proposed Route

Feature	Foggy Ridge Road Variation	Proposed Route
General		
Total length (miles)	1.2	1.0
Length adjacent to existing ROW (miles)	0.7	0.0
Land disturbed within construction ROW (acres) a/	19.7	16.7
Land Use		
Populated areas b/ within ½ mile (number)	0	0
National Forest System lands crossed (miles)	0	0
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number)	11	4
Residences within 50 feet of construction work space (number)	2	0
Resources		
Forested land crossed (miles)	0.3	0.1
Forested land affected during construction (acres)	5.2	1.9
Forested land affected during operation (acres)	2.1	0.8
Wetlands crossed (feet)	84	46
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number)	1	1
Shallow bedrock crossed (miles)	0	0
Steep slope (>20 percent) crossed (miles)	0.3	0.1
Karst area crossed (miles)	0	0

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

10.6.14 Bryant West Variation (MPs 289.4-293.4)

The Bryant West Variation is the pipeline route in the area near Redeye, Virginia, identified as the preferred route in MVP's April 2015 filing with FERC. Since April 2015, MVP has incorporated into its Proposed Route in this area a route modification, identified in the April 2015 filing with FERC as Alternative 144. The previously identified Alternative 144 is incorporated into the Proposed Route at the request of a landowner who suggested a straightened route as a means to reduce overall impact.

The Bryant West Variation would begin at MP 289.4 of the Proposed Route where it would continue southeast generally in a straight line, crossing a patchwork of woodlots and agricultural land for 4.5 miles before rejoining the Proposed Route at MP 293.4 (Figure 10.6-14).

Table 10.6-14 includes a comparison of environmental features crossed by Alternative 144 and the corresponding segment of the Proposed Route.

The Bryant West Variation is the same length and would affect the same area during construction as the corresponding segment of the Proposed Route. The alternative would cross 3 fewer waterbodies and cross slightly less forested land than the Proposed Route. The Proposed Route would be within 50 feet of one residence, while no residences would be within 50 feet of the variation. Officials and residents from Pittsylvania County, Virginia have expressed concern over potential water supply impacts from the pipeline crossing of Cherrystone Creek, which flows into Cherrystone Lake, the drinking water supply for Chatham, Virginia. The Proposed Route would cross Cherrystone Creek at about MP 292.4, about 2.2 miles upstream from the water supply intake. The Bryant West Variation would cross Cherrystone Creek about 1.7 miles further upstream than the Proposed Route or about 3.9 miles upstream from the water supply intake. MVP will cross Cherrystone Creek using an open cut dry ditch method, which will avoid or minimize direct impact on the surface water flow within the creek (see discussion in Resource Report 2). MVP does not believe the Bryant West Variation would be environmentally preferable to the corresponding segment of Proposed Route.

Table 10.6-14

Comparison of Bryant West Variation and the Proposed Route

Feature	Bryant West Variation	Proposed Route
General		
Total length (miles)	4.5	4.5
Length adjacent to existing ROW (miles)	0.4	0.4
Land disturbed within construction ROW (acres) a/	68.4	68.8
Land Use		
Populated areas b/ within ½ mile (number)	0	0
National Forest System lands crossed (miles)	0	0
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number)	24	25
Residences within 50 feet of construction work space (number)	0	1
Resources		
Forested land crossed (miles)	2.6	2.9
Forested land affected during construction (acres)	39.1	43.3
Forested land affected during operation (acres)	15.7	17.5
Wetlands crossed (feet)	133	87
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number)	3	9
Shallow bedrock crossed (miles)	0.1	0.1
Steep slope (>20 percent) crossed (miles)	0	0
Karst area crossed (miles)	0	0

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.

ROW = right-of-way
NRHP = National Register of Historic Places

10.6.15 Variation 35 (MPs 298.0-300.97)

MVP evaluated Variation 35 as a possible way to increase use of existing rights-of-way as suggested by landowners in comments filed with FERC (Wilson and Hankins). The variation would begin at MP 298.0 where it would continue east along the north side of an existing pipeline right-of-way for 2.2 miles, and then turn sharply southwest for 0.4 miles before rejoining the Proposed Route at MP 300.97 at the Project terminus (Figure 10.6-15).

Table 10.6-15 includes a comparison of environmental features crossed by Variation 35 and the corresponding segment of the Proposed Route.

Variation 35 is about 0.4 miles shorter and would affect about 5.8 fewer acres during construction than the corresponding segment of Proposed Route. The variation would also make greater use of an existing right-of-way, following about 2.2 miles (85 percent) compared to 0.3 miles (1 percent) for the Proposed Route. However, MVP identified several constructability issues along the variation. The existing overhead electric transmission line parallels a creek channel, and installation of a pipeline along this route would require multiple crossings of this stream, and/or crossing back and forth across the existing right-of-way to avoid construction within the creek. At one location, an outbuilding for a residence located along Transco Road would be within the construction work area for the variation. For these reasons, MVP does not believe Variation 35 is environmentally preferable to the corresponding segment of Proposed Route.

Table 10.6-15

Comparison of Variation 35 and the Proposed Route

Feature	Variation 35	Proposed Route
General		
Total length (miles)	2.6	3.0
Length adjacent to existing ROW (miles)	2.2	0.3
Land disturbed within construction ROW (acres) a/	39.6	45.4
Land Use		
Populated areas b/ within ½ mile (number)	0	0
National Forest System lands crossed (miles)	0	0
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number)	14	12
Residences within 50 feet of construction work space (number)	0	0
Resources		
Forested land crossed (miles)	0.4	1.8
Forested land affected during construction (acres)	6.9	26.8
Forested land affected during operation (acres)	2.5	10.7
Wetlands (NWI) crossed (feet) c/	0	0
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number) c/	4	4
Shallow bedrock crossed (miles)	0	0
Steep slope (>20 percent) crossed (miles)	0	0
Karst area crossed (miles)	0	0

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

10.6.16 CGV Peters Mountain Variation (MPs 194.0-199.4)

Columbia Gas of Virginia (CGV) maintains a 6-inch diameter pipeline that crosses about 0.8 miles of the Jefferson National Forest across Peters Mountain to provide service to the Celanese Acetate LLC (Celanese) plant near Narrows, Virginia. CGV recently installed an additional 12-inch-diameter natural gas distribution pipeline adjacent to the existing 6 inch pipeline in this area to provide additional service to the Celanese plant (USDA Forest Service 2013). The CGV pipeline to the Celanese plant is about 5 miles southwest of where the Proposed Route crosses Peters Mountain. MVP evaluated the CGV pipeline route as potential alternative route to cross the Jefferson National Forest and the Appalachian National Scenic Trail.

The U.S. Forest Service and Celanese recently reached an agreement on an easement for a relocation of the Appalachian National Scenic Trail to the east of the CGV pipeline. Because of this relocation, following the CGV pipeline route for the Project would avoid crossing the Appalachian National Scenic Trail along Peters Mountain. However, the MVP Pipeline would still need to cross the Appalachian National Scenic Trail at another location. To avoid crossing the New River two times, from the area of the Celanese plant the pipeline would need to turn east, requiring a crossing of the Appalachian National Scenic Trail within the recently relocated segment of the trail to the east of the Celanese plant. A conceptual route for such a variation is shown on Figure 10.6.16. MVP understands that the recent agreement and land transfer between the Forest Service and Celanese would not allow for a pipeline crossing in this location. Alternatively, the MVP Pipeline could move to the west of the Celanese plant, which would require a crossing of the New River, then cross the Appalachian National Scenic Trail within the Jefferson National Forest south of Bluff City, then crossing the New River a second time to return to the Proposed Route. Because the CGV Peters Mountain Variation would not avoid a crossing of the Appalachian National Scenic Trail, but would just move the crossing to another location within the Jefferson National Forest, MVP does not believe either of these options are feasible. However, as requested in FERC's August 11, 2015 letter to MVP, a conceptual route has been identified east of the Celanese plant for comparison to the corresponding segment of Proposed Route (Figure 10.6.16).

Table 10.6-16 includes a comparison of environmental features crossed by the CGV Peters Mountain Variation and the corresponding segment of the Proposed Route.

The CGV Peters Mountain Variation would be about 9.1 miles longer than the corresponding segment of the Proposed Route, resulting in about 137.8 additional acres of disturbance during construction. During initial planning, the possibility of following the existing CGV right-of-way over Peters Mountain had merit since it seemed to provide an option for crossing the Jefferson National Forest at Peters Mountain and the Appalachian National Scenic Trail adjacent to an existing cleared right-of-way. However, since the Appalachian National Scenic Trail recently moved from this area, following the CGV right-of-way no longer provides an opportunity for a collocated crossing of the trail. Because of the significant additional length, additional acreage of disturbance, and no benefit of a collocated crossing of the Appalachian National Scenic Trail, MVP does not consider the CGV Peters Mountain Variation to be environmentally preferable to the corresponding segment of Proposed Route.

Table 10.6-16

Comparison of CGV Peters Mountain Variation and the Proposed Route

Feature	CGV Peters Mountain Variation	Proposed Route
General		
Total length (miles)	14.5	5.4
Length adjacent to existing ROW (miles)	1.6	0
Land disturbed within construction ROW (acres) a/	219.4	81.6
Land Use		
Populated areas b/ within ½ mile (number)	1	0
National Forest System lands crossed (miles)	1.6	1.6
National Forest Wilderness crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	1	1
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number)	53	23
Residences within 50 feet of construction work space (number)	2	3
Resources		
Forested land crossed (miles)	8.7	4.7
Forested land affected during construction (acres)	132.4	70.0
Forested land affected during operation (acres)	52.7	28.2
Wetlands (NWI) crossed (feet) c/	103	0
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number) c/	1	2
Shallow bedrock crossed (miles)	4.1	1.6
Steep slope (>20 percent) crossed (miles)	7.3	2.9
Karst area crossed (miles)	11.1	4.4

a/ Assuming 125-foot-wide construction ROW.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the variation.

ROW = right-of-way
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

10.6.17 Alternative Crossing Locations of the Appalachian National Scenic Trail

Eight of the pipeline alternatives and variations evaluated by MVP and discussed above in Sections 10.5 and 10.6 include an alternative crossing location of the Appalachian National Scenic Trail. In the sections above the alternative trail crossing locations are compared to the proposed crossing location and evaluated within the context all other environmental and social features and impacts along the various lengths of pipeline for each alternative. As requested in FERC's August 11, 2015 letter to MVP, this section looks at just a single point on each alternative - the crossing of the Appalachian National Scenic Trail - and compares that point to the trail crossing by the Proposed Route. A comparison of impacts on the Appalachian National Scenic Trail between the pipeline alternatives and variations that include a crossing of the trail are summarized below and in Table 10.6-17. Topographic maps and aerial photos of the proposed and each alternative crossing location, and ground-based photos of the proposed crossing location, are included in Appendix 10-B.

10.6.17.1 Proposed Route

The Proposed Route crosses the Appalachian National Scenic Trail at MP 194.45 within Jefferson National Forest where the Appalachian National Scenic Trail runs along Peters Mountain, in Monroe County, West Virginia. At the trail crossing the Proposed Route is not adjacent to an existing right-of-way. Land use at the crossing is mixed forested/open land (see photos in Appendix 10-B), and the surrounding land use is primarily forested with some scattered scrub and open lands. Where the trail runs along Peters Mountain there are few man-made forest breaks, with the nearest forest break that would be experienced by a trail hiker about 3.4 miles from the proposed crossing. MVP proposes to cross the Appalachian National Scenic Trail using a horizontal bore underneath the trail, leaving about 100 feet of undisturbed vegetation on each side of the trail; therefore the proposed crossing would not create a new forest break within this forested section of trail. A visual impact analysis for the Proposed Route crossing of the trail confirms that the proposed crossing method would result in no visual impact to users of the Appalachian National Scenic Trail (see Resource Report 8).

Table 10.6-17

Appalachian National Scenic Trail Crossing Alternatives

Comparative Feature	Pipeline Alternative							
	Proposed Route	**Route Alternative 1**	**Northern Alternative**	**Variation 110/110R a/**	**Variation 110J**	**Peters Mountain East Variation**	**Peters Mountain West Variation**	**CGV Peters Mountain Variation**
General Location of trail crossing b/	Peters Mt., Jefferson NF	Pearis Mt., Jefferson NF	Near Avon	Sinking Creek Mt., Jefferson NF	Near Mill Cove Rd, Jefferson NF	Peters Mt., Jefferson NF	Peters Mt., Jefferson NF	Near Narrows
Adjacent to existing right-of-way	No	Yes	No	No	Yes	No	No	No
Land use at crossing	Forest/open	Forest	Forest	Forest	Forest	Forest	Forest/open	Forest
Surrounding land use c/	Forest, some open land	Forest, some farm	Forest	Forest	Forest, isolated residential	Forest	Forest, some open land	Mixed Forest/ farm/ mining
Topography at crossing	Ridge top	Ridge top	Rolling Hills	Ridge side slope	Rolling hills	Ridge top	Ridge top	Ridge top
Distance (miles) to nearest break in forest d/	3.4	0.0	4.0	2.8	0.0	3.5	3.0	0.25

a/ Both Variations 110 and 110R include the same crossing location of the Appalachian National Scenic Trail.
b/ All crossings are located in Virginia.
c/ Generally within one-half mile of the trail crossing.
d/ Distance along trail from pipeline crossing to nearest road, right-of-way, field, or other man-made break in forest vegetation that would be experienced by a hiker on the trail.

10.6.17.2 Route Alternative 1

Route Alternative 1 would cross the Appalachian National Scenic Trail within Jefferson National Forest where the trail runs along Pearis Mountain, in Giles County, Virginia. At the trail crossing location, Route Alternative 1 is adjacent to an existing cleared right-of-way for an overhead electric transmission line. Land use at the crossing is forested, and the surrounding land use is mostly forested with some farming. By crossing at an existing cleared right-of-way, Route Alternative 1 would not create a new forest opening that would be experienced by a trail hiker. MVP has not evaluated the feasibility of a horizontal bore crossing at this location. However because the crossing is adjacent to an existing cleared right-of-way, even an open cut crossing at this location would not create a new forest clearing along the trail.

10.6.17.3 Northern Alternative

The Northern Alternative would cross the Appalachian National Scenic Trail in a forested area of rolling hills in Nelson County, Virginia, near Avon. At the trail crossing location, the Northern Alternative is not adjacent to an existing right-of-way or forest opening. Surrounding land use at the crossing is forested. The Northern Alternative would cross the trail in an area where there are few existing man-made forest breaks, with the nearest forest break that would be experienced by a trail hiker about 4 miles from the crossing. An open cut crossing of the trail at this location would create a new man-made forest break. No new forest break would be created if it was feasible to cross the trail at this location by horizontal bore.

10.6.17.4 Variation 110 and 110R

Variations 110 and 110R cross the Appalachian National Scenic Trail within Jefferson National Forest where the Appalachian National Scenic Trail runs along Sinking Creek Mountain, in Craig County, Virginia. At the trail crossing Variations 110 and 110R are not adjacent to an existing right-of-way. Land use at the crossing is forested, and the surrounding land use is also forested. Where the trail runs along Sinking Creek Mountain, there are few man-made forest breaks, with the nearest forest break that would be experienced by a trail hiker about 2.8 miles from the pipeline crossing. An open cut crossing of the trail at this location would create a new man-made forest break. No new forest break would be created if it was feasible to cross the trail at this location by horizontal bore.

10.6.17.5 Variation 110J

Variation 110J would cross the Appalachian National Scenic Trail within Jefferson National Forest where the trail near Mill Cove Road within the Jefferson National Forest, in Craig County, Virginia. At the trail crossing location Variation 110J is adjacent to an existing cleared right-of-way for an overhead electric transmission line. Land use at the crossing is forested, and the surrounding land use is mostly forested with some isolated residential. By crossing at an existing cleared right-of-way, Route Alternative 1 would not create a new forest opening that would be experienced by a trail hiker. MVP has not evaluated the feasibility of a horizontal bore crossing at this location. However because the crossing is adjacent to an existing cleared right-of-way, even an open cut crossing at this location would not create a new forest clearing along the trail.

10.6.17.6 Peters Mountain East Variation

Peters Mountain East Variation crosses the trail within Jefferson National Forest where the Appalachian National Scenic Trail runs along Peters Mountain, in Monroe County, West Virginia. The trail crossing by this variation is about 0.2 mile east of the crossing by the Proposed Route. At the trail crossing, the

variation is not adjacent to an existing right-of-way. Land use at the crossing is mixed forested and open land, and the surrounding land use is forested. Where the trail runs along Peters Mountain, there are few man-made forest breaks, with the nearest forest break that would be experienced by a trail hiker about 3.6 miles from the proposed crossing. An open cut crossing of the trail at this location would create a new man-made forest break. No new forest break would be created if it was feasible to cross the trail at this location by horizontal bore.

10.6.17.7 Peters Mountain West Variation

Peters Mountain West Variation crosses the trail within Jefferson National Forest where the Appalachian National Scenic Trail runs along Peters Mountain, in Monroe County, West Virginia. The trail crossing by this variation is about 0.4 mile west of the crossing by the Proposed Route. At the trail crossing the variation is not adjacent to an existing right-of-way. Land use at the crossing is mixed forested/open land, and the surrounding land use is forested. Where the trail runs along Peters Mountain, there are few man-made forest breaks, with the nearest forest break that would be experienced by a trail hiker about 3.0 miles from the proposed crossing. An open cut crossing of the trail at this location would create a new man-made forest break. No new forest break would be created if it was feasible to cross the trail at this location by horizontal bore. The topography along the route of this variation is not as conducive to measures to reduce visual impact as at the Proposed Route and would not allow for as much vegetation buffer on either side of the trail crossing or for a "dogleg" in the pipeline alignment to reduce potential long view of the right-of-way from the trail crossing (see Section 10.6.6).

10.6.17.8 CGV Peters Mountain Variation

The CGV Peters Mountain Variation would cross the Appalachian National Scenic Trail in a forested area in Giles County, Virginia, near Narrows. At the trail crossing location, the variation is not adjacent to an existing right-of-way or forest opening. Surrounding land use at the crossing is mixed forest/farm/and reclaimed mining. The CGV Peters Mountain Variation would cross the trail in an area where there are existing man-made forest breaks and disturbances, with the nearest forest break that would be experienced by a trail hiker about 0.25 miles from the crossing. An open cut crossing of the trail at this location would create a new man-made forest break. No new forest break would be created if it was feasible to cross the trail at this location by horizontal bore.

10.6.18 Alternative Crossing Locations of the Blue Ridge Parkway

Two of the major pipeline route alternatives evaluated by MVP and discussed above in Section 10.5 include an alternative crossing location of the Blue Ridge Parkway. In Section 10.5 the alternative parkway crossing locations are compared to the proposed crossing location and evaluated within the context all other environmental and social features and impacts along the various lengths of pipeline for each alternative. As requested in FERC's August 11, 2015 letter to MVP, this section looks at just a single point on each alternative - the crossing of the Blue Ridge Parkway - and compares that point to the parkway crossing by the Proposed Route. Pipeline route alternatives that include a crossing of the Blue Ridge Parkway and comparative features at the parkway crossing by each alternative are listed in Table 10.6-18. Topographic maps and aerial photos of the proposed and each alternative crossing location and ground-based photos of the proposed crossing location are included in Appendix 10-C.

Table 10.6-18 Blue Ridge Parkway Crossing Alternatives			
Comparative Feature	**Pipeline Alternative**		
	Proposed Route	**Route Alternative 1**	**Northern Alternative**
General Location of Parkway crossing a/	Near Bent Mt.	East of Floyd	East of Sherando
Adjacent to existing right-of-way	No	Yes	No
Land use at crossing	Pasture/hay fields	Woods, powerline right-of-way, local roadway, scrub wetland	Forested
Surrounding land use b/	Mixed farm/ residential/ woodland	Mixed woodland/ residential/farm	Forested
Topography at crossing	Level	Level	Rolling hills
Length of NPS lands crossed (feet)	2,600	990	680
a/ All crossings are located in Virginia. b/ Generally within one-half mile of the Parkway crossing.			

10.6.18.1 Proposed Route

The Proposed Route crosses the Blue Ridge Parkway at MP 244.35 near Bent Mountain, Virginia. At the parkway crossing, the Proposed Route is not adjacent to an existing right-of-way, but crosses the parkway at a location with open pasture and hayfields on both sides of the road. Land use at the crossing is agricultural (pasture and hayfields, see photos in Appendix 10-C), and the surrounding land use is a mix of rural farm land, residential, and woodland. The topography is generally level, and views from the parkway at this location are of rural farmland adjacent to the road and matrix of rural farmland and woodlots in the mid foreground. There are no vistas or panoramic views at the proposed crossing location. MVP proposes to cross the Blue Ridge Parkway using a horizontal bore underneath the road, which will avoid direct impact on the road or travelers along the parkway during pipeline construction. During construction, heavy equipment and the graded construction right-of-way will be visible to travelers along the parkway. Following construction, the pipeline right-of-way and workspace will be restored to pre-construction contours and reseeded with an herbaceous cover similar to the adjacent fields. Within one or two growing seasons following construction, the pipeline right-of-way will be essentially indistinguishable to travelers along the parkway. A visual impact analysis for the Proposed Route crossing of the Blue Ridge Parkway confirms that the proposed crossing method would result in no long-term visual impact to users of the parkway (see Resource Report 8).

10.6.18.2 Route Alternative 1

Route Alternative 1 would cross the Blue Ridge Parkway east of Floyd, Virginia, where the parkway is immediately adjacent to Route 860/Shooting Creek Road. At the parkway crossing, the alternative is adjacent to an existing overhead electric transmission line right-of-way. Land use on the east side of the parkway crossing is roadway, woodland, and cleared right-of-way, and on the west side is a large scrub-shrub wetland adjacent to the road and woodland in the distance. The surrounding land use is mix of woodland, residential, and rural farm land. The topography is generally level, and views from the

parkway at this location are of Shooting Creek Road, woodland, and cleared right-of-way to the east, and shrub wetland and woodland to the west. There are no vistas or panoramic views at the crossing location. In general, a horizontal bored crossing of the parkway and Shooting Creek Road at this location would be preferred in order to avoid direct impact on the road surfaces and travelers along the roadways. MVP has not conducted a detailed evaluation of the feasibility of this method at this location. However the ability to successfully complete a horizontal bore would be complicated by the large scrub wetland and floodplain west of the crossing, and a short but steep slope immediately to the east of Shooting Creek Road. Either a bored crossing or an open cut crossing of the parkway at this location would create new cleared right-of-way in the woodland on the east side, adjacent to the existing cleared right-of-way. Long-term visual impact of a pipeline crossing at this location would be minimized by its location immediately adjacent to an existing cleared right-of-way.

10.6.18.3 Northern Alternative

The Northern Alternative would cross the Blue Ridge Parkway east of Sherando, Virginia, where the parkway is parallel to Route 610/Howardsville Turnpike. At the parkway crossing, the alternative is not adjacent to an existing right-of-way. Land use at this crossing location is forested and open land between the parkway and Route 610, as well as the surrounding land use, is forested. The topography is rolling hills, with a ridge running above the parkway to the east. Views to the east from the parkway at this location are primarily forest in the foreground with the ridgeline to the east preventing vistas or panoramic views to the east. However the topography provides for expansive views to the west. In general, a horizontal bored crossing of the parkway at this location would be preferred in order to avoid direct impact on the road surfaces and travelers along the roadway. MVP has not conducted an evaluation of the feasibility of this method at this location. Either a bored crossing or an open cut crossing of the parkway at this location would create a new cleared right-of-way through forest to the east. The clearing required for work space and pipeline right-of-way on the west side would represent a long-term impact, but would be within a partially open area which would minimize the long term visual impact.

10.6.19 Roanoke Road Crossing

In its August 11, 2015 comments on draft Resource Report 10, FERC asked for an analysis of an alternative crossing of Roanoke Road, including crossing via horizontal directional drill (HDD). Roanoke Road, or US Highway 460/11, is crossed by the Project at MP 233.95 near Lafayette, Virginia. At this location, Roanoke Road is situated immediately adjacent to a railroad and Cove Hollow Road/Route 603. There are open fields on each side of the proposed crossing, and MVP proposes to cross these three features at this location using a horizontal bore, working from temporary construction work space in the open fields. Crossing by horizontal bore will avoid any impact on traffic on Roanoke Road and Cove Hollow Road, as well as the railroad. The siting of the proposed pipeline at this location was influenced by the Roanoke River to the north, Lafayette to the west, and Spring Hollow Reservoir to the east. MVP believes that crossing Roanoke Road at the proposed location using horizontal bore will provide the greatest chance of success and avoid impacts on users of the road. MVP does not believe that an HDD at this location would provide any environmental advantages over a horizontal bore.

A 65-acre site on the south side of Roanoke Road has been identified as a possible location of an intermodal yard, for transfer of rail-to-truck and truck-to-rail. The Proposed Route would pass through this site. It is unclear if the intermodal yard will ever be built, as there are a number of obstacles and some local opposition to such a project (Roanoke.com 2014).

MVP also evaluated Route Alternative 1 that would include an alternative crossing of Roanoke Road, west of Radford, Virginia, about 25 miles southwest of the proposed crossing location. At this location Roanoke Road is parallel to a railroad and Old Route 11. The crossing of Roanoke Road by Alternative 1 would be in open agricultural fields. See the full analysis of Route Alternative 1 in Section 10.5.

10.6.20 Minor Route Modifications

MVP has spent considerable effort to identify the best possible route for the proposed pipeline, which included on-site evaluation where access was obtained. This on-site evaluation resulted in numerous minor route modifications that have been incorporated into the Proposed Route. Route modifications have been made for a number of reasons, including adjusting to better work with topography; improving the pipeline crossings of roads and waterbodies; avoiding and minimizing impacts on wetlands and waterbodies; avoiding identified cultural resources; and addressing landowner concerns at specific properties. MVP has prepared two tables that list minor route modifications and the reasons for those modifications. Appendix 10-D, Table 10-D-1 lists minor route changes that were identified in the April 2015 draft Resource Report 10. Appendix 10-D, Table 10-D-2 lists minor route changes that have been incorporated into the Proposed Route since the April 2015 draft Resource Report 10.

10.7 COMPRESSOR STATION ALTERNATIVES

10.7.1 Compressor Station Site Alternatives

The discussion below describes the proposed and alternative sites evaluated for the Bradshaw, Harris, and Stallworth Compressor Stations. MVP is a new pipeline; therefore, all proposed compressor stations are new compressor stations. Because there are no existing compressor stations, expansion of existing compressor stations is not a viable alternative for the MVP Project.

In general, siting of the compressor stations began with the use of a hydraulic model to determine the required spacing of the stations along the pipeline. The model determined that a location within a 10-mile zone (+/- 5 miles from target MP) along the pipeline would be sufficient to maintain the optimized performance of the pipeline. The 10-mile zone provides options for compressor site selection that optimize constructability and site accessibility, while minimizing environmental impact and allowing for locating stations in isolated areas to minimize visual and noise impacts on area residences.

10.7.1.1 Bradshaw Compressor Station

The proposed site for the Bradshaw Compressor Station is at MP 2.8 in Wetzel County, West Virginia. In addition to the proposed site, MVP evaluated two alternate sites for this station, Bradshaw Alternative Sites 1A and 1B (Figures 10.7-1a and 10.7-1b). The main criteria used for selection of the site were topography, vicinity of the site to the proposed pipeline route, site access, and surrounding land use, including population density and distance from the nearest residences. The proposed site is located directly along the Proposed Route; however, the compressor station building within the site would be about 475 feet from the pipeline, requiring about 475 feet of suction and discharge piping to be installed between the proposed pipeline and compressor building. Due to topography there will be a need for extensive cut and fill, and the suction and discharge piping will be within the area disturbed by the cut and fill. The topography at the proposed site is typical for the area of Wetzel County crossed by the pipeline. The proposed site is served by an existing access road nearby. However this road will require upgrade for use as the permanent access road to the compressor site. The nearest noise sensitive area (NSA) to the

proposed site is a residence on Fallen Timber Run Road located approximately 1,335 feet north of the site. There is extensive mature Eastern deciduous forest vegetation between the NSA and the site. Residences and NSAs within 1 mile of the proposed site are shown in the noise assessment included in Resource Report 9, and detailed operational noise analysis for operation of the proposed site and potential impact on NSAs is included in Resource Report 9. The proposed site will impact about 5.8 acres of Prime Farmland soils, although the site is currently forested and not in agricultural use.

Bradshaw Alternative Site 1A is located about 1.5 miles south southwest of the proposed station location, and is predominantly Eastern deciduous forest with topography that is not conducive to construction of a compressor site. Bradshaw Site 1A is limited by the sharpness of a ridge top within the site that is approximately 20 feet wide and would require a massive cut and fill to create a buildable site. There is also no existing access road to Bradshaw Site 1A, and use of the site for a compressor station would require construction of a new permanent access road. Bear Run Road that runs south of the alternative location is an unimproved ATV trail. Total construction disturbance for Bradshaw Site 1A would depend on the extent of cut and fill required, MVP estimates that the area of impact is at least 25 percent greater than the proposed site.

The nearest residences and NSAs at the Bradshaw Alternative 1A location are slightly farther away from the site than at the proposed site, with the closest NSA about 1,900 feet northeast of the site, compared to 1,335 feet for the proposed location. However, there are significantly more NSAs within one mile of the Bradshaw Alternative 1A site, with a large group of more than 30 residences starting about 4,000 feet southwest of the alternative site. Both the proposed and Bradshaw Alternative 1A sites are located on the top of hills in heavily forested areas. The NSAs for both sites are located in the hollows surrounding the station site, and similar terrain shielding would be expected for both locations. Both areas are heavily forested, with similar mixes of eastern deciduous forest of similar age. Foliage shielding effects would be expected to be similar at both.

Visual impact of a compressor station at this site would be limited because of the mature forested vegetation surrounding the site, which would screen views from the residences and roads nearest the site, which are also at lower elevations and would screen the site due to topography. The site could be visible from distant viewpoints at the same or higher elevations of the site, especially due to the extensive cut and fill that would be required.

No detailed cut and fill plan was prepared for Bradshaw Alternative Site 1A, therefore no potential impact on Prime Farmland soil has been measured. However, the site is currently forested and not in agricultural use.

Bradshaw Alternative Site 1B is also predominantly mature Eastern deciduous forest with steep topography. Bradshaw Site 1B is similar to Bradshaw Site 1A with regards to the sharpness of a ridge top within the site that would require extensive cut and fill. Bradshaw Site 1B also has no existing access and would require construction of a new permanent access road. Similar to Site 1A, total construction disturbance for Bradshaw Site 1B would depend on the extent of cut and fill required, however because of the topography of the site MVP does not plan to prepare a detailed cut and fill plan. Estimated area of impact is also approximately 25 percent greater than the proposed site. The nearest identified NSA to Bradshaw Site 1B is a residence on Fallen Timber Run Road about 2,800 feet northwest of the site. There is extensive mature Eastern deciduous forest vegetation between the NSA and the site. Visual impact of a compressor station at this site would be limited because of the mature forested vegetation surrounding the

site, which would screen views from the residences and roads nearest the site, which are also at lower elevations which would screen the site due to topography. The site could be visible from distant viewpoints at the same or higher elevations of the site, especially due to the extensive cut and fill that would be required.

No detailed cut and fill plan was prepared for Bradshaw Alternative Site 1B, therefore no potential impact on Prime Farmland soil has been measured. However, the site is currently forested and not in agricultural use.

MVP does not consider either Bradshaw Alternative Site 1A or Bradshaw Alternative Site 1B to be environmentally or technically preferable to the proposed site for the Bradshaw Compressor Station. This is due primarily to the additional extensive cut and fill that would be required for each site, estimated to be about 25 percent greater than for the proposed site. A new permanent access road would also be required for each of the alternative sites.

10.7.1.2 Harris Compressor Station

The proposed site for the Harris Compressor Station is at MP 77.5 in Braxton County, West Virginia. In addition to the proposed site, MVP evaluated one alternative site for this station, Harris Alternative Site 2A near MP 72.6 (Figures 10.7-2a and 10.7-2b). The main criteria used for selection of the site were topography, vicinity of the site to the proposed pipeline route, site access, and surrounding land use including population density and distance from the nearest residences. The proposed Harris Compressor Station site was determined to be ideal as the pipeline route intersects the property, topography is suitable requiring minimal cut and fill, there is an existing access road (Milroy Road/Route 24/5), and the site is in close proximity to the proposed Columbia WB Interconnect and measuring station site. Because the proposed site is in close proximity to the WB system, the need for additional piping to tie into the Columbia WB Interconnect will consist of approximately 1,000 feet of 24-inch pipe. The nearest NSA to the proposed site is a residence located approximately 1,445 feet northeast of the site. There is extensive mature Eastern deciduous forest vegetation between the site and the NSA. NSAs within 1 mile of the proposed site and potential noise impact on those sites are discussed further in Resource Report 9. The proposed site will impact about 2.5 acres of Prime Farmland soils, although the site is currently forested and not in agricultural use.

The Harris Compressor Station Alternative Site 2A is located about 3.6 miles northwest of the proposed station location. Harris Alternative Site 2A has acceptable topography to build the compressor station. A disadvantage of this site is the greater distance between the site and the Columbia WB Interconnect. At the proposed Harris Compressor Station site the Columbia WB Interconnect and measuring station is at the compressor station site, which will allow more flexibility on the operation of the measuring station in the event of a station shutdown.

The NSAs at the Harris Alternative Site 2A location are slightly closer to the compressor station than at the proposed site, with the closest NSA about 1,200 feet east of the site, compared to 1,445 for the proposed location. There also appear to be slightly more NSAs within one mile of the Harris Alternative 2A site, with several residences scattered along Pauley Turnpike, Hemp Patch Road, and Route 19/4.

Both the proposed and Harris Alternative 2A sites are located on the top of hills in areas heavily vegetated with Eastern deciduous forest. The NSAs for the Harris Alternative Site 2A are primarily located in the hollows surrounding the station site, while the closest NSAs for the proposed site are on nearby hilltops.

However, the closest NSAs to the proposed site are acoustically shielded by terrain features. Both areas are heavily vegetated with mature Eastern deciduous forest. Foliage shielding effects would be expected to be similar at both locations.

Visual impact of a compressor station at this site would be limited because of the mature forested vegetation surrounding the site, which would screen views from the residences and roads in the hollows nearest the site. The site could be visible from distant viewpoints at the same or higher elevations of the site, especially due to the extensive cut and fill that would be required.

No detailed cut and fill plan was prepared for Harris Alternative Site 2A, therefore no potential impact on Prime Farmland soil has been measured. However, the site is currently forested and not in agricultural use.

MVP does not consider Harris Compressor Station Alternative 2A to be environmentally or technically preferable to the proposed site for the Harris Compressor Station. This is due primarily to the greater distance between the alternative site and the Columbia WB Interconnect.

10.7.1.3 Stallworth Compressor Station

The proposed site for the Stallworth Compressor Station is at MP 154.2 in Fayette County, West Virginia. In addition to the proposed site, MVP evaluated two alternative sites for this station, Stallworth Alternative Site 3A near MP 154.7 and Alternative Site 3B near MP 154.9, both in Greenbrier County, West Virginia (Figures 10.7-3a and 10.7-3b). The main criteria used for selection of the site were topography, vicinity of the site to the proposed pipeline route, site access, and surrounding land use including population density and distance from residences. The proposed site was determined to be ideal because it is located directly on the pipeline route, requires very little cut and fill to attain a buildable site, and access will be easily buildable off of Dawson-Springdale Road (Route 29). The closest NSA to the proposed site is approximately 1,340 feet away, and there is significant terrain and vegetation shielding between the site and the NSA. NSAs within 1 mile of the proposed site and potential noise impact on those NSAs are discussed in Resource Report 9. The proposed site will impact about 5.5 acres of Prime Farmland soils, although the site is currently forested and not in agricultural use.

The Stallworth Compressor Station Alternative 3A is located about one-half mile south of the proposed station location. The Stallworth Alternative 3A site is on the side of a hill on the opposite side of Dawson Springdale Road from the proposed site, about as far south from the road as the proposed location is north of the road. Stallworth Alternative Site 3A would require extensive cut and fill and installation of retaining walls to protect the site from earthen slippage. In addition, there are several wet weather drains within the site that would have to be diverted as part of the cut and fill and site work. The alternative site is directly on the proposed pipeline route, and access to the site would be easily buildable off of Dawson-Springdale Road (Route 29).

The NSAs at the Stallworth Alternative 3A location are a similar distance from the compressor station site, with the closest NSA located about 1,355 feet north of the site, compared to 1,340 feet south for the proposed location. There are a similar number of NSAs for the Alternative 3A site, and all of these NSAs are also NSAs for the proposed site. The Stallworth Alternative 3A site has significantly less terrain shielding between the site and nearest residences than the proposed site. The Alternative 3A site is located on the north side of a hill and has a line of sight to residences to the north. The proposed site, located on top of a hill, has significant terrain shielding to all of the residences/NSAs surrounding the site.

Although the alternative site itself is forested, there is significantly less mature Eastern deciduous forest between the Stallworth Alternative 3A site and the NSAs to the north, as areas between the Stallworth Alternative 3A site and the NSAs are cleared agricultural land that offer little in the way of vegetation screening for visual or noise attenuation. The ground surrounding the proposed site is dense deciduous forest and would be expected to offer significant sound attenuation and visual screening for much of the year.

No detailed cut and fill plan was prepared for Stallworth Alternative Site 3A, therefore no potential impact on Prime Farmland soil has been measured. However, the site is currently forested and not in agricultural use.

Stallworth Alternative Site 3B is very similar to Site 3A. Stallworth Alternative Site 3B would also require extensive cut and fill and installation of retaining walls to protect the site from earthen slippage, and similar to Stallworth Alternative Site 3A, after review of the cut and fill and stabilization requirements, it was determined that this site is not desirable for a compressor station. In addition, there are several wet weather drains within the site that would have to be diverted as part of the cut and fill and site work. The alternative site is directly on the proposed pipeline route, and access to the site would be easily buildable off of Dawson-Springdale Road (Route 29). The nearest NSA to Stallworth Alternative Site 3B is the same residence on Dawson Springdale Road located about 2,800 feet northwest of the site.

Both Stallworth Alternative Site 3A and Stallworth Alternative Site 3B are located directly along the proposed pipeline route, would provide good access, and would provide good distance for visual and noise buffer between the nearest NSA. While both alternative sites are technically feasible, both alternative sites would require extensive cut and fill, site stabilization, and relocation of surface drainages to be used for a compressor station. The proposed site is the preferred site for the Stallworth Compressor Station because it would require very little cut and fill to attain a buildable site, is located directly along the Proposed Route, and access will be easily obtained off of Dawson-Springdale Road (Route 29). MVP has come to a purchase agreement with all of the landowners for the Stallworth compressor site acreage, so there is no operational noise impact expected at the proposed site.

10.7.2 Compressor Station Operational Alternatives

10.7.2.1 Electric Motor Driven Compression

The proposed compressor stations will include centrifugal turbines powered by natural gas, with the natural gas obtained directly from the pipeline. In some instances natural gas compressor stations are powered by electric motor driven compressors. The use of electric motor driven compressors for the Project is not feasible because of the lack of the necessary quantity of power required for each site, as described below.

The Bradshaw Compressor Station would require approximately 70 MW if it were an electric motor drive facility. This amount of electricity exceeds the amount available on the 138-kV transmission system in the vicinity of the station. Obtaining the required quantity of electric power would be expensive, and the time required for the power system studies, engineering, and construction of a transmission line extension would exceed four years, which exceeds the timeline of the Project construction and commissioning.

The Harris Compressor Station would require approximately 35 MW if it were an electric motor drive facility and there is not sufficient power (at least 138-kV transmission system power) available within

several miles of the site. Obtaining the required quantity of electric power would be expensive, and the time required for the power system studies, engineering, and construction of a transmission line extension would exceed four years, which exceeds the timeline of the Project construction and commissioning.

The Stallworth Compressor Station would require approximately 35 MW if it were an electric motor drive facility. The station is located more than five miles from the closest 138-kV transmission system. The time required for the power system studies, engineering, and construction of a transmission line extension would exceed four years, which exceeds the timeline of the Project construction and commissioning.

For these reasons the use of electric motor driven compression is not a reasonable alternative for the three proposed compressor stations.

10.7.2.2 Waste Heat Electric Generation

In light of the Commission's interest in integrating alternative environmentally-friendly measures, MVP reviewed the commercial and technical viability of installing and operating waste heat recovery facilities on its system. Waste heat-to-power is the process of capturing heat discarded by an existing industrial process and using that heat to generate power. MVP has determined that it is not technically or economically feasible at this time to install heat recovery systems on the proposed compressor exhaust stacks and convert the waste heat into electric power without additional environmental impacts. Varying pipeline operating conditions result in fluctuating turbine loads providing an inconsistent exhaust gas source not suitable for waste heat driven secondary energy extraction processes. MVP researched the total costs associated with designing, permitting, constructing, and operating and maintaining a waste heat recovery system at each of the proposed compressor stations, and compared these costs to the value of the estimated electric power that could be generated and sold back to the local utility. Power is generated through the conversion of water to steam in order to spin a turbine for electric generation. The remote nature of the compressor stations prohibits necessary access to water necessary for the steam generation. Lack of nearby power distribution systems, large or small, prohibits the benefit of generating excess capacity to supplement the electric grid generated power. The comparison resulted in waste heat recovery generating costs substantially greater than the power sales cost estimate. Accordingly, it is not economically feasible to install waste heat recovery systems at any of the proposed compressor stations. However, even though MVP is not proposing the installation of any waste heat facilities at this time, MVP will not preclude the installation of waste heat recovery facilities on its systems as conditions may change over time.

In addition, MVP has considered the possibility of using waste heat recovery as a heat source for cold weather operations. This would be primarily for building heat. Site buildings include the compressor building, motor control center building, switchgear building, air systems building and office/storage building. The compressor buildings are ventilated with a heat source from one or more compressor units and do not include or require heating. The motor control center and switchgear equipment buildings generate substantial heat and only require cooling. The air system building generates substantial heat and requires ventilation, not heat. An office building space of approximately 1,380 sq. ft. at each compressor station will require heat, but this small amount of space will not justify the cost, operation and maintenance of waste heat recovery equipment.

10.8 REFERENCES

ACEEE (American Council for an Energy-Efficient Economy). 2003. Natural Gas Price Effects of Energy Efficiency and Renewable Energy Practices and Policies. Report Number E032. Available online at http://aceee.org/research-report/e032.

ACEEE (American Council for an Energy-Efficient Economy). 2005. Impacts of Energy Efficiency and Renewable Energy on Natural Gas Markets: Updated and Expanded Analysis. Report Number E032. April 2005.AWEA (American Wind Energy Association). 2012. Wind Energy Basics. Available online at: http://archive.awea.org/faq/wwt_basics.html.

Cumberland Times Union. 2014. Spectra Energy puts proposed natural gas pipeline project on hold. August 14. http://www.times-news.com/news/spectra-energy-puts-proposed-natural-gas-pipeline-project-on-hold/article_da99ae08-2362-11e4-b94f-0019bb2963f4.html).

EIA (U.S. Energy Information Agency). 2014. Annual Energy Outlook 2014 with Projections to 2040. April 2014. Available on the web at: www.eia.gov/forecasts/aeo.

EIA. 2014b. How much Coal, Natural Gas, or Petroleum is Used to Generate a Kilowatt hour of Electricity. Available online at http://www.eia.gov/tools/faqs/faq.cfm?id=667&t=2.

EIA. 2015a. Annual Energy Outlook 2015 with Projections to 2040. April 2014. Available on the web at: www.eia.gov/forecasts/aeo.

EIA. 2015b. Electric Power Monthly, with Data for July 2015. Table 6.7.b. EIA. Available online at http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm. September 2015.

National Register of Historic Places. 2014. Greater Newport Rural Historic District. Available on the web at: http://www.nationalregisterofhistoricplaces.com/va/giles/districts.html.

NREL (National Renewable Energy Laboratory). 2013. Land-Use Requirements for Solar Power Plants in the United States. Available online at http://www.nrel.gov/docs/fy13osti/56290.pdf.

Roanoke.com. 2014. Consultants say intermodal yard at Elliston still viable, but costlier. By Jeff Sturgeon, Posted: Wednesday, September 24, 2014 9:28 pm. Available online at http://www.roanoke.com/business/news/consultants-say-intermodal-yard-at-elliston-still-viable-but-costlier/article_9f846b45-0f0f-50b6-9e4f-07274b832b59.html?mode=print.

Solar by the Watt. 2009. Solar Energy Land Area Efficiency or How Many Acres per WM, KWP Per Acre. March, 9, 2009. Available online at: http://solarbythewatt.com/2009/03/09/solar-energy-land-area-efficiency-or-how-much-acres-per-mw-kwp-per-acre.

Spectra Energy. 2015. New Projects and our Process, New Projects in U.S. http://www.spectraenergy.com/Operations/New-Projects-and-Our-Process/New-Projects-in-US/.

The Robisonian. 2014. Potential pipeline bidder opts out. http://www.robesonian.com/news/news/50132968/Potential-pipeline-bidder-opts-out. August 14.

USEPA (United States Environmental Protection Agency). 2014. 2011 National Emissions Inventory, Version 1, Technical Support Document. http://www3.epa.gov/ttn/chief/net/2011nei/2011_nei_tsdv1_draft2_june2014.pdf. June 2014 Draft.

USEPA. 2007. Natural Gas: Electricity from Natural Gas. Last updated December 28, 2007. Available at: http://www.epa.gov/ cleanenergy/energy-and-you/affect/natural-gas.html.

USDA Forest Service. 2013. Decision Notice And Finding Of No Significant Impact For The Natural Gas Pipeline Construction Project, Proposed By Columbia Gas Of Virginia For Service To Celanese Plant In Giles County, Virginia.

WVDNR (West Virginia Department of Natural Resources). 2014. Wildlife Resources, Wildlife Management Areas. Available on the web at: http://www.wvdnr.gov/Hunting/WMA.shtm.

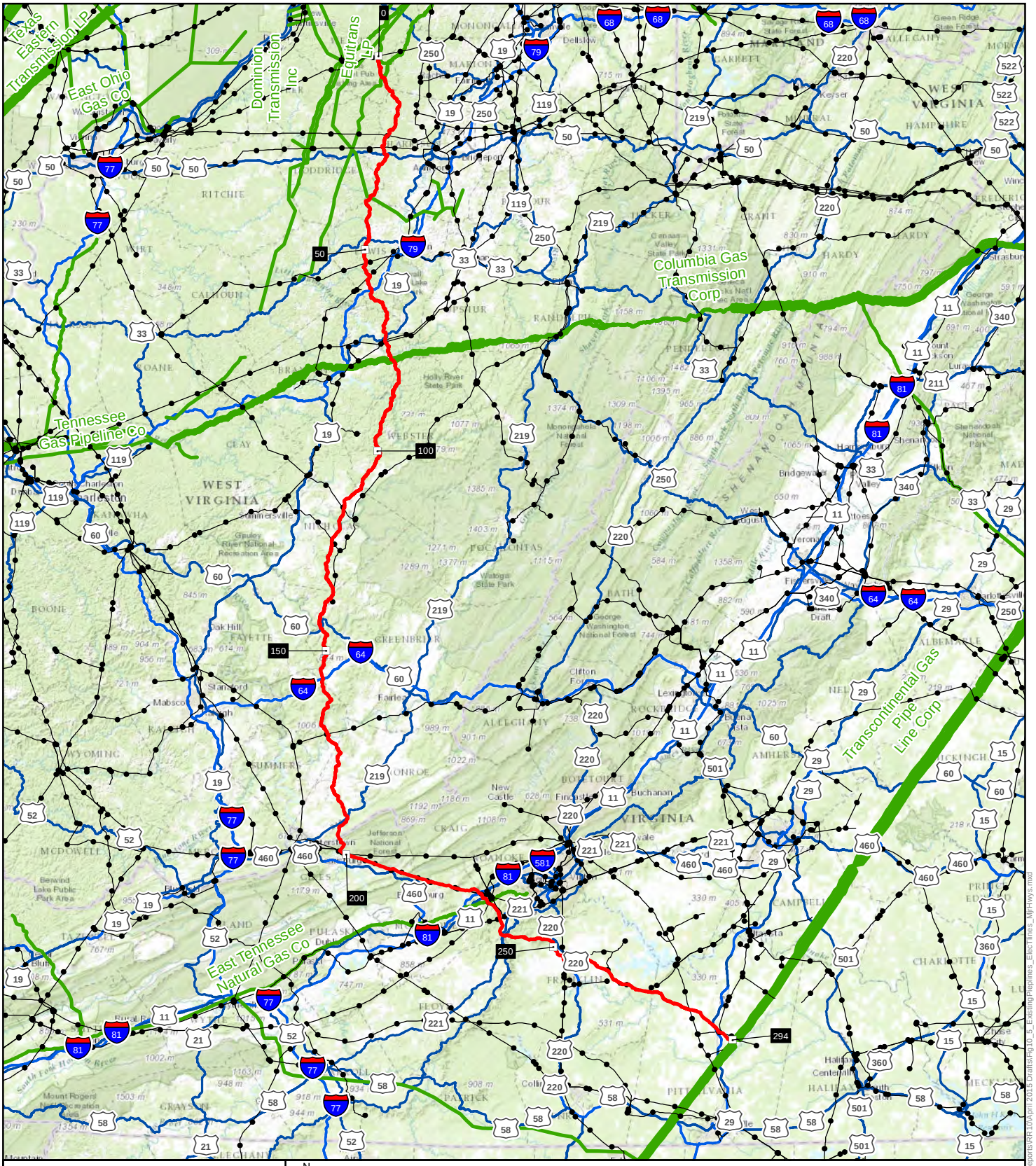
Mountain Valley Pipeline Project

Docket No. CP16-__-000

Resource Report 10

Appendix 10-A
Pipeline and Compressor Station Alternative Maps

Appendix 10-A
Pipeline and Compressor Station Alternative Maps



Mountain Valley Pipeline

N

NAD 1983 UTM 17N 1:1,625,000

0 25 50 Miles

Mountain Valley PIPELINE

Figure 10.5
Existing Pipeline Systems, Electric Transmission Lines, and Major Highways in the Project Area

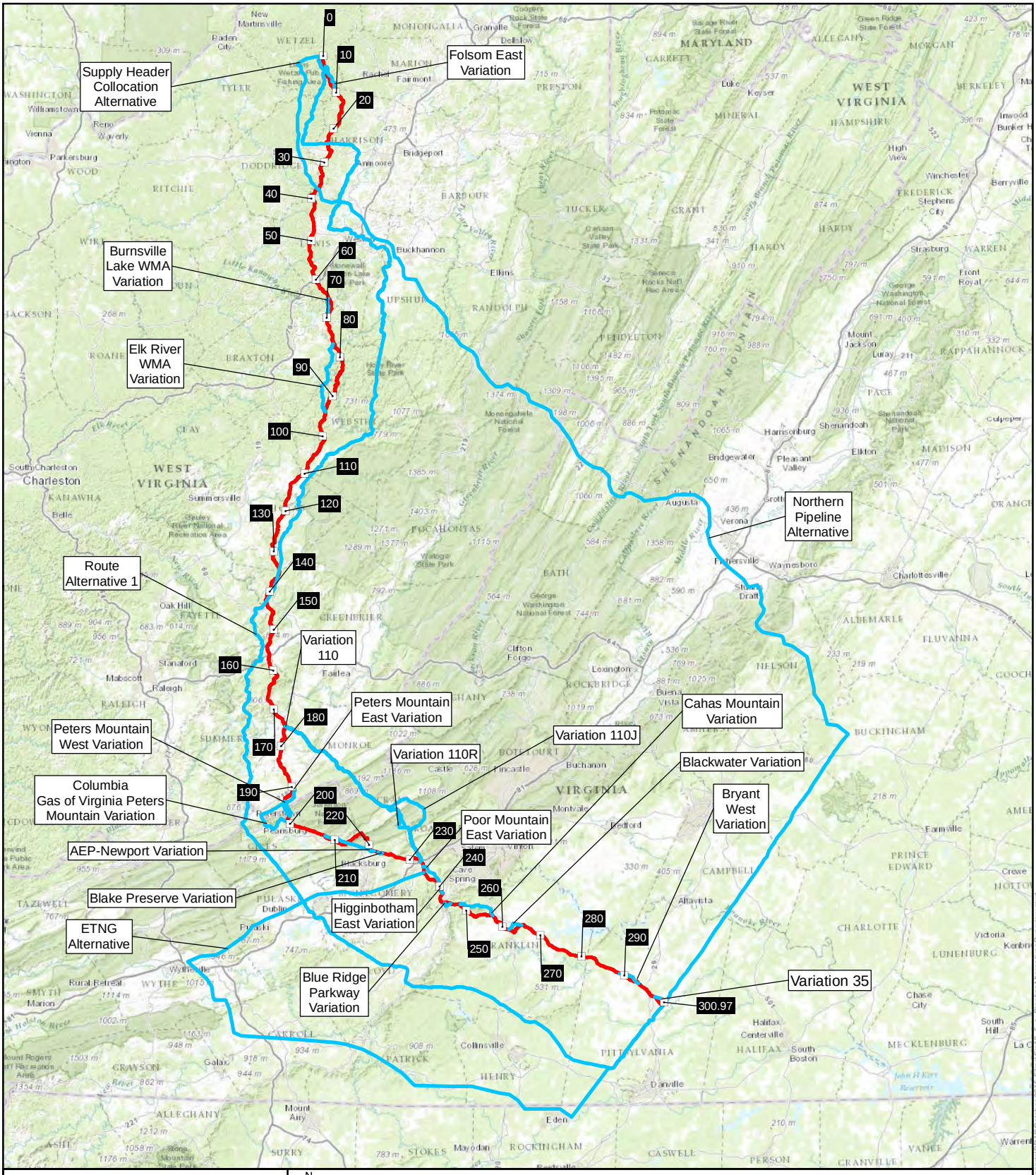
October 2015

Data Sources: ESRI Streaming Data, 2014, Ventyx 2014.

Legend

- Milepost
- Proposed Route
- Electric Transmission Line
- Existing Pipeline System
- Primary Limited Access or Interstate
- Primary US and State Highway

Document Path: P:\EQT-EquitransMVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR 10\April 2015 Drafts\Fig10_5_ExistingPiplines_ElecTlines_MjrHwys.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N

1:1,700,000

0 5 10 20 30 40 Miles

Mountain Valley PIPELINE

Figure 10.5-a
Pipeline Alternatives
Overview Map

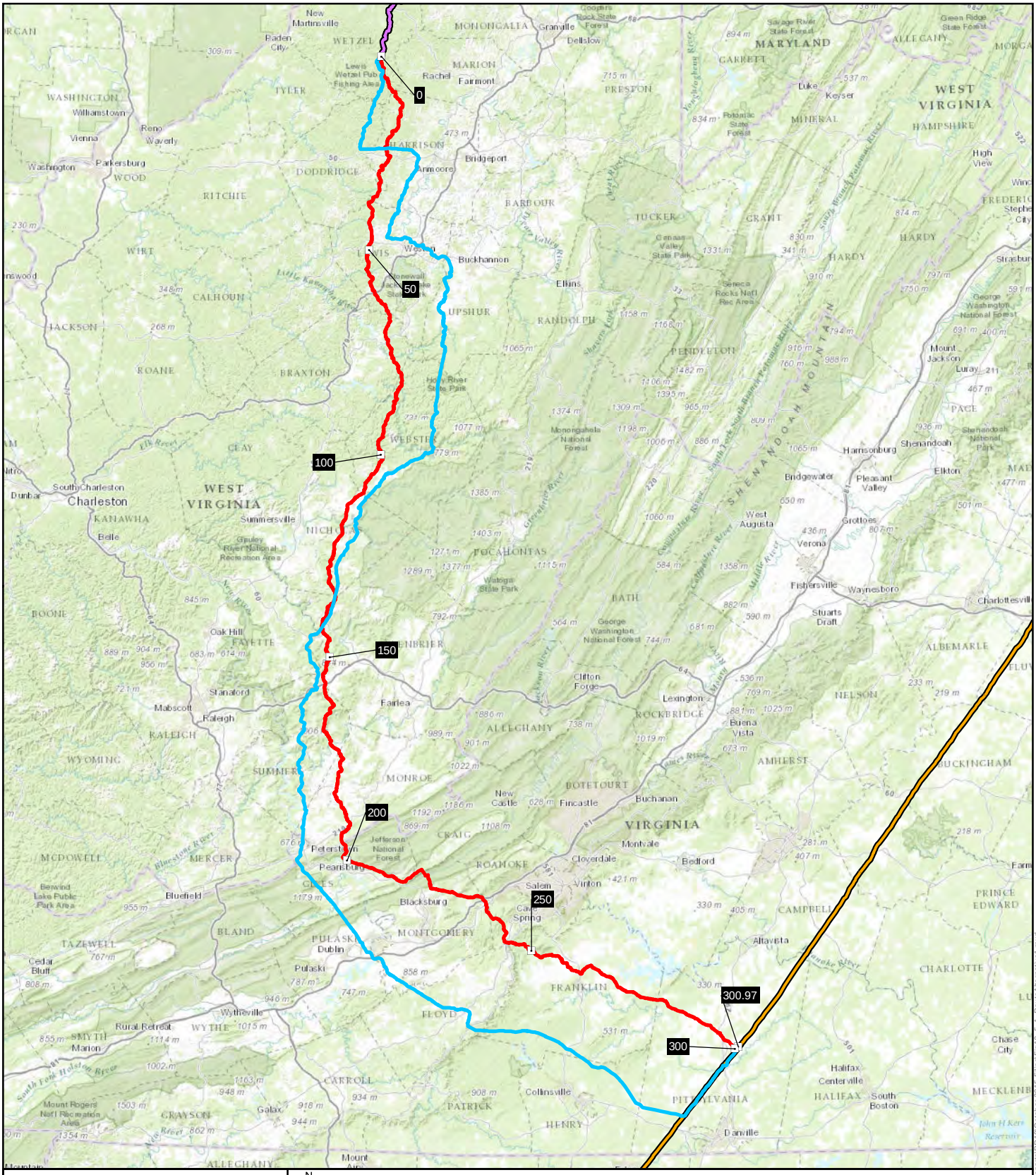
October 2015

Data Sources: ESRI Streaming Data, 2014, Ventyx 2014.

Legend

- Milepost
- Alternative Route
- Proposed Route

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_5_a_PipelineAlternativesOverview.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:1,625,000

0 25 50 Miles

Mountain Valley PIPELINE

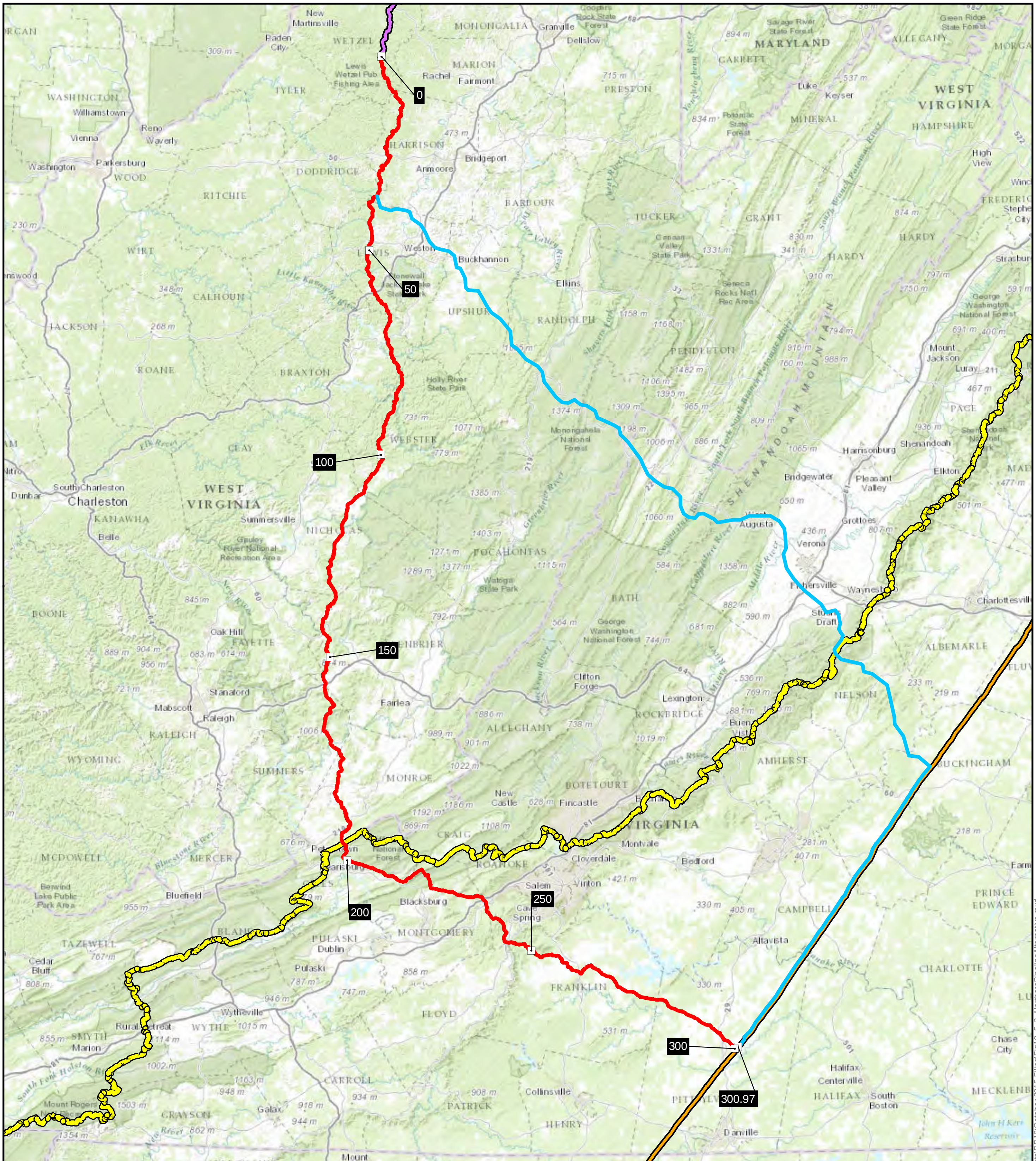
Figure 10.5-1
Route Alternative 1

October 2015

Data Sources: ESRI Streaming Data, 2014, Ventyx 2014.

Legend

- Milepost
- Route Alternative 1
- Proposed Route
- Existing Equitrans H-302 Line
- Existing Transco Pipeline



Mountain Valley Pipeline Project	N	NAD 1983 UTM 17N	1:1,625,000	0 — 25 — 50 Miles

Mountain Valley PIPELINE

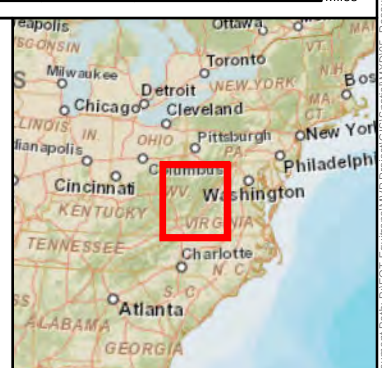
Figure 10.5-2
Northern Pipeline Alternative

October 2015

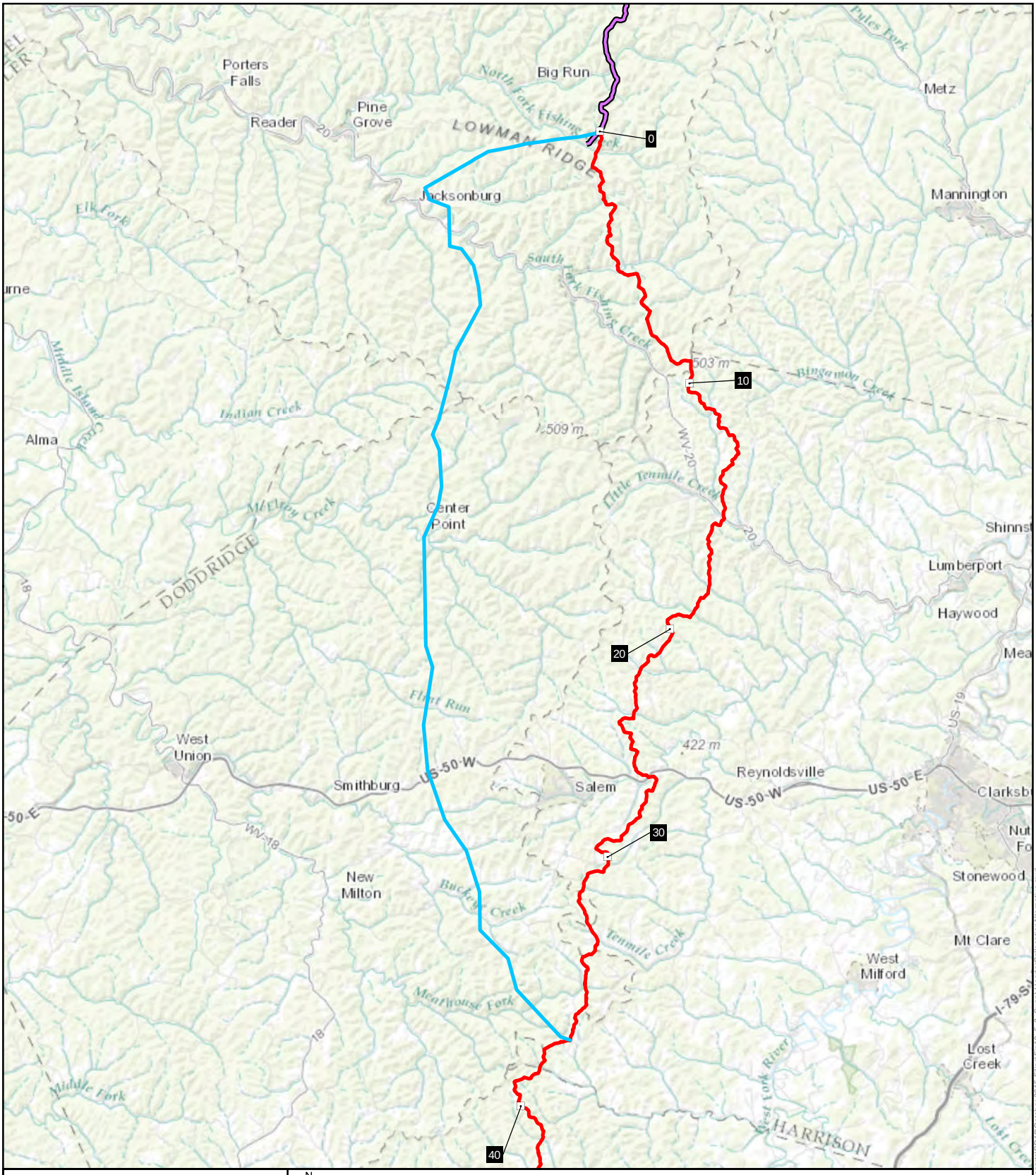
Data Sources: ESRI Streaming Data, 2014, Ventyx 2014.

Legend

- Milepost
- Northern Pipeline Alternative
- Proposed Route
- Appalachian Trail
- Existing Equitrans H-302 Line
- Existing Transco Pipeline



Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_5_2_NorthernPipelineAlternative.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:250,000

0 5 10 Miles

Mountain Valley PIPELINE

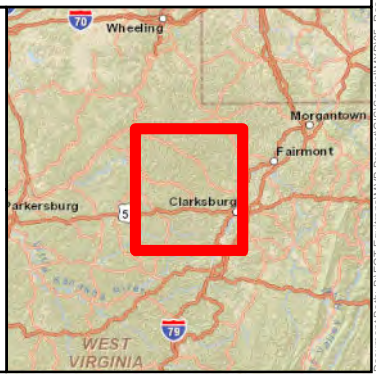
Figure 10.5-3
Supply Header
Collocation Alternative

October 2015

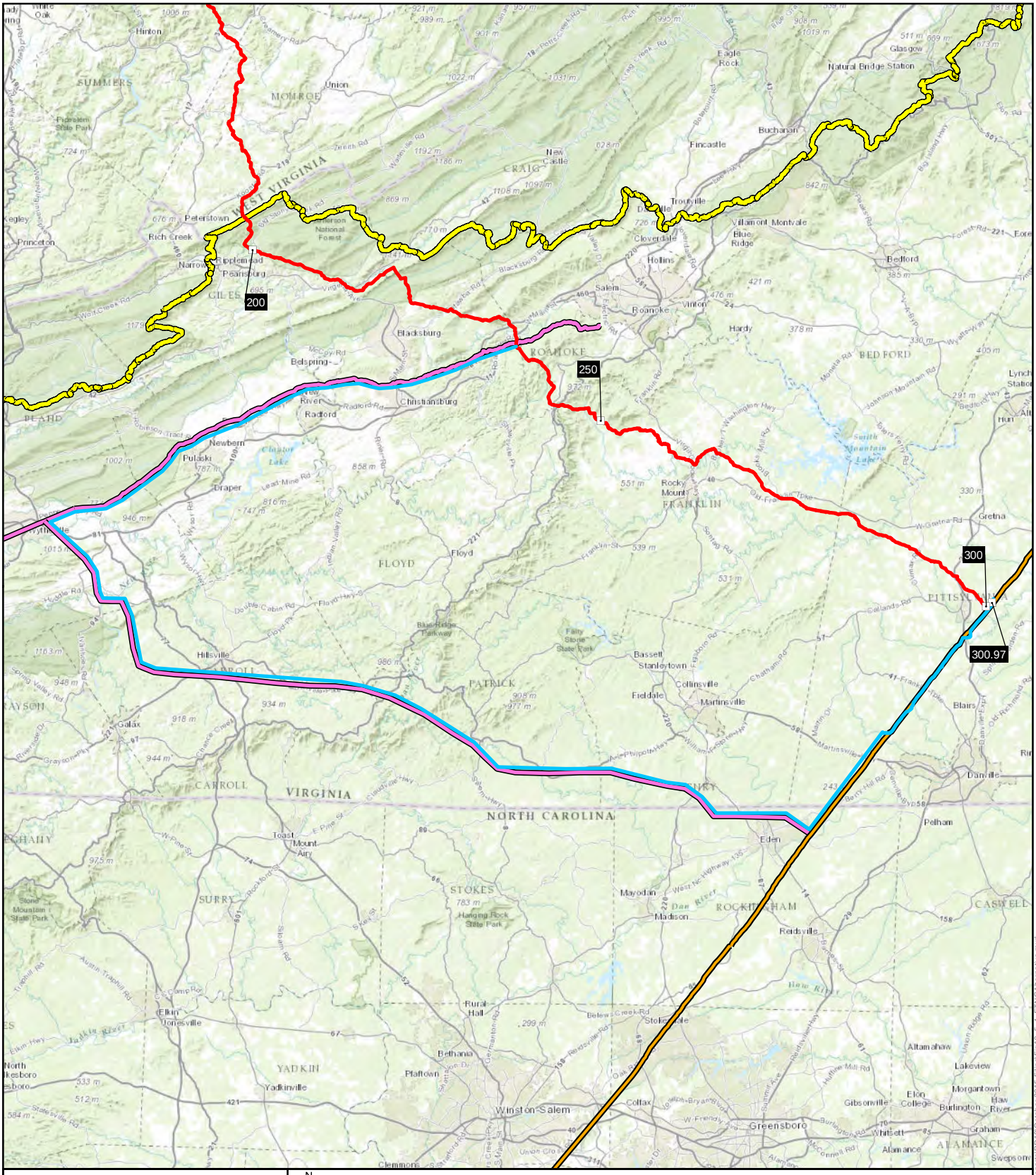
Data Sources: ESRI Streaming Data, 2014, Ventyx 2014.

Legend

- Milepost
- Supply Header Collocation Alternative
- Proposed Route
- Existing Equitrans H-302 Line



Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_5_3_SupplyHeaderCollocationAlternative.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:860,000

0 15 30 Miles

Mountain Valley PIPELINE

Figure 10.5-4
ETNG Alternative

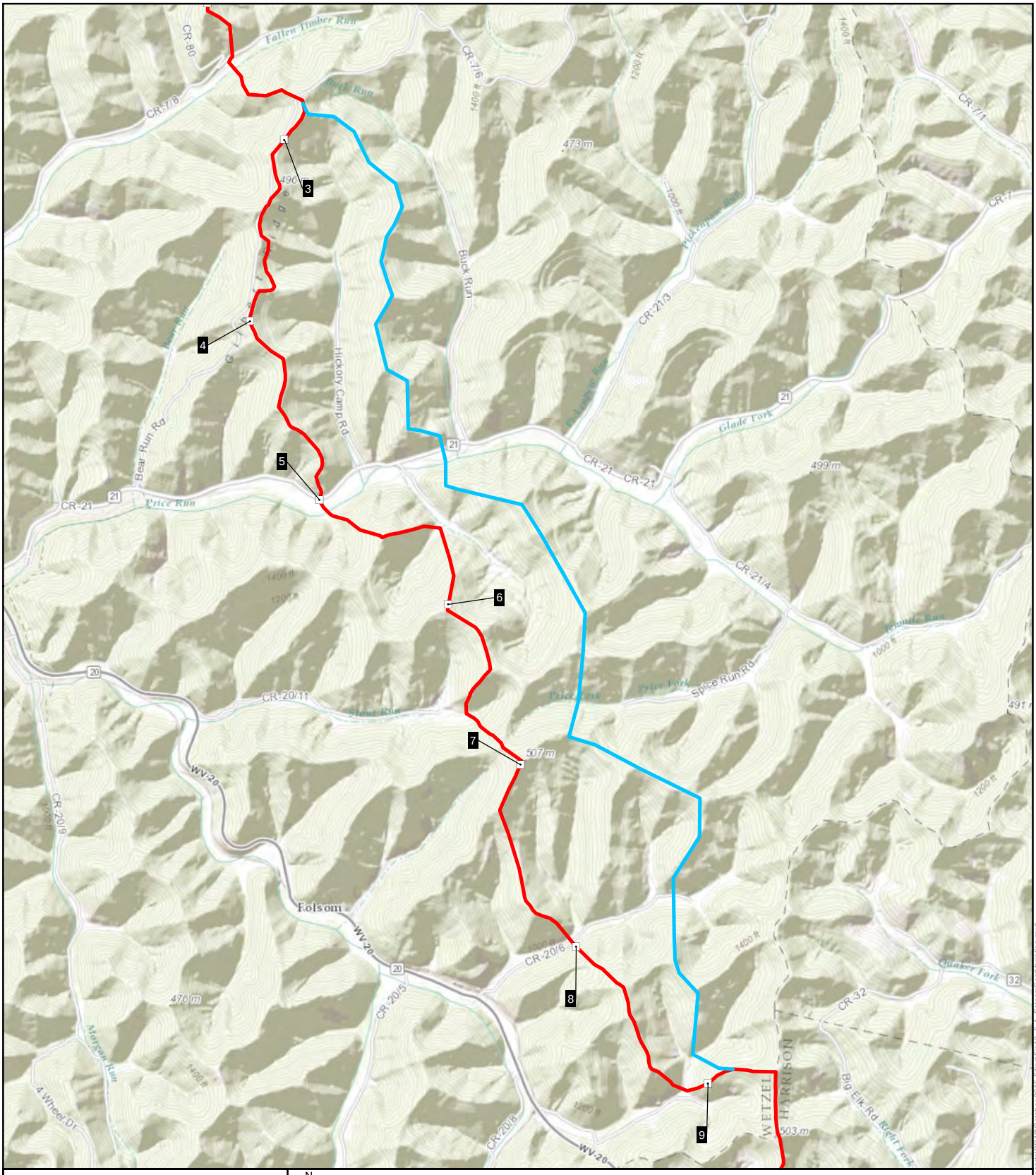
October 2015

Data Sources: ESRI Streaming Data, 2014, Ventyx 2014.

Legend

- Milepost
- ETNG Alternative
- Proposed Route
- Appalachian Trail
- Existing Transco Pipeline
- Existing East Tennessee Natural Gas Pipeline

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_5_4_ETNGAlternative.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:40,000

0 0.5 1 Miles

Mountain Valley PIPELINE

Figure 10.6-1
Folsom East Variation

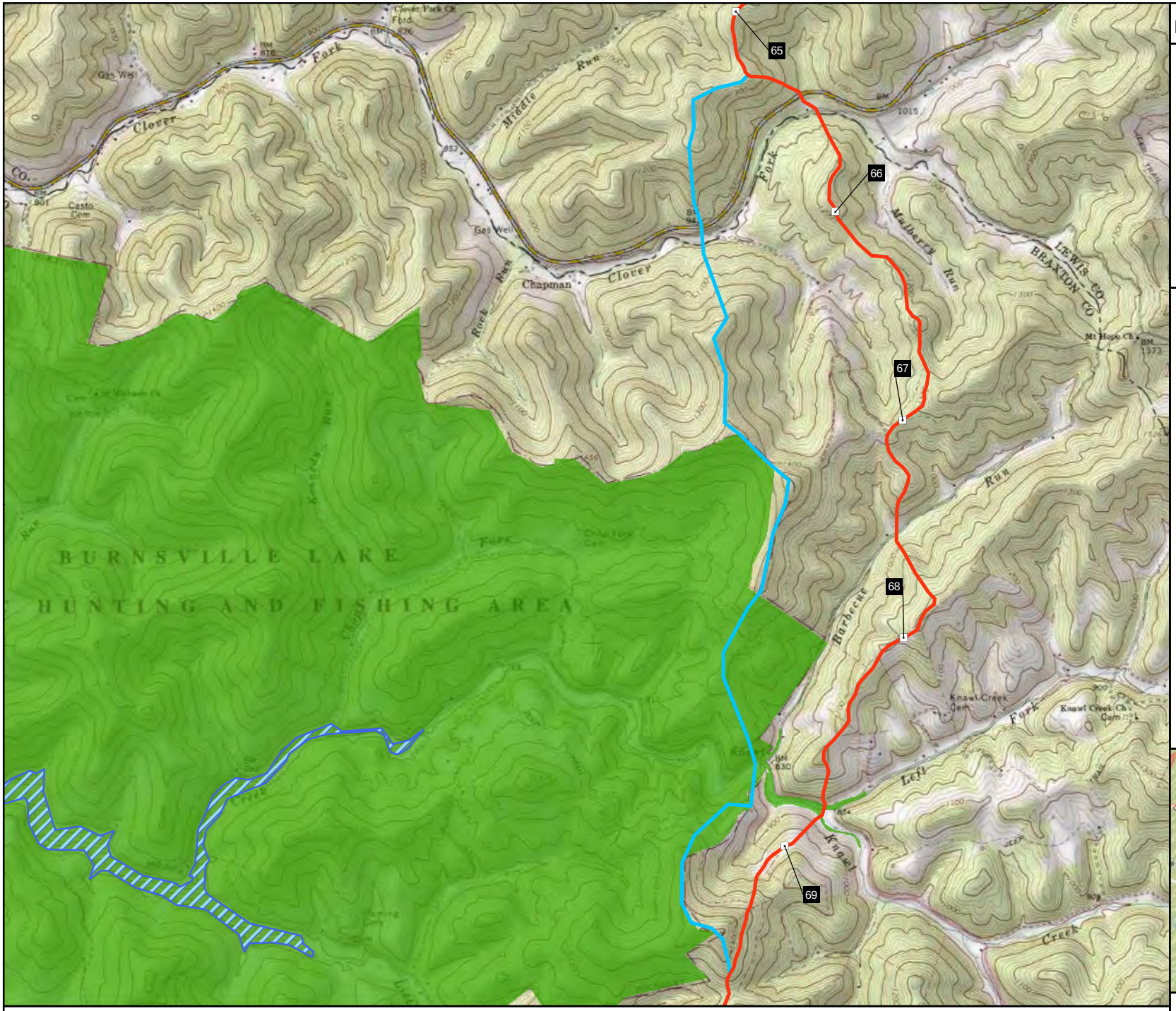
October 2015

Data Sources: ESRI Streaming Data, 2014, Ventyx 2014.

Legend

- Milepost
- Folsom East Variation
- Proposed Route

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_1_FolsomEastVariation.mxd



Mountain Valley Pipeline Project

Mountain Valley PIPELINE

Figure 10.6-2
Burnsville Lake Wildlife Management Area Variation

October 2015

Legend

- Milepost
- Proposed Route
- Burnsville Lake Wildlife Management Area Variation
- Burnsville Lake
- Burnsville Lake Wildlife Management Area

N

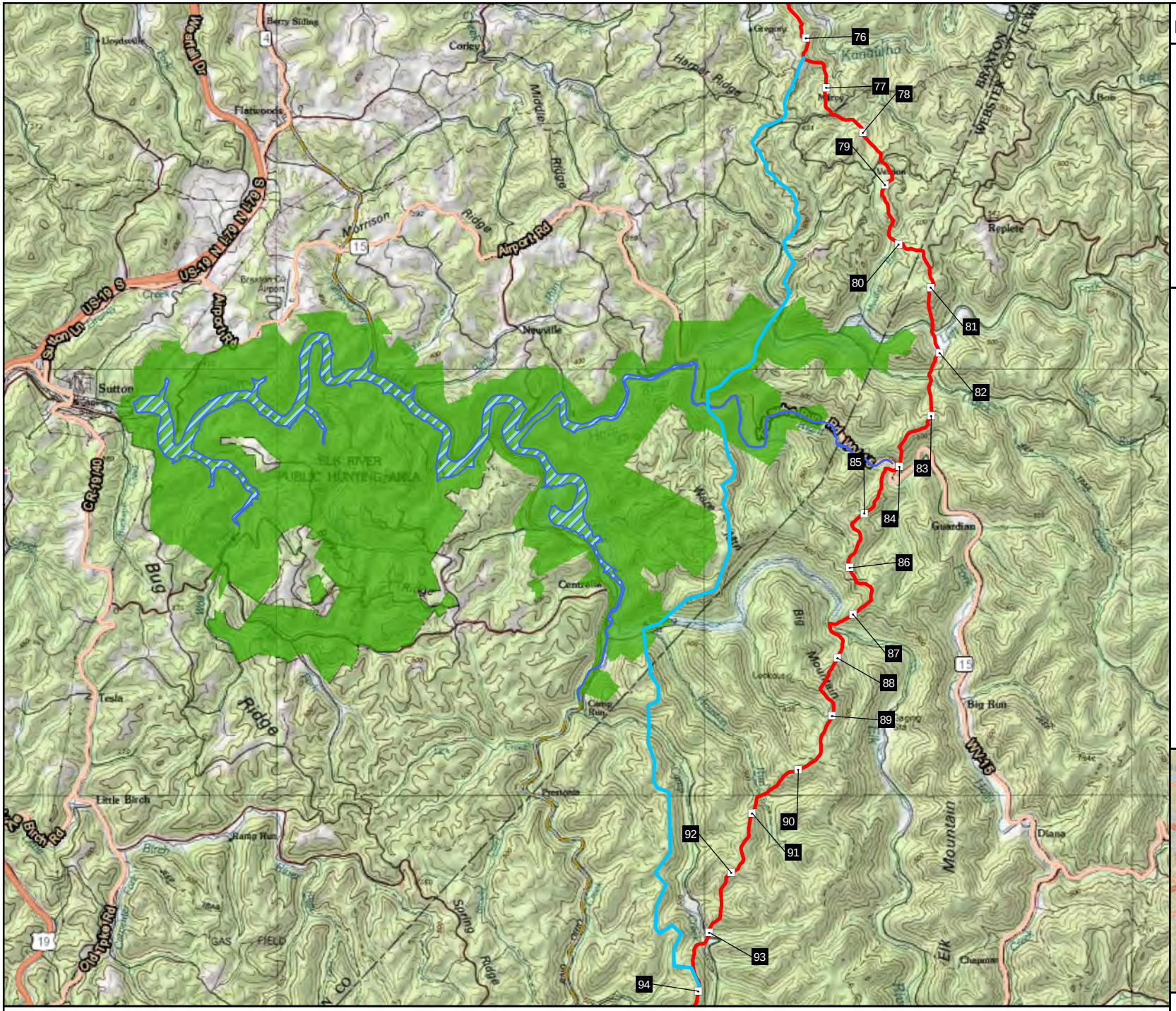
1:33,000

NAD 1983 UTM 17N

0 0.5 1 2 Miles

Data Sources: ESRI Streaming Data, 2014. United States Army Corp of Enigneers, West Virginia Department of Natural Resources.

Document Path: P:\EQ\Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_2_BurnsvilleLakeWMA_Variation.mxd



1:125,000 NAD 1983 UTM 17N

0 2.5 5 10 Miles

Mountain Valley Pipeline Project

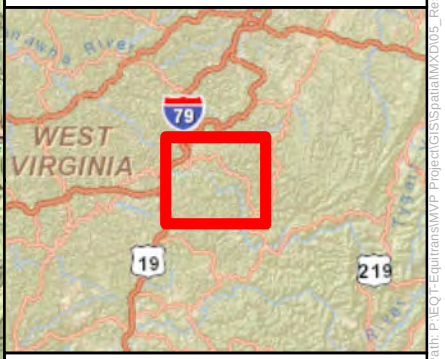
Mountain Valley PIPELINE

Figure 10.6-3
Elk River Wildlife Management Area Variation

October 2015

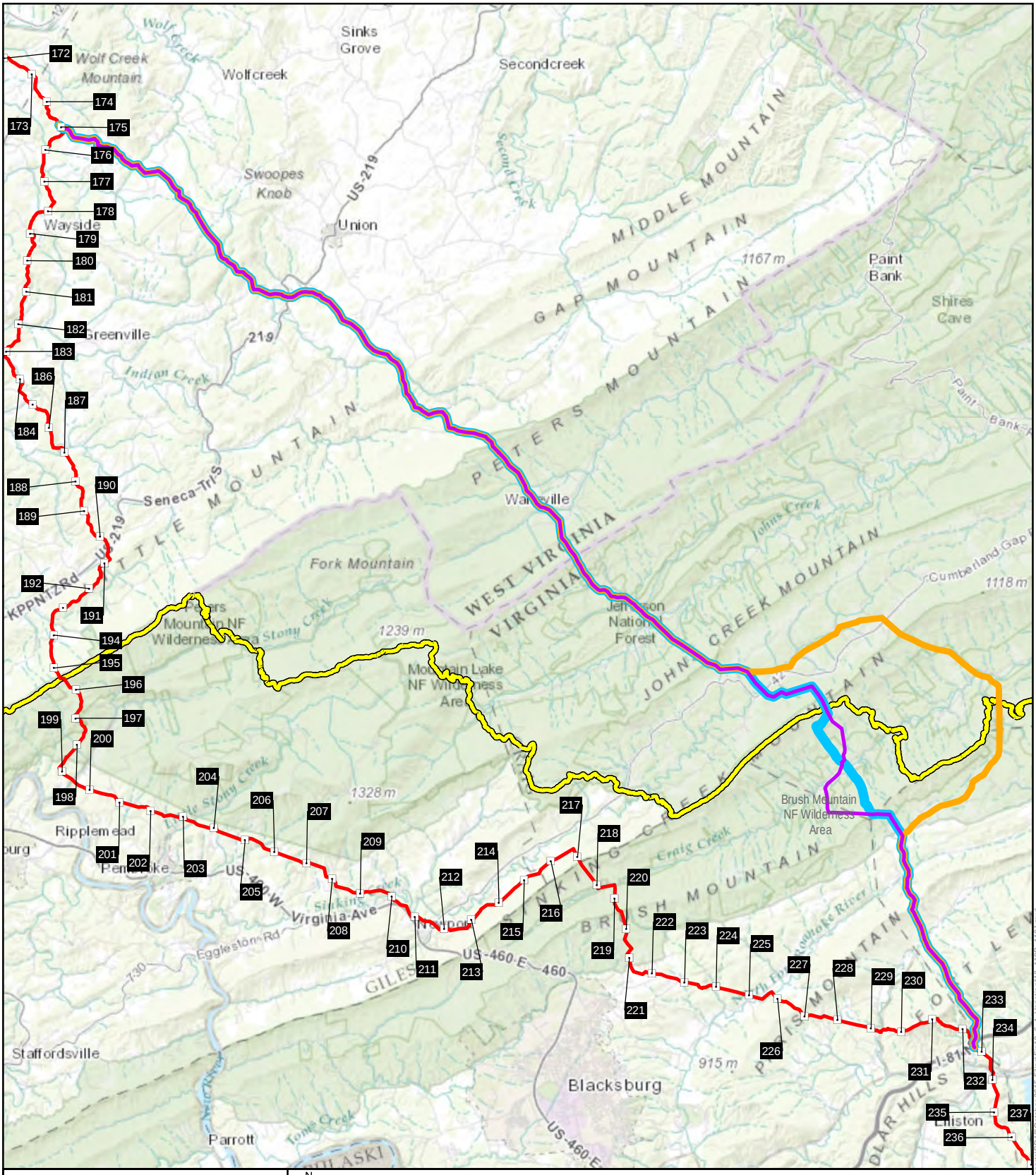
Legend

- Milepost
- Elk River Wildlife Management Area Variation
- Proposed Route
- Sutton Lake
- Elk River Wildlife Management Area



Data Sources: ESRI Streaming Data, 2014. United States Army Corp of Enigneers, West Virginia Department of Natural Resources.

Document Path: P:\EQT Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_3_ElkRiverWMA_Variation.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:250,000

0 2.5 5 10 Miles

Mountain Valley PIPELINE

Figure 10.6-4
Variation 110, 110R & 110J

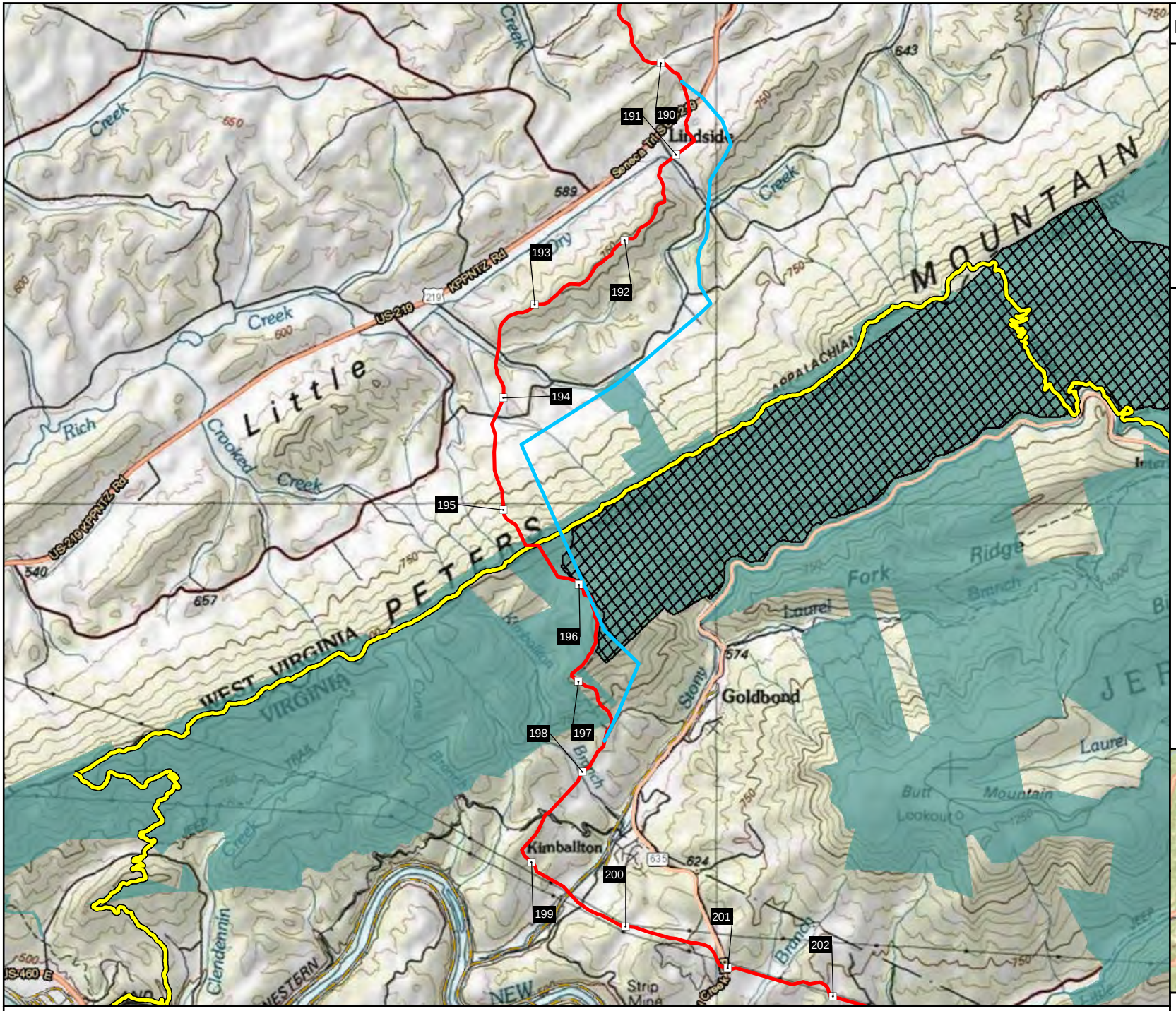
October 2015

Data Sources: ESRI Streaming Data, 2014, Ventyx 2014, National Park Service, Protected Areas Database.

Legend

- Milepost
- Variation 110
- Variation 110J
- Variation 110R
- Proposed Route
- Appalachian Trail

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_4_Variation110_110R_110J.mxd



Mountain Valley Pipeline Project

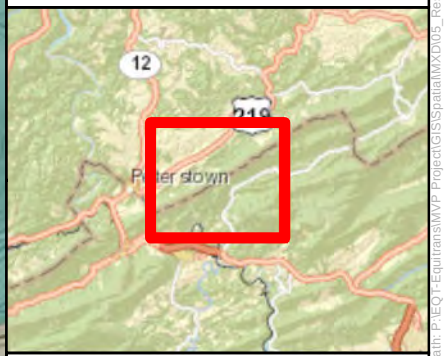
Mountain Valley PIPELINE

Figure 10.6-5
Peters Mountain East Variation

October 2015

Legend

- Milepost
- Peters Mountain East Variation
- Proposed Route
- Appalachian Trail
- Peters Mountain Wilderness Area
- Jefferson National Forest



N

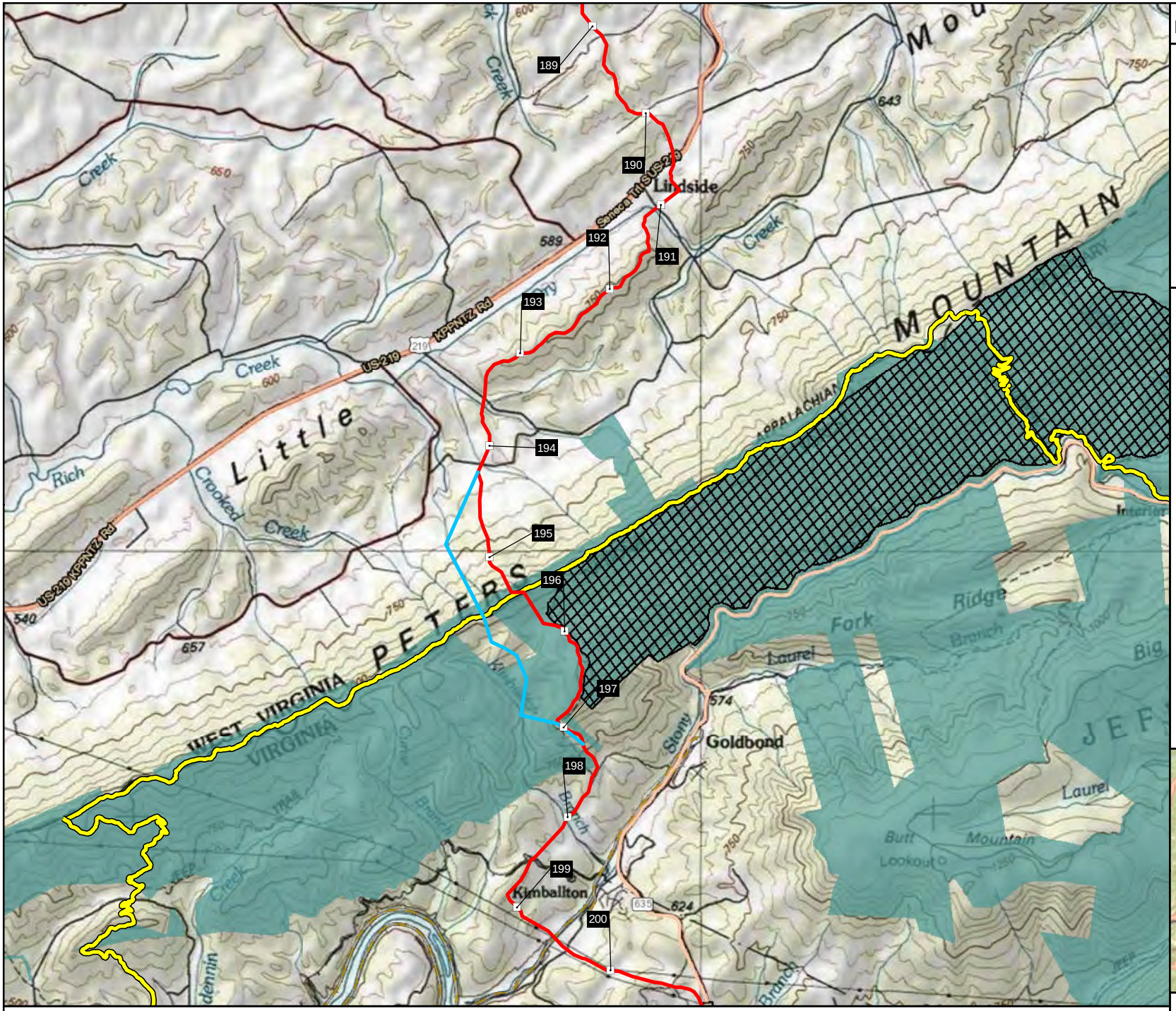
1:73,500

NAD 1983 UTM 17N

0 1 2 4 Miles

Data Sources: ESRI Streaming Data, 2014. United States Department of Agriculture, National Park Service, Virginia Department of Conservation and Recreation.

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_5_PetersMountainEastVariation.mxd



1:74,000 NAD 1983 UTM 17N

0 1 2 4 Miles

Mountain Valley Pipeline Project

Mountain Valley PIPELINE

Figure 10.6-6
Peters Mountain West Variation

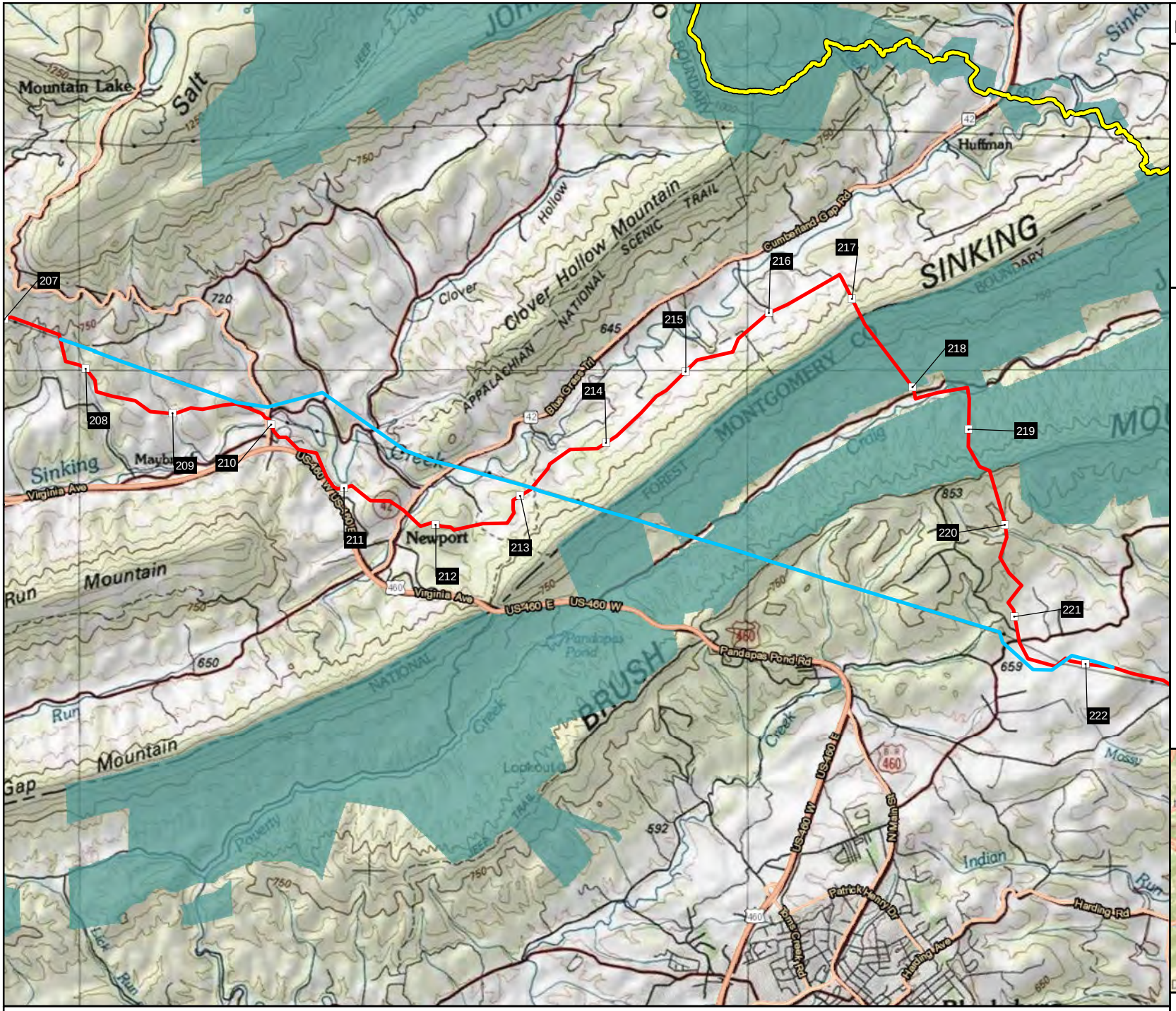
October 2015

Legend

- Milepost
- Peters Mountain West Variation
- Proposed Route
- Appalachian Trail
- Peters Mountain Wilderness Area
- Jefferson National Forest

Data Sources: ESRI Streaming Data, 2014. United States Department of Agriculture, National Park Service, Virginia Department of Conservation and Recreation.

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_6_PetersMountainWestVariation.mxd



Mountain Valley Pipeline Project

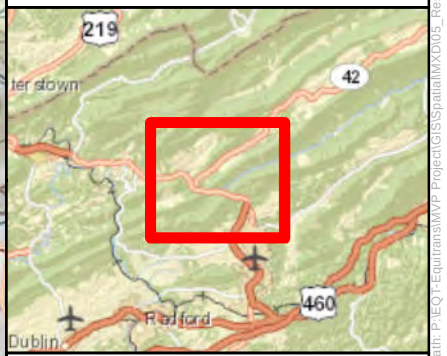
Mountain Valley PIPELINE

Figure 10.6-7
AEP-Newport Variation

October 2015

Legend

- Milepost
- AEP-Newport Alternative
- Proposed Route
- Appalachian Trail
- Jefferson National Forest



N

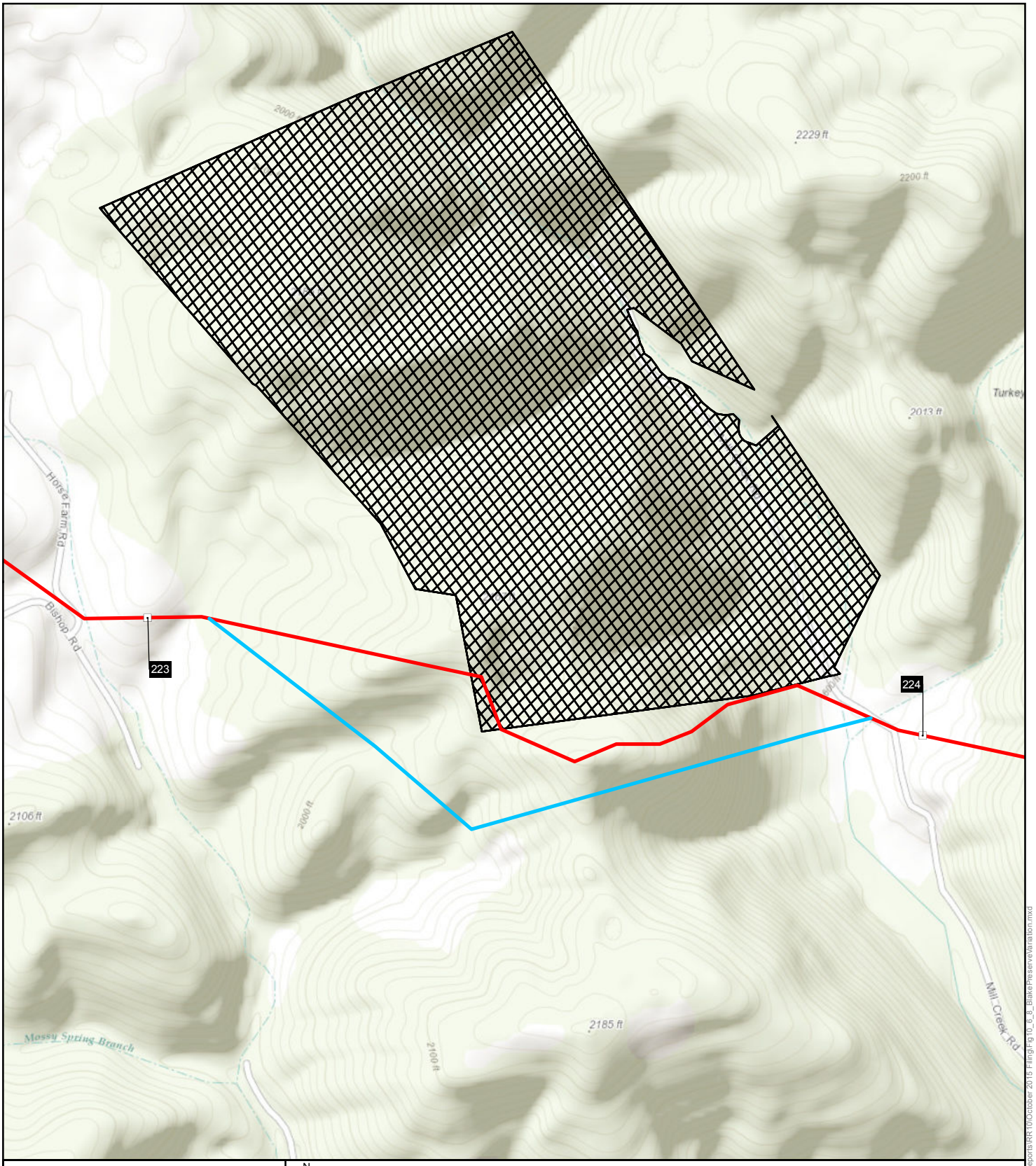
1:80,000

NAD 1983 UTM 17N

0 1 2 4 Miles

Data Sources: ESRI Streaming Data, 2014. United States Department of Agriculture, National Park Service, Virginia Department of Conservation and Recreation.

Document Path: P:\EQT-EquitransMVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_7_AEPNewportVariation.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:10,000

0 0.125 0.25 Miles

Mountain Valley PIPELINE

Figure 10.6-8
Blake Preserve Variation

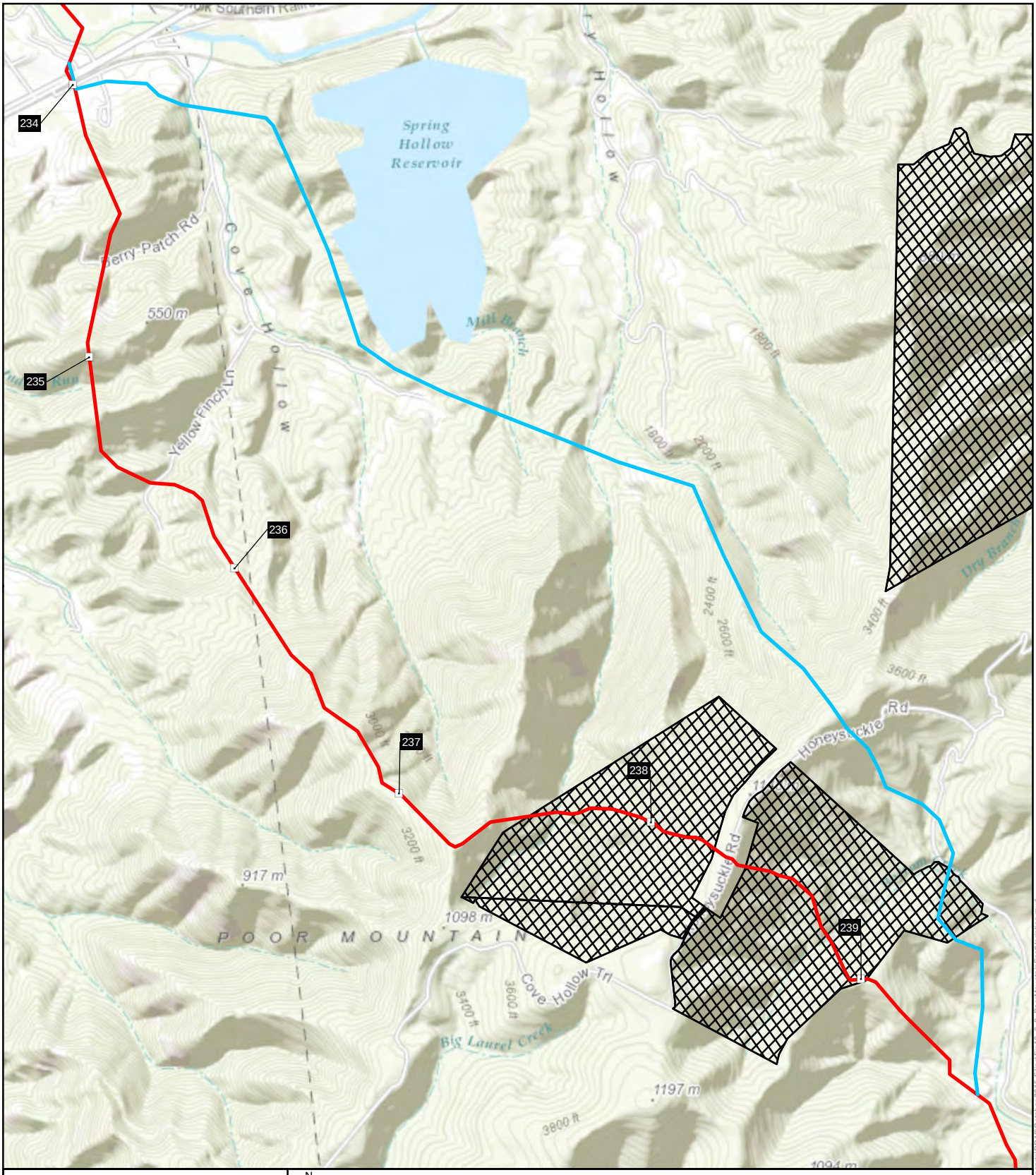
October 2015

Data Sources: ESRI Streaming Data, 2014, Ventyx 2014, Virginia Department of Conservations and Recreation.

Legend

- Milepost
- Blake Preserve Alternative
- Proposed Route
- Mill Creek Springs Natural Area Preserve

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_8_BlakePreserveVariation.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:30,000

0 0.125 0.25 Miles

Mountain Valley PIPELINE

Figure 10.6-9
Poor Mountain East Variation

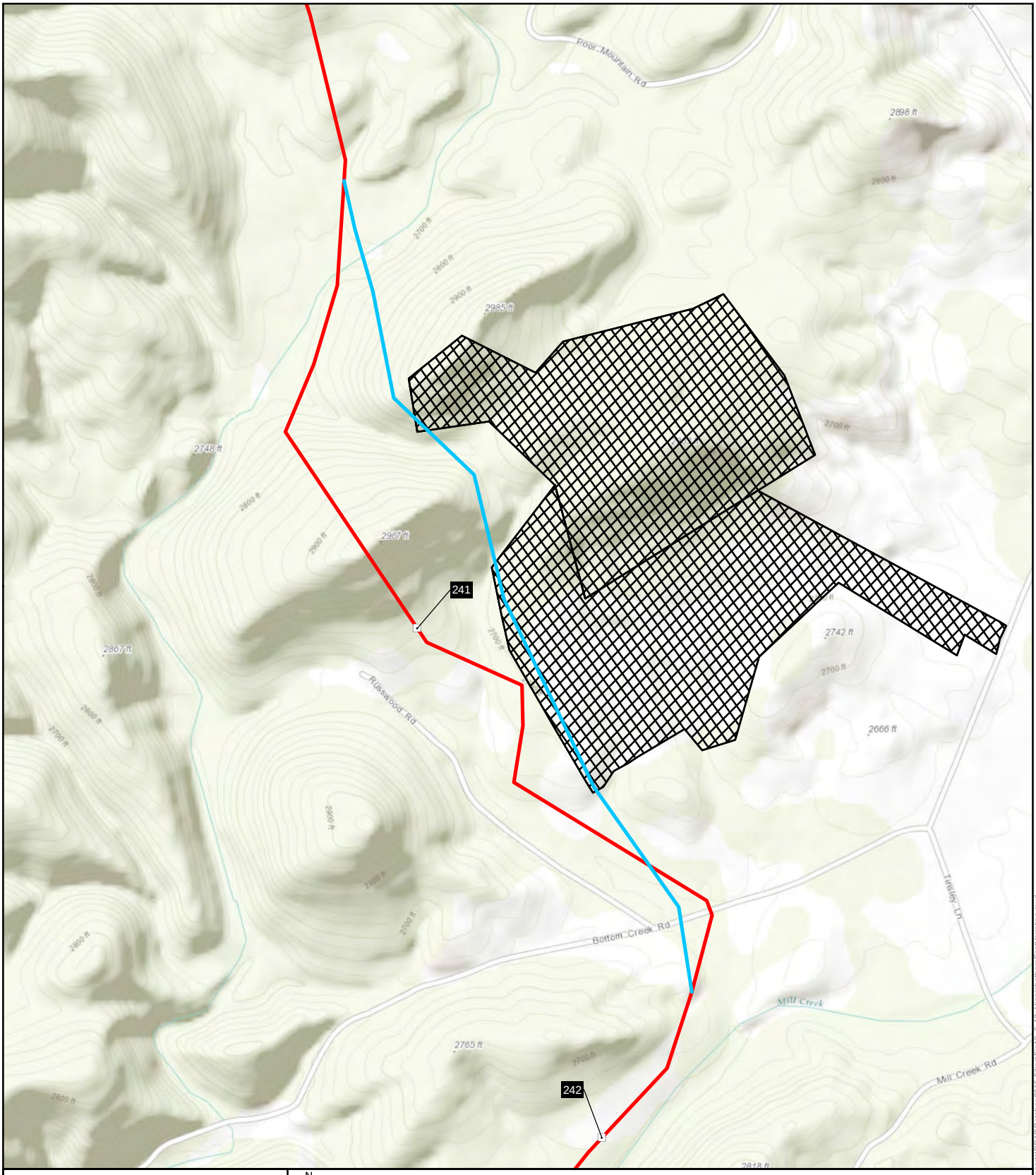
October 2015

Data Sources: ESRI Streaming Data, 2014, Ventyx 2014, National Conservation Easement Database.

Legend

- Milepost
- Poor Mountain East Alternative
- Proposed Route
- Ducks Unlimited Parcel Boundary

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_9_PoorMountainEastVariation.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:12,000

0 0.125 0.25 Miles

Mountain Valley PIPELINE

Figure 10.6-10
Higgenbotham East Variation

October 2015

Data Sources: ESRI Streaming Data, 2014, Ventyx 2014, Coates Field Services.

Legend

- Milepost
- Higginbotham East Variation
- Proposed Route
- Higginbotham Parcel Boundary

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_10_HigginbothamEastVariation.mxd

Mountain Valley Pipeline Project

Mountain Valley PIPELINE

Figure 10.6-11
Blue Ridge Parkway Variation

October 2015

Legend

- Milepost
- Blue Ridge Parkway Variation
- Proposed Route
- Blue Ridge Parkway

N

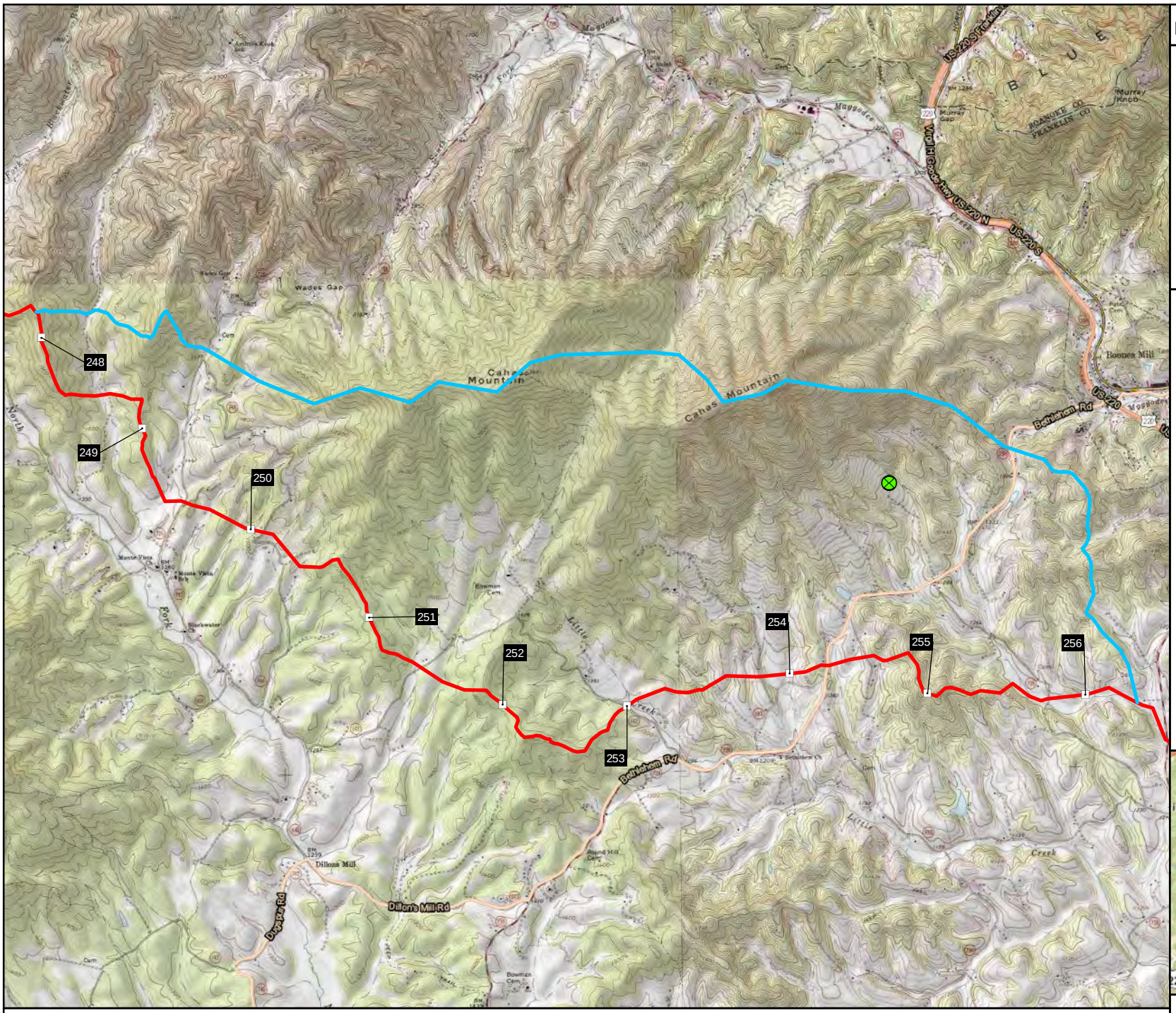
1:25,500

NAD 1983 UTM 17N

0 0.5 1 2 Miles

Data Sources: ESRI Streaming Data, 2014. National Scenic Byway Program.

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_11_BlueRidgeParkway_Variation.mxd



Mountain Valley Pipeline Project

Mountain Valley PIPELINE

Figure 10.6-12
Cahas Mountain Variation

October 2015

Legend

- Boones Mill Water Treatment Plant
- Milepost
- Cahas Mountain Variation
- Proposed Route

N

1:50,000

NAD 1983 UTM 17N

0 0.5 1 2 Miles

Data Sources: ESRI Streaming Data, 2014. United States Department of Agriculture, National Park Service, Virginia Department of Conservation and Recreation.

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_12_CahasMountainVariation.mxd

Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:10,000

0 0.125 0.25 Miles

Mountain Valley PIPELINE

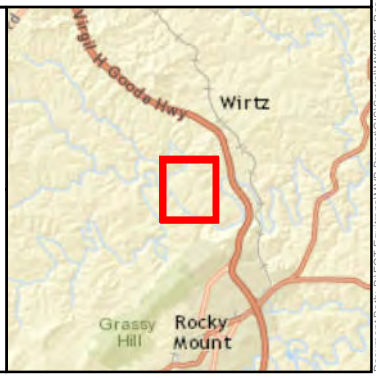
Figure10.6-13
Foggy Ridge Road Variation

October 2015

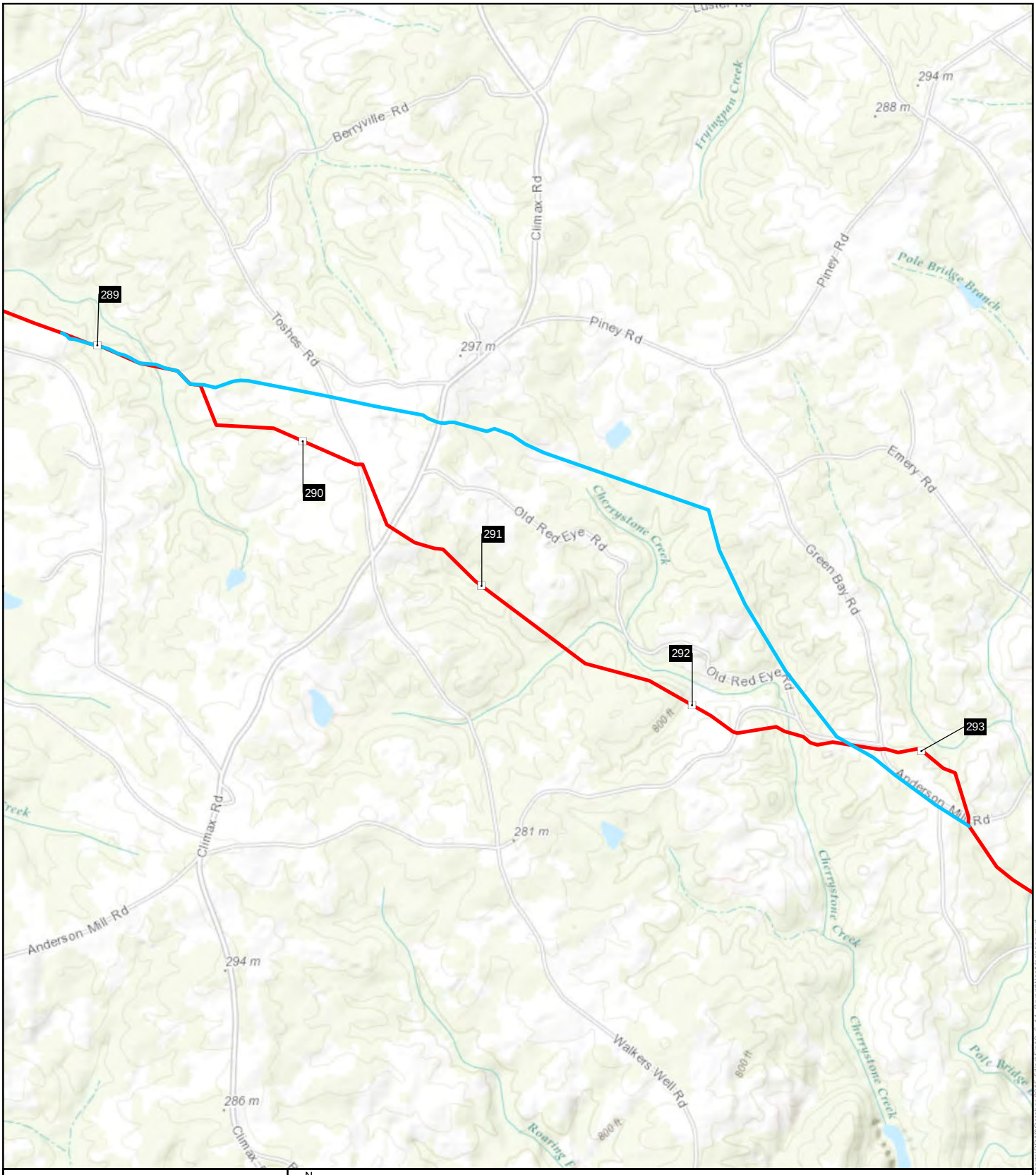
Data Sources: ESRI Streaming Data, 2014, Ventyx 2014.

Legend

- Milepost
- Foggy Ridge Road Variation
- Proposed Route



Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_13_FoggyRidgeRoadVariation.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:35,000

0 0.5 1 Miles

Mountain Valley PIPELINE

Figure10.6-14
Bryant West Variation

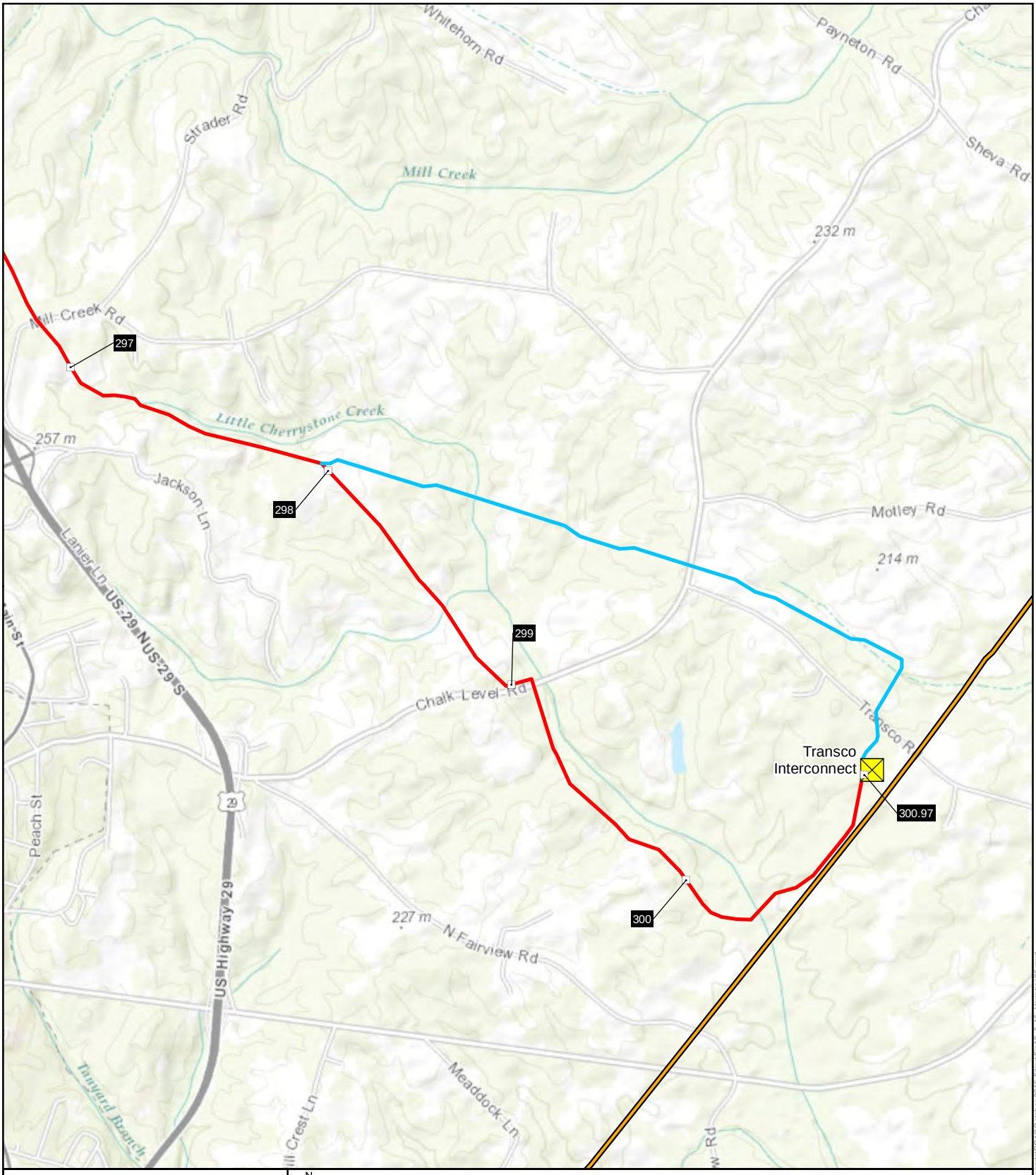
October 2015

Data Sources: ESRI Streaming Data, 2014, Ventyx 2014.

Legend

- Milepost
- Bryant West Variation
- Proposed Route

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_14_BryantWestVariation.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:30,000

0 0.5 1 Miles

Mountain Valley PIPELINE

Figure 10.6-15
Variation 35

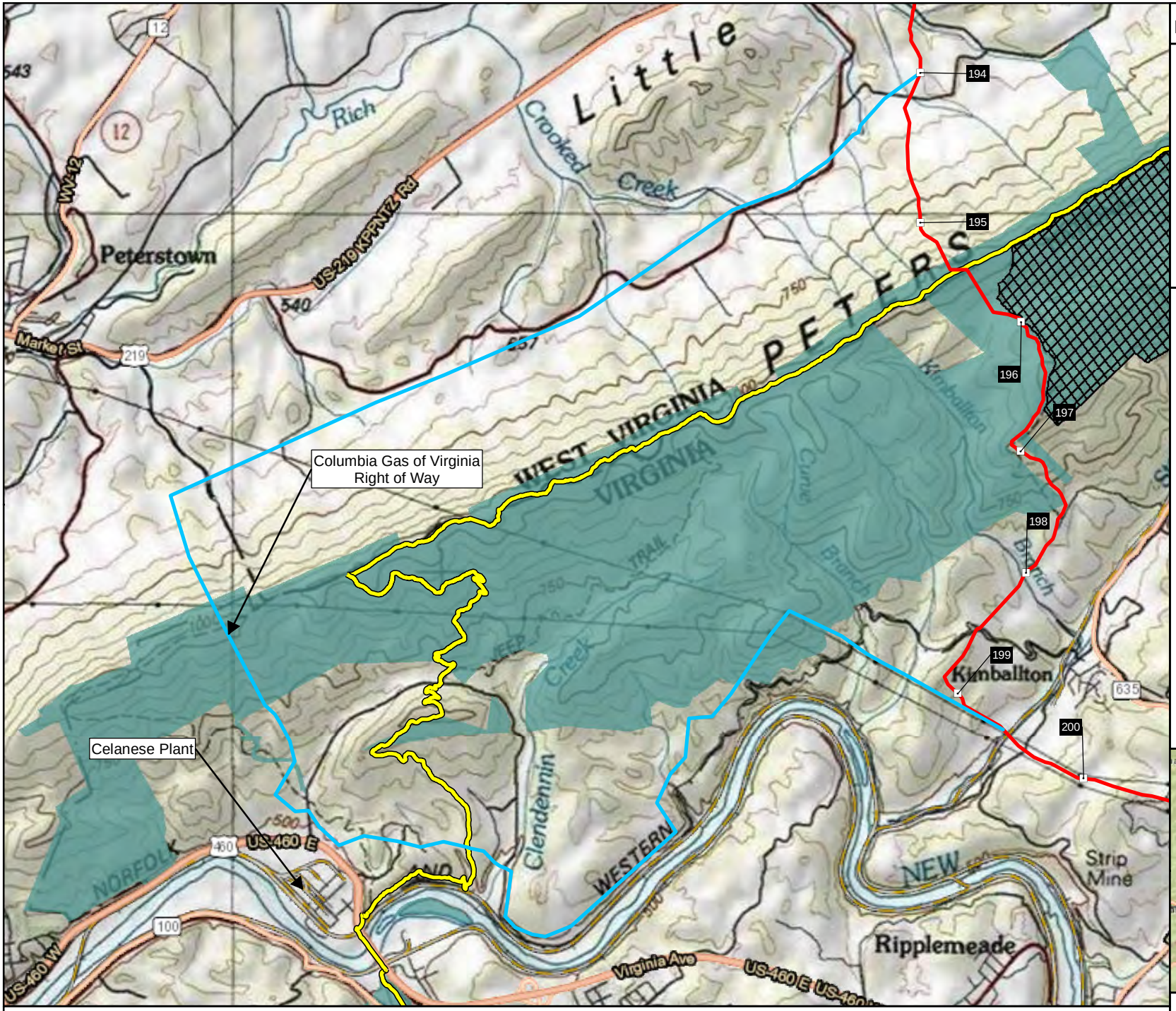
October 2015

Data Sources: ESRI Streaming Data, 2014, Ventyx 2014.

Legend

- Milepost
- Interconnect
- Variation 35
- Proposed Route
- Existing Transco Pipeline

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_6_15_Variation35.mxd



1:55,000 NAD 1983 UTM 17N

0 0.5 1 2 Miles

Mountain Valley Pipeline Project

Mountain Valley PIPELINE

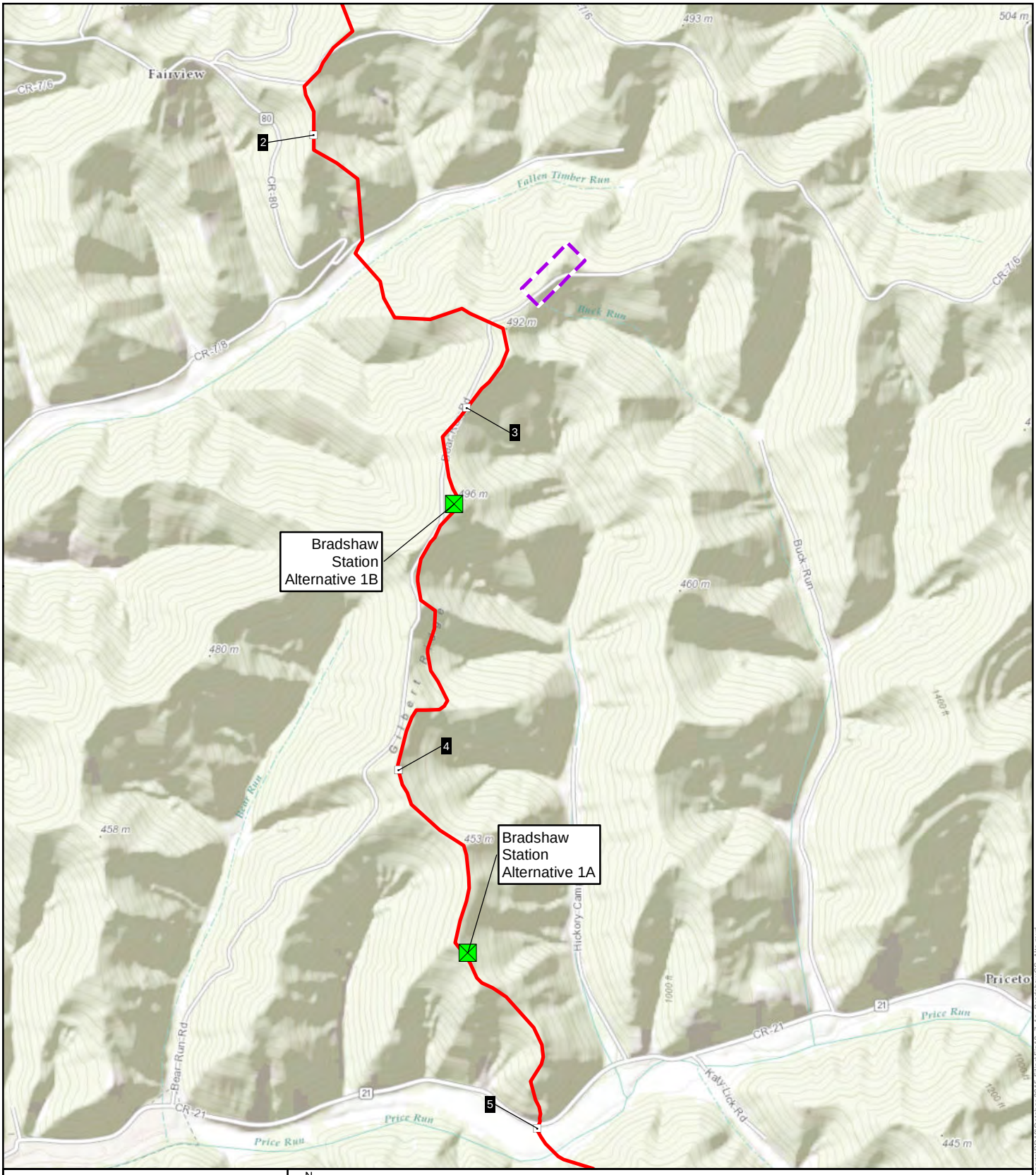
Figure 10.6-16
Columbia Gas of Virgina
Peters Mountain Variation

October 2015

Legend

- Milepost
- Columbia Gas of Virgina Peters Mountain Variation
- Proposed Route
- Appalachian Trail
- Peters Mountain Wilderness Area
- Jefferson National Forest

Data Sources: ESRI Streaming Data, 2014. United States Department of Agriculture, National Park Service, Virginia Department of Conservation and Recreation.



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:20,000

0 0.25 0.5 Miles

Mountain Valley PIPELINE

Figure 10.7-1a
Bradshaw Compressor Station Alternatives

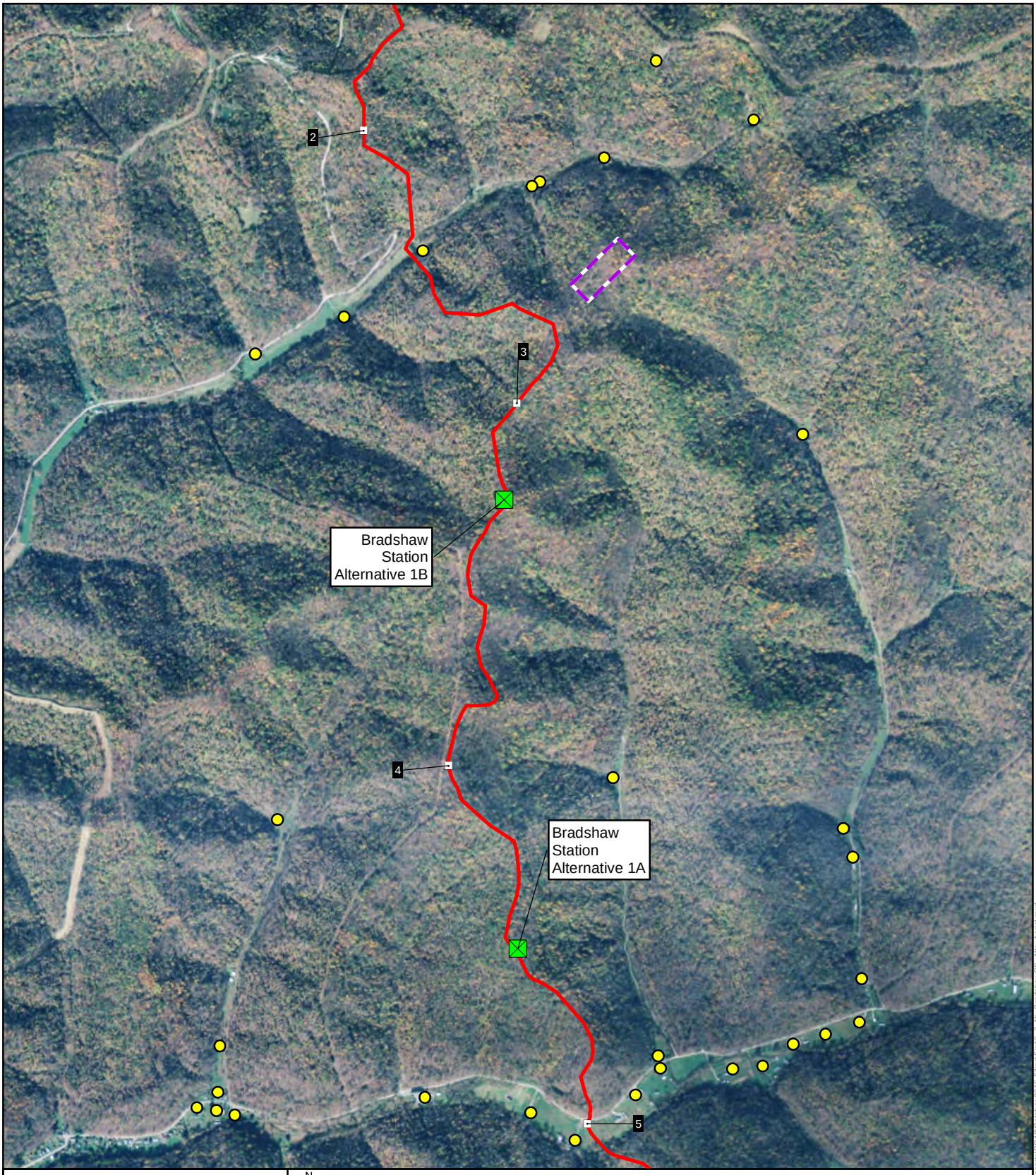
October 2015

Data Sources: ESRI Streaming Data, 2014.

Legend

- Milepost
- Compressor Station Alternative
- Proposed Bradshaw Station Fence
- Proposed Route

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_7_1a_BradshawCS_Alts.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:20,000

0 0.25 0.5 Miles

Mountain Valley PIPELINE

Figure 10.7-1b
Bradshaw Compressor Station Alternatives

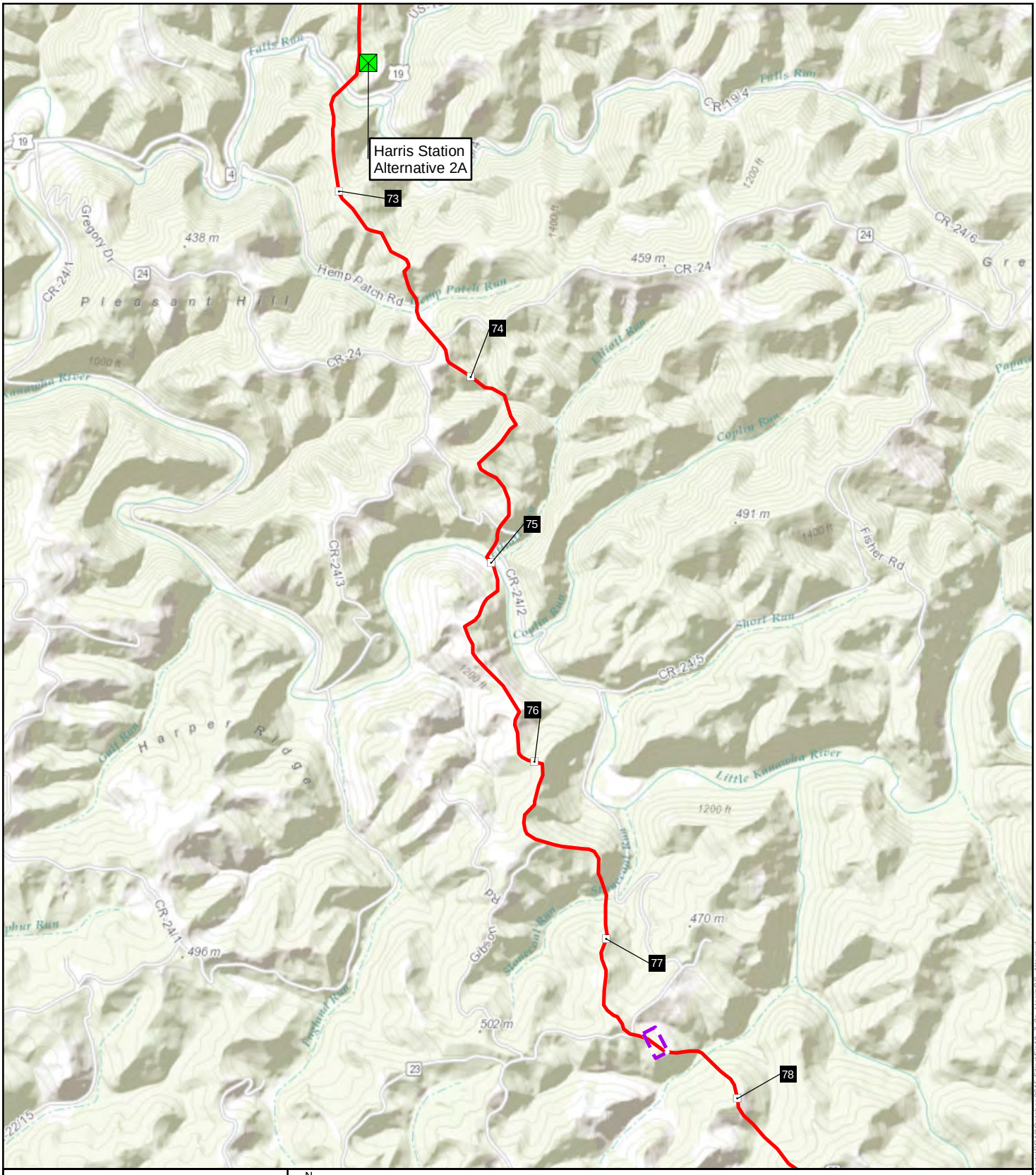
October 2015

Data Sources: ESRI Streaming Data, 2014.

Legend

- Residence/Noise Sensitive Area
- Milepost
- Compressor Station Alternative
- Proposed Bradshaw Station Fence
- Proposed Route

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_7_1b_BradshawCS_Alts_Aerial.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:35,000

0 0.25 0.5 Miles

Mountain Valley PIPELINE

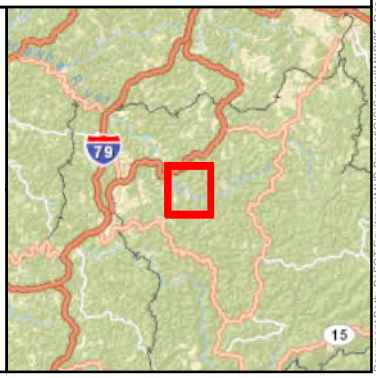
Figure 10.7-2a
Harris Compressor Station Alternatives

October 2015

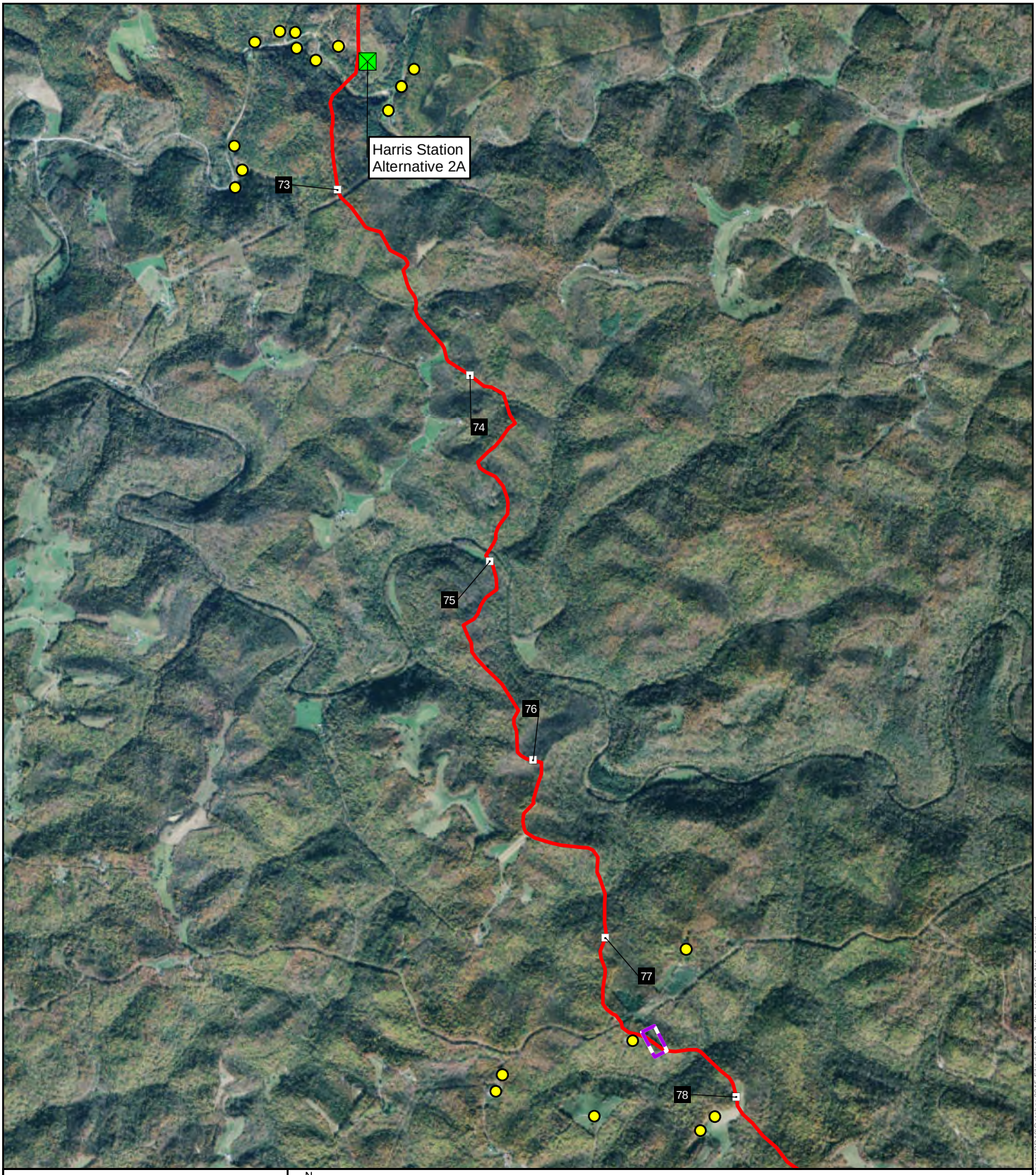
Data Sources: ESRI Streaming Data, 2014.

Legend

- Milepost
- Compressor Station Alternative
- Proposed Harris Station Fence
- Proposed Route



Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_7_2a_HarrisCS_Alts.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:35,000

0 0.25 0.5 Miles

Mountain Valley PIPELINE

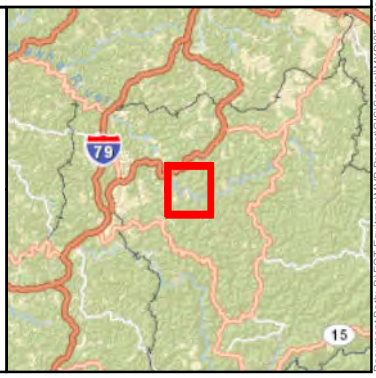
Figure 10.7-2b
Harris Compressor Station Alternatives

October 2015

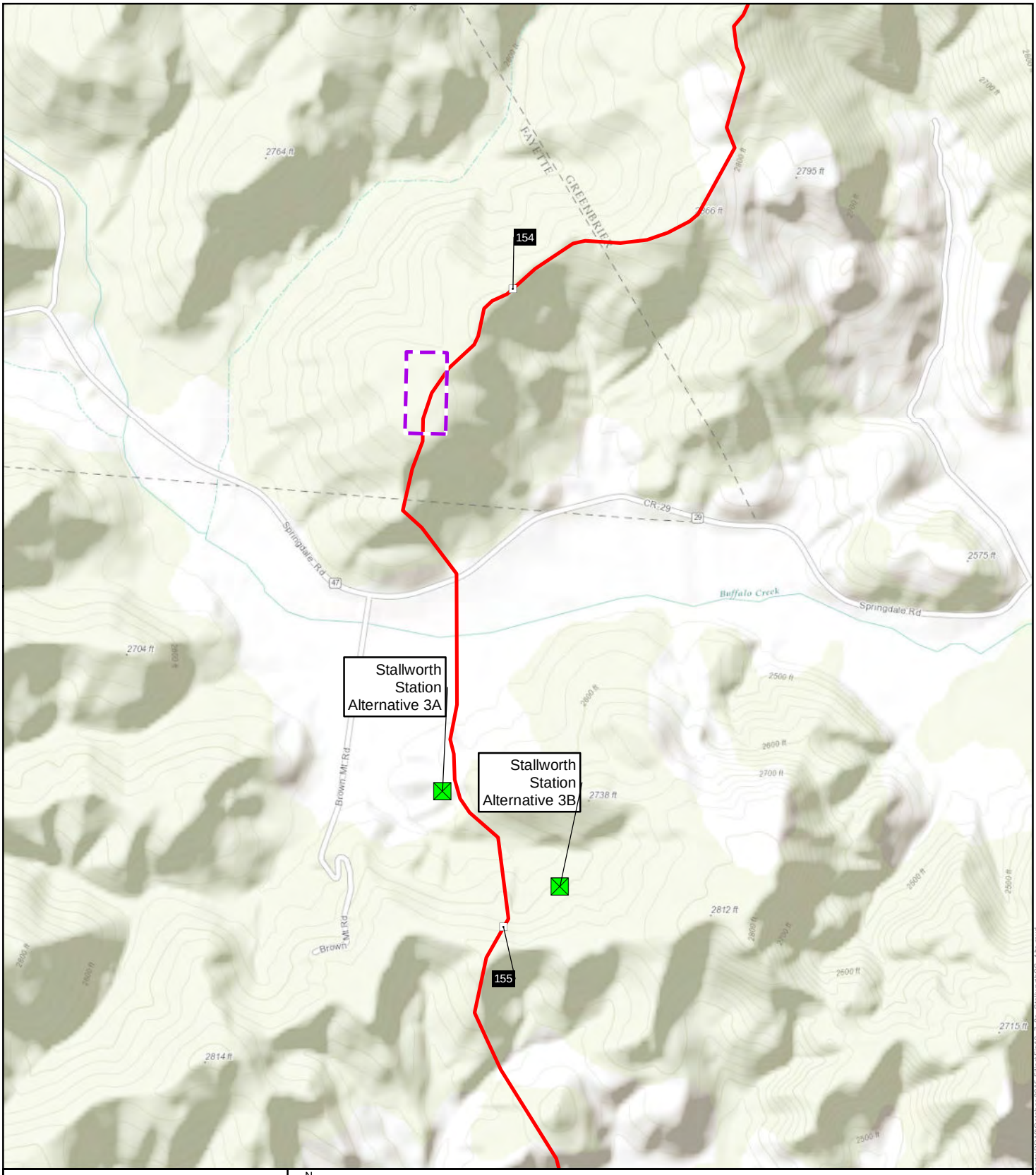
Data Sources: ESRI Streaming Data, 2014.

Legend

- Residence/Noise Sensitive Area
- Milepost
- Compressor Station Alternative
- Proposed Harris Station Fence
- Proposed Route



Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_7_2b_HarrisCS_Alts_Aerial.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:12,000

0 0.125 0.25 Miles

Mountain Valley PIPELINE

Figure 10.7-3a
Stallworth Compressor Station Alternatives

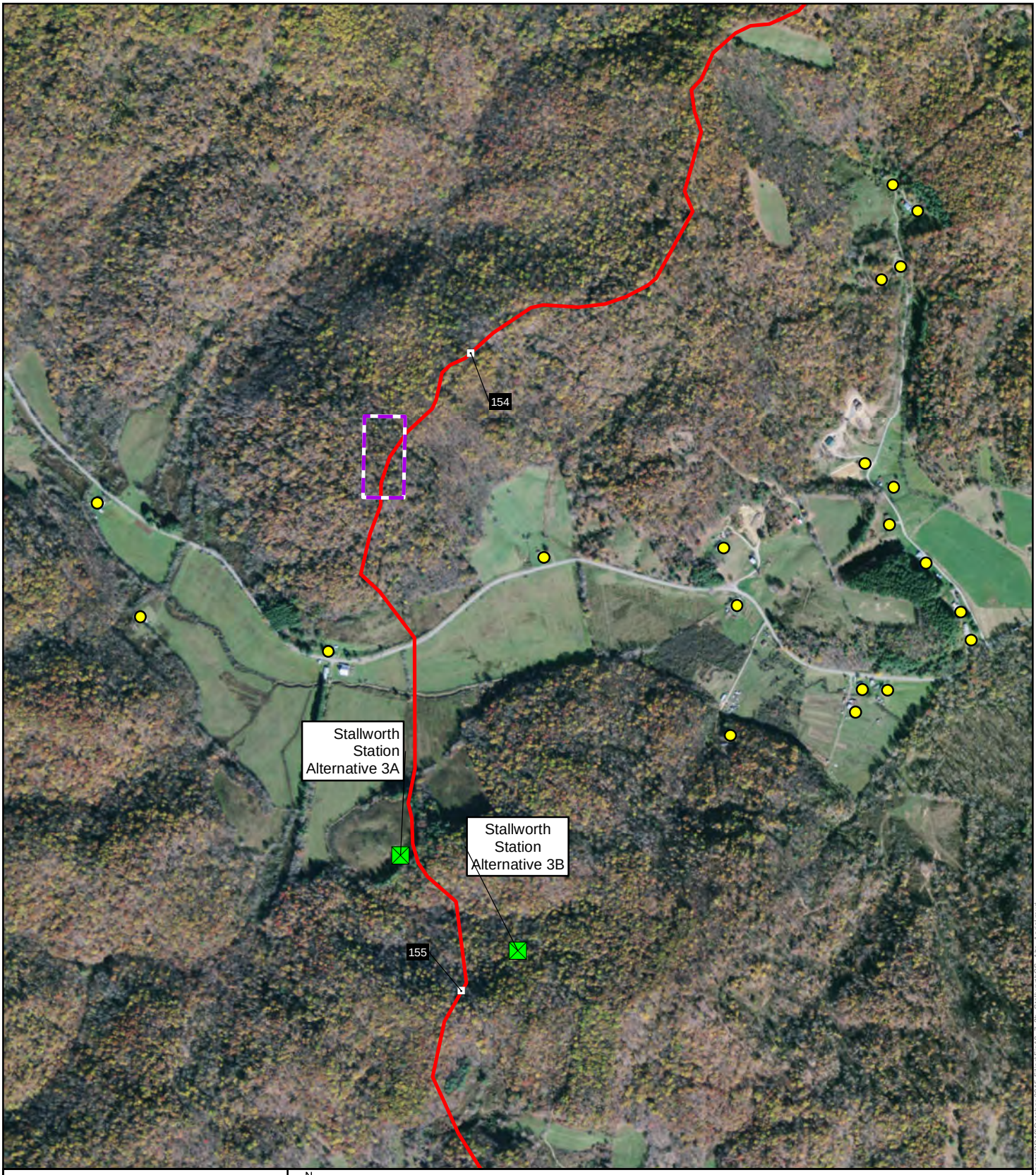
October 2015

Data Sources: ESRI Streaming Data, 2014.

Legend

- Milepost
- Compressor Station Alternative
- Proposed Stallworth Station Fence
- Proposed Route

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_7_3a_StallworthCS_Alts.mxd



Mountain Valley Pipeline Project

N

NAD 1983 UTM 17N 1:12,000

0 0.125 0.25 Miles

Mountain Valley PIPELINE

Figure 10.7-3b
Stallworth Compressor Station Alternatives

October 2015

Data Sources: ESRI Streaming Data, 2014.

Legend

- Residence/Noise Sensitive Area
- Milepost
- Compressor Station Alternative
- Proposed Stallworth Station Fence
- Proposed Route

Document Path: P:\EQT-Equitrans\MVP Project\GIS\Spatial\MXD\05_Resource_Reports\RR10\October 2015 Filing\Fig10_7_3b_StallworthCS_Alts_Aerial.mxd

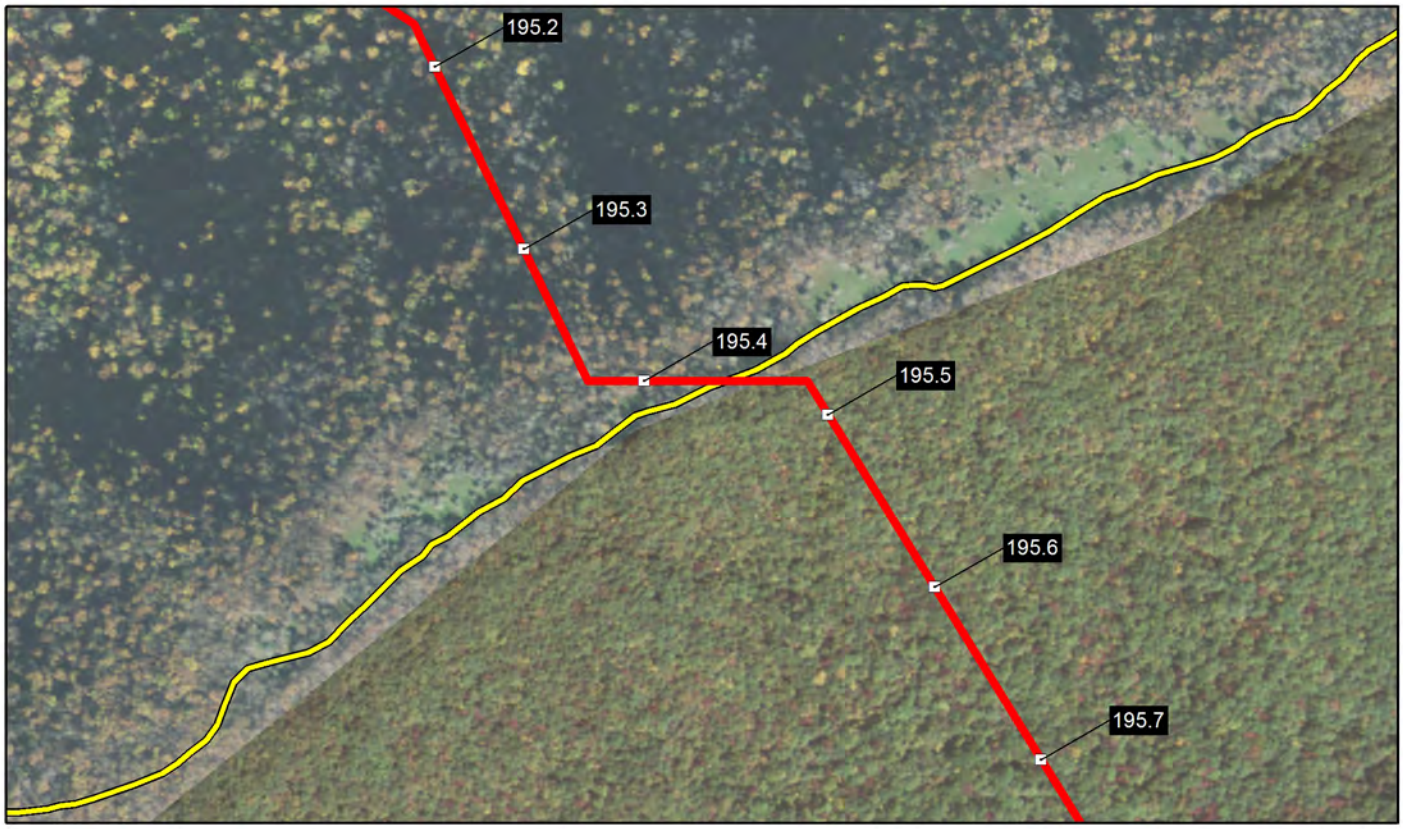
Mountain Valley Pipeline Project

Docket No. CP16-__-000

Resource Report 10

Appendix 10-B
Appalachian National Scenic Trail Crossing Alternatives Maps

Proposed Route Appalachian Trail Crossing

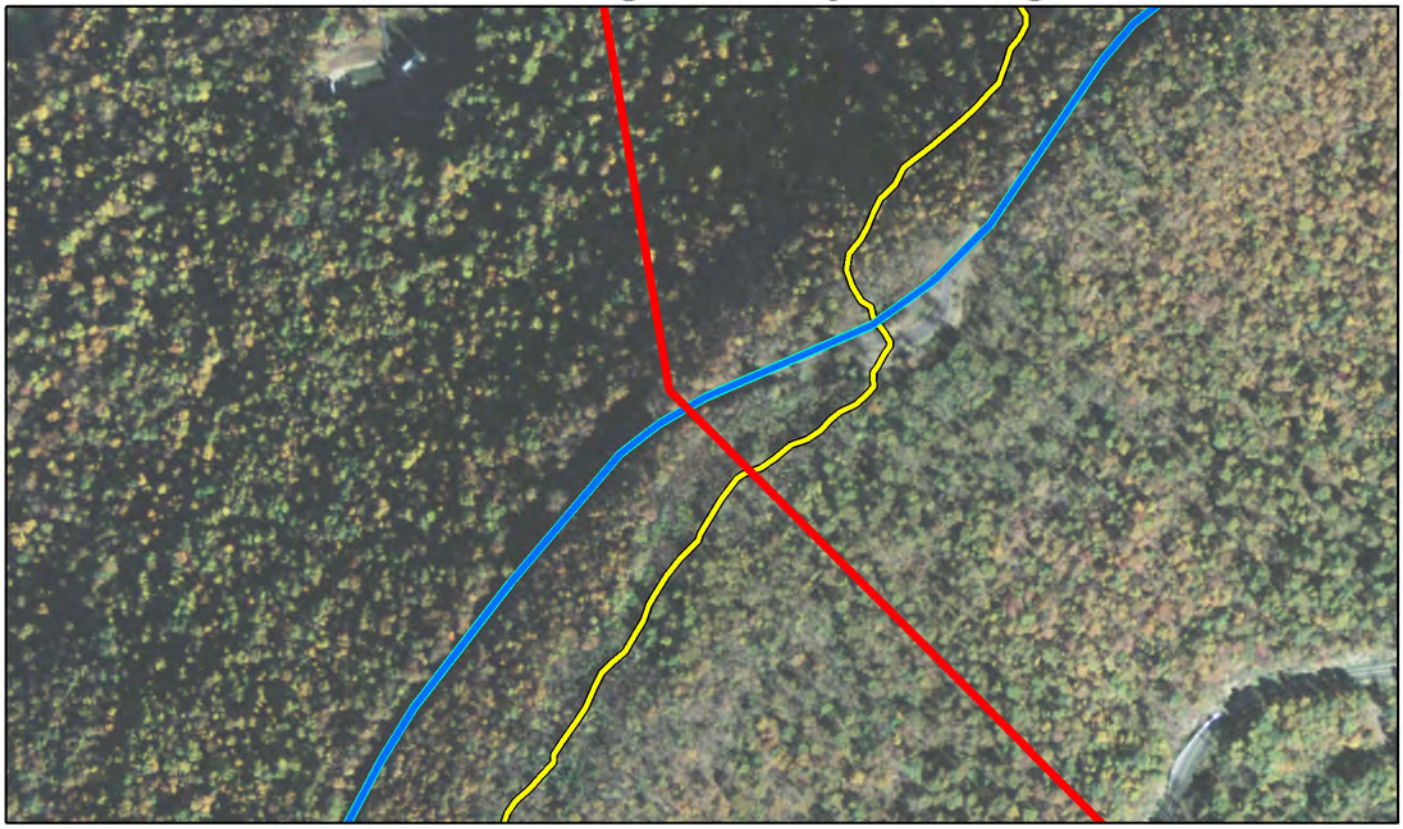


0 250 500 1,000 Feet

N W E S

Appalachian National Scenic Trail at Proposed Route Crossing Location

Northern Pipeline Alternative Appalachian Trail and Blue Ridge Parkway Crossing



0 250 500 1,000
Feet

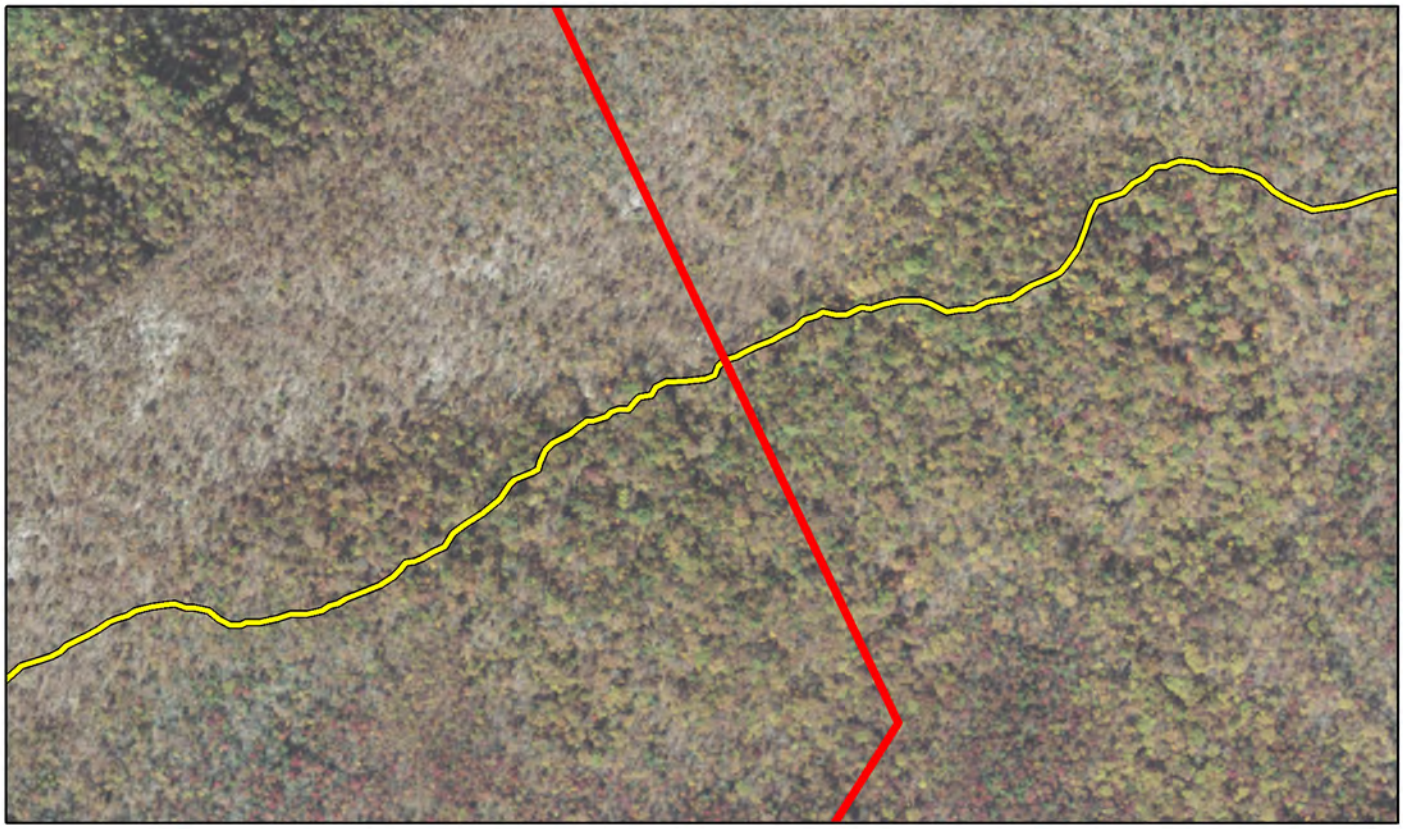
N
W E
S

Route Alternative 1 Appalachian Trail Crossing

0 250 500 1,000 Feet

N W E S

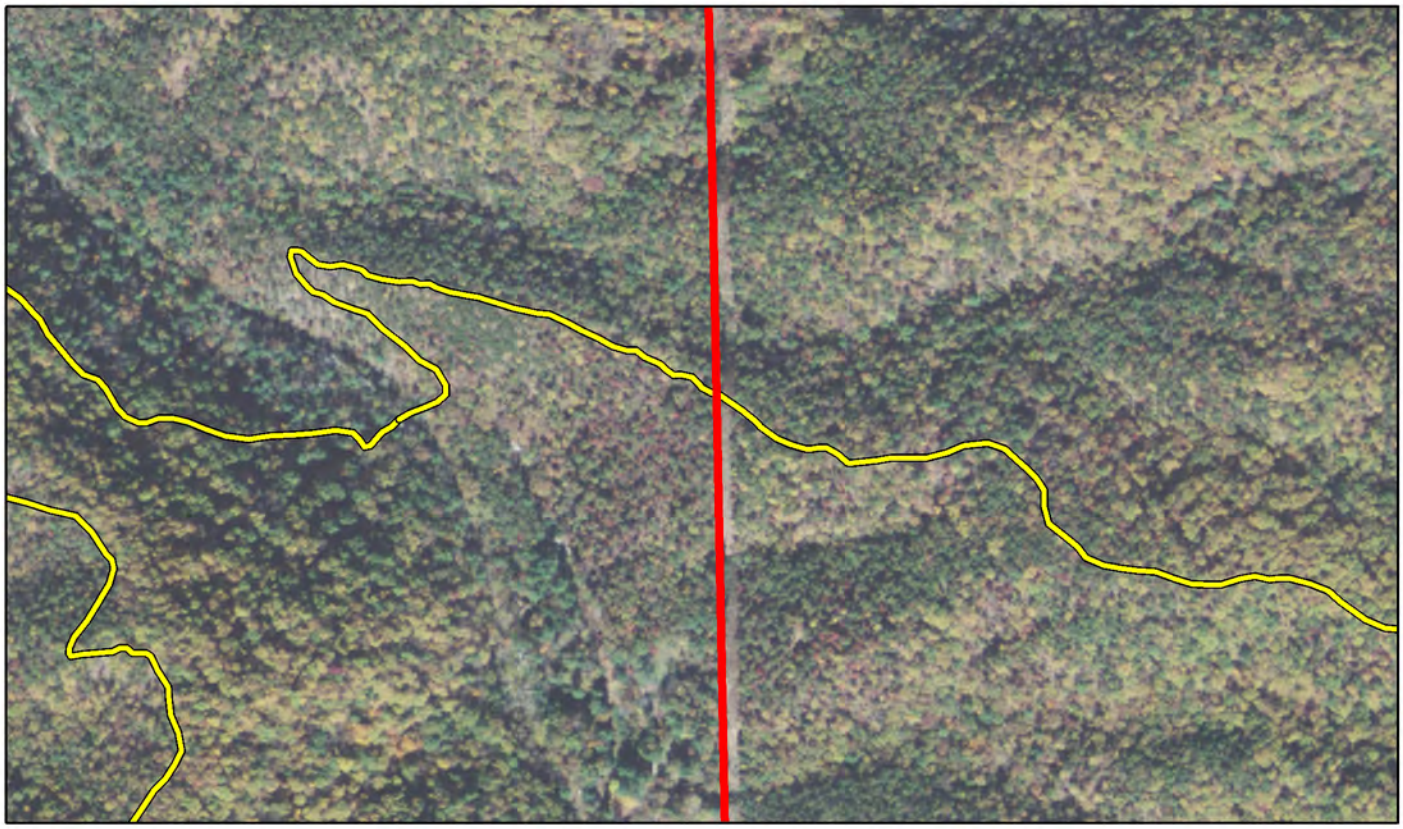
Variation 110 Appalachian Trail Crossing



0 250 500 1,000
Feet

N
W E
S

Variation 110J Appalachian Trail Crossing



0 250 500 1,000 Feet

N
W E
S

Peters Mountain West Variation Appalachian Trail Crossing

0 250 500 1,000 Feet

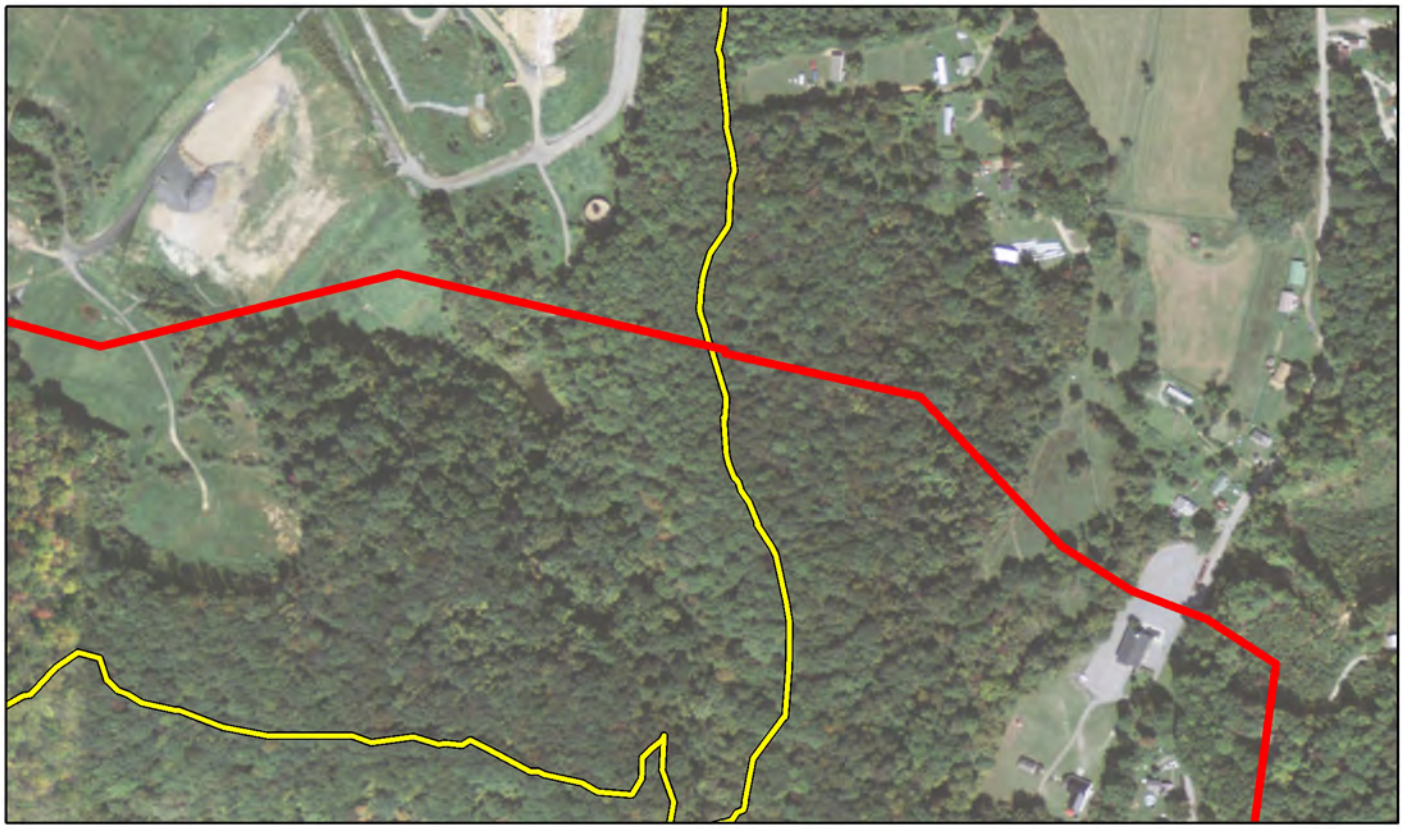
N W E S

Peters Mountain East Variation Appalachian Trail Crossing

0 250 500 1,000
Feet

N
W E
S

Columbia Gas of Virginia Peters Mountain Variation
Appalachian Trail Crossing



0 250 500 1,000 Feet

N
W E
S

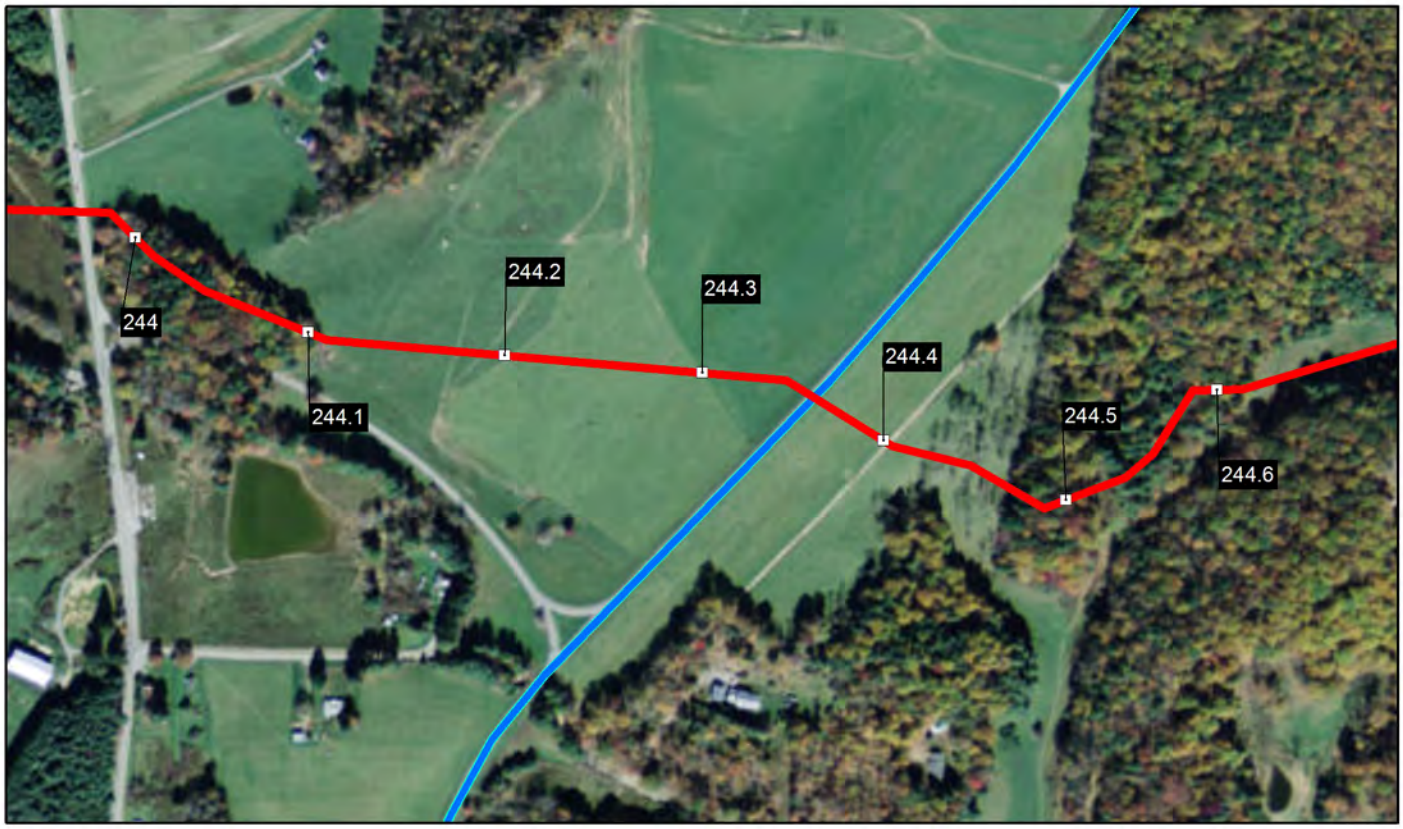
Mountain Valley Pipeline Project

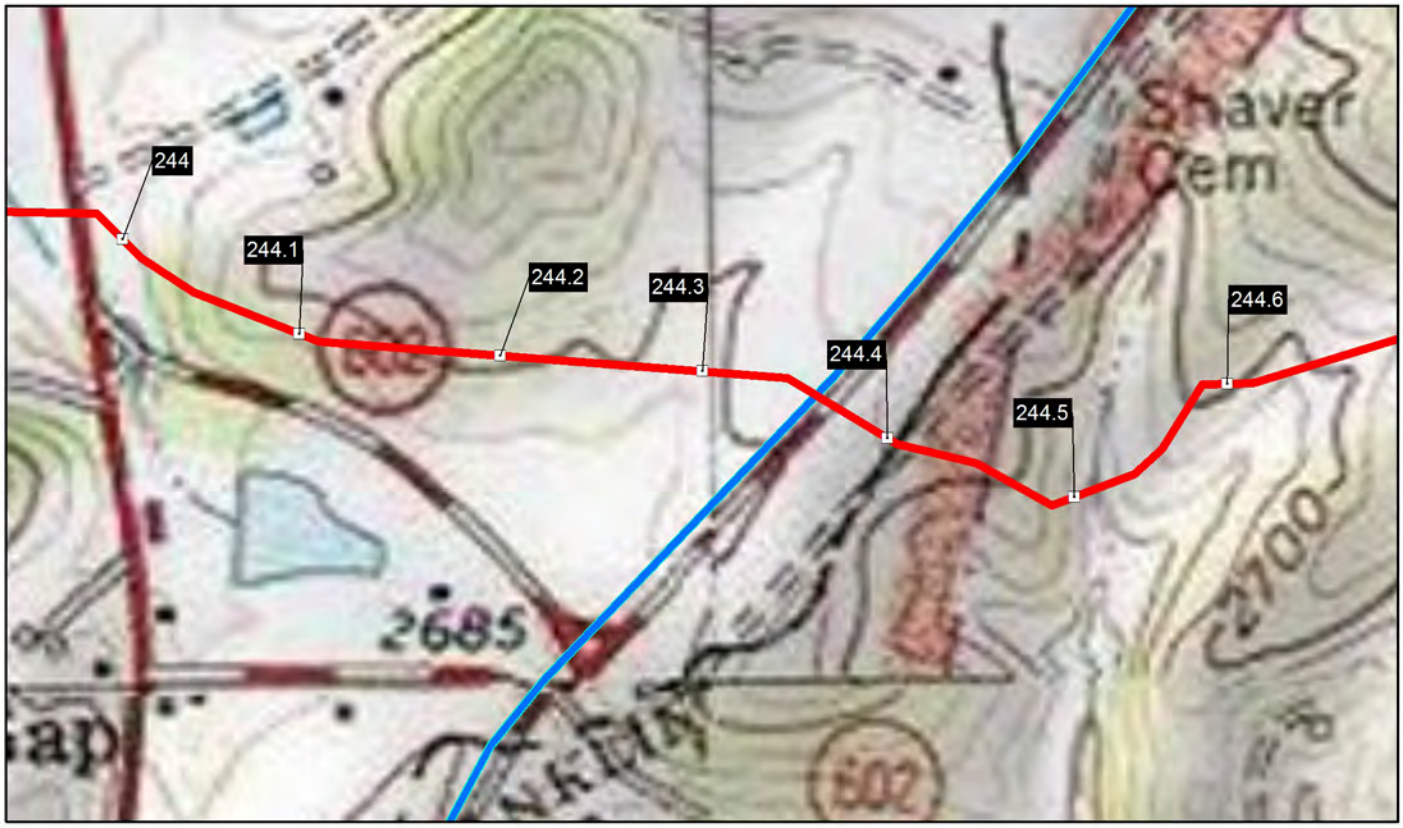
Docket No. CP16-__-000

Resource Report 10

Appendix 10-C
Blue Ridge Parkway Crossing Alternatives Maps

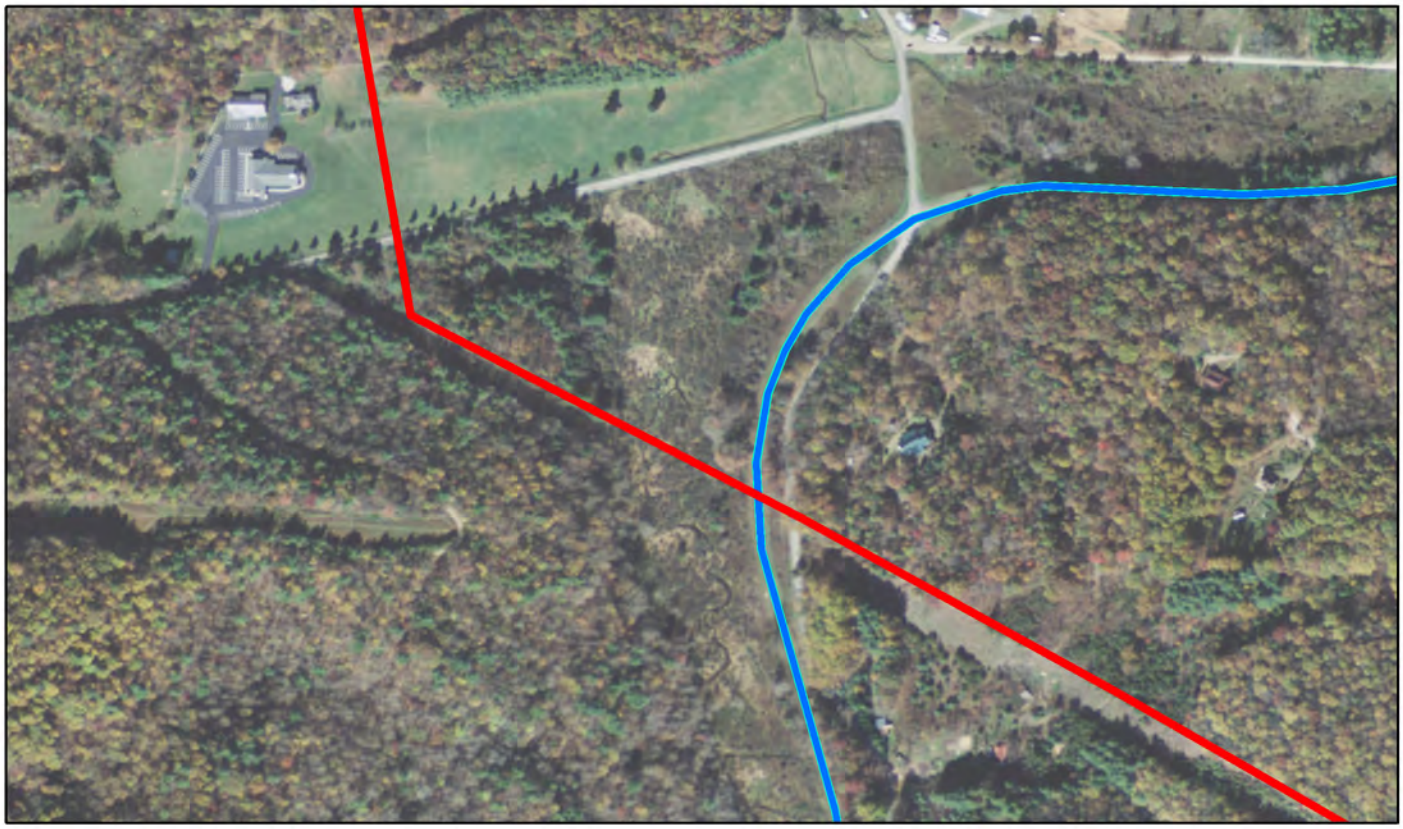
Proposed Route Blue Ridge Parkway Crossing

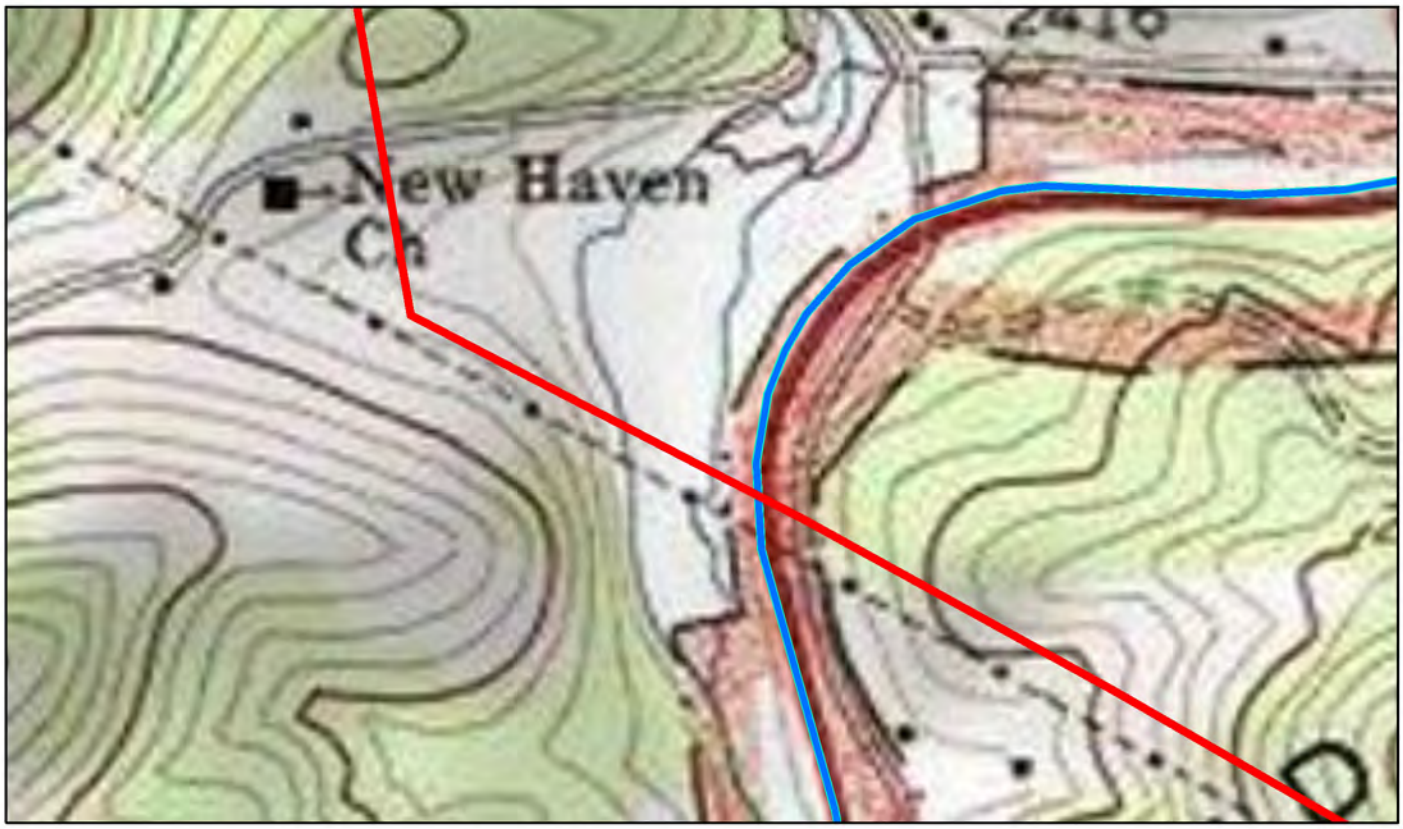




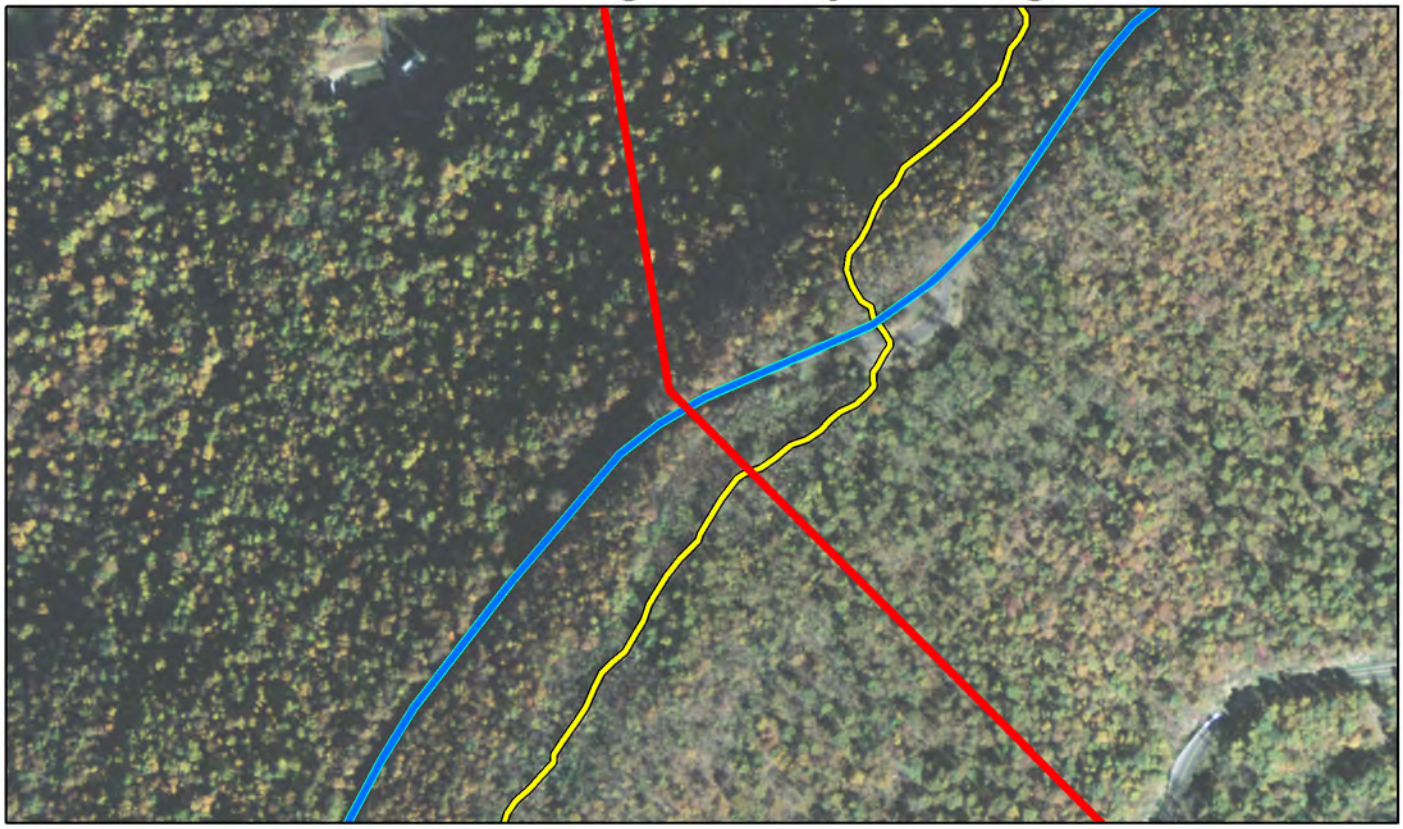
Blue Ridge Scenic Parkway at Proposed Route Crossing Location

Route Alternative 1 Blue Ridge Parkway Crossing





Northern Pipeline Alternative Appalachian Trail and Blue Ridge Parkway Crossing



0 250 500 1,000
Feet

N
W E
S

Mountain Valley Pipeline Project

Docket No. CP16-__-000

Resource Report 10

Appendix 10-D
Minor Route Modifications Incorporated into Proposed Route

Table 10-D-1

Minor Route Modifications Incorporated into the April 2015 Pipeline Route a/

MP	Description of Change	Reason for Change
0.2	Shift east 140 feet	Eliminate side hill construction
0.4	Shift east 200 feet	Eliminate side hill construction
11.3	Shift north 100 feet at crossing of Big Elk Road	Better road crossing due to steep slope
11.55	Shift north 220 feet	Eliminate side hill construction
12.1-12.5	Shift east 80 at crossing of Goose Run Road, and up to 150 feet east south of road crossing.	Constructability
15.5	Shift west 250 feet	Better stream, road, and railroad crossing to eliminate side hill construction
15.7	Shift south 300 feet	Eliminate side hill construction
21.0	Shift south 350 feet	Eliminate side hill construction
23.2	Shift west 200 feet	Aligned for a more perpendicular stream crossing and reduced steep slope
25.9-26.0	Shift east 50 feet at crossing of Highway 50.	Elimination of Route 50 Road Bore
28.85	Shift South 80 feet	Eliminate side hill construction
30.1-30.2	Shift west 100 feet at Halls Run Road and south	Winch hill constructability
32.2-32.9	Shift East including crossings of Turtletree Fork Road at MP 32.45 (150 feet) and MP 32.8 (200 feet)	Eliminate side hill construction
33.95	Shift east 200 feet.	Eliminate side hill construction
34.0-34.7	Shift west, up to 650 feet, including crossing of Meathouse Fork Rd.	Shift to avoid existing natural gas drilling operations
37.7	Shift west 180 feet	Better road crossing location
43.85-44.05	Shift west 60 feet to west side of Fawn Hill Road	Eliminate side hill construction
44.4	Shift East 70 feet, including crossing of Freemans Creek Road and Fink Creek	Aligned for a more perpendicular stream crossings
44.55	Shift west 120 feet	Eliminate side hill construction
45.9	Shift west 180 feet	Eliminate side hill construction
46.2	Shift east 90 feet, including crossing of unnamed road	Eliminate side hill construction
47.55	Shift east 170 feet, including crossing of Route 33	Shift to create less impacts to landowner drive and approach to Route 33
52.1	Shift east 160 feet	Eliminate side hill construction
52.8-53.0	Shift east up to 120 feet	Eliminate side hill construction
57.1	Shift west 300 feet	Eliminates steep peak construction and places pipe on a natural bench below
67.0-68.1	Shift west up to 1,800 feet	Route shifted to accommodate current pipeline construction
69.05	Shift east 460 feet, including crossing of Left Fork Knawls Creek Road	Aligned for a more perpendicular stream crossing and approach to steep hill
71.0	Shift west 500 feet	Eliminates 90 degree bends
72.7	Shift west 600 feet	Eliminate side hill construction and 90 degree bends

Table 10-D-1

Minor Route Modifications Incorporated into the April 2015 Pipeline Route a/

MP	Description of Change	Reason for Change
73.9	Shift west 530 feet	Eliminate side hill construction
75.35	Shift west 280 feet	Shifted for constructability and to miss cemetery
80.2	Shift west 550 feet	Improve constructability on steep slopes
81.0-81.35	Shift east up to 400 feet, including crossing of Vic Lunceford Road-Mollohan Ridge	Eliminates steep slope construction
82.4-82.9	Shift east up to 250 feet, including crossing of Cowger Hill Road	Eliminates 90 degree turns in pipeline
84.0-85.0	Shift west up to 1,500 feet, including crossing of Route 15	Moves away from residences and improves constructability
87.7	Shift west 150 feet, including crossing of Elk River	Aligned for a more perpendicular stream crossing and approach to steep hill
92.75	Shift east 360 feet, including crossing of waterbody	Aligned for a more perpendicular stream crossing and eliminated two 90 degree bends
97.8-98.2	Shift east up to 220 feet, including crossing of Route 28	Constructability
102.2	Shift north 470 feet	Avoidance of drainage area and potential slip
104.55	Shift west 140 feet	Reduce side cut and disturbance of drainage
106.05	Shift west 190 feet, including crossing of Meadow Fork Road	Eliminates side cut and damage to Meadow Fork Road
106.2	Shift east 300 feet, including two crossings of John Goff Road	Eliminates side cut and damage to John Goff Road
109.25-109.65	Shift west up to 580 feet	Eliminates construction on steep slopes
109.85	Shift east 100 feet	Eliminates side hill construction
110.9	Shift north 300 feet	Eliminates side hill construction
111.0-111.45	Shift east up to 260 feet	Moves away from existing ponds
111.6	Shift west 360 feet	Improve constructability on steep slopes
111.95	Shift north 260 feet	Eliminates side hill construction
112.85-113.5	Shift south up to 650 feet	Moved away from existing pond and less tree clearing
115.2	Shift west 250 feet	Eliminates side hill construction
115.55-115.85	Shift west up to 200 feet	Eliminates side hill construction
116.25-117.0	Shift east up to 950 feet	Eliminates side hill construction
119.45	Shift west 280 feet	Eliminates side hill construction
121.85-122.6	Shift east up to 320 feet including crossing of Canvas Nettie Road/Route 39	Moves Pipeline further from residential area and eliminates construction on side slope
124.95	Shift east400 feet, including crossing of Odell Town Road	Eliminates side hill construction
125.2	Shift west 470 feet	Eliminates side hill construction
125.6-126.1	Shift west up to 680 feet	Eliminates side hill construction
126.2	Shift east 380 feet	Eliminates side hill construction

Table 10-D-1

Minor Route Modifications Incorporated into the April 2015 Pipeline Route a/

MP	Description of Change	Reason for Change
126.95-127.45	Shift west up to 400 feet	Eliminates side hill construction
127.45-128.2	Shift east up to 520 feet	Eliminates side hill construction
128.2-128.95	Shift west up to 860 feet	Eliminates side hill construction
129.5-130.7	Shift west up to 560 feet, including crossing of Old Nicholas Road	Eliminates side hill construction
131.0-132.05	Shift west up to 950 feet, including crossing of Hominy Creek Road	Eliminates side hill construction, a 90 degree turn, decreases area of disturbance
132.05-132.8	Shift east up to 1,050 feet	Avoidance of keep off tracts
132.9-133.2	Shift east up to 680 feet, including crossings of Old Nicholas Road and Snowhill Road	Moves to the edge of land owners property
133.35-133.9	Shift west up to 250 feet, including crossings of Snowhill Road and Bamboo School Road	Eliminates side hill construction
134.5	Shift east 340 feet	Eliminates side hill construction
136.75	Shift south 320 feet, including crossings of Bamboo School Road and Angiins Creek Road	Keeps the pipeline on the ridge top rather than going up and over two hillsides
137.05	Shift north 150 feet	Avoidance of a residential area
137.7	Shift south 420 feet	Improve constructability on steep slopes
137.8-138.55	Shift west up to 300 feet	Eliminates side hill construction
140.2	Shift west 400 feet	Eliminates side hill construction
140.7-141.3	Shift west up to 850 feet, including crossing of Bingham Road	Avoidance of a residential area
143.1	Shift west 940 feet	Improve constructability on steep slopes
144.25	Shift west 240 feet	Improve constructability on steep slopes
146.3	Shift east 500 feet	Eliminates side hill construction
147.55-148.2	Shift east up to 600 feet	Eliminates side hill construction and moves away from existing pond
148.35	Shift west 200 feet	Moves away from existing pond
151.45	Shift west 230 feet	Improve constructability on steep slopes
152.2	Shift east 330 feet	Eliminates side hill construction
154.7	Shift east 220 feet, including crossing of Dawson Springdale Road/Route 29	Avoidance of low lying area
158.75-159.15	Shift west up to 270 feet	Move away from a residence
159.75-160.15	Shift east up to 160 feet	Eliminates side hill construction
162.75-164.35	Shift east up to 2,200 feet	Eliminates side hill construction
168.15-168.65	Shift west up to 730 feet	Improve constructability on steep slopes
169.6-170.05	Shift east up to 360 feet, including crossing of Clayton Road/Route 6	Improve constructability
170.35	Shift west 170 feet, including crossing of Route 3	Aligned for a more perpendicular stream crossing
170.7	Shift east 370 feet	Aligned for a more perpendicular stream crossing

Table 10-D-1

Minor Route Modifications Incorporated into the April 2015 Pipeline Route a/

MP	Description of Change	Reason for Change
172.2-173.3	Shift east up to 980 feet, including crossing of Lowell Road	Eliminates side hill construction
174.75-175.55	Shift east up to 700 feet	Minimizes tree clearing
178.9-179.55	Shift east up to 450 feet	Eliminates side hill construction
179.6-180.45	Shift west up to 520 feet	Eliminates side hill construction
181.3-181.7	Shift east up to 250 feet	Minimizes tree clearing
181.75-182.35	Shift west up to 450 feet	Eliminates side hill construction
185.6-186.6	Shift west up to 730 feet	Improve constructability on steep slopes
200.55	Shift west 320 feet, including crossing of Route 635	Eliminates side hill construction
201.95	Shift south 150 feet, including crossing of Hendrickson Road	Moved away from existing utility corridor due to construability concerns on steep slope
238.65-239.1	Shift north up to 550 feet, just south of crossing of Blue Ridge Parkway	Improve constructability and eliminates steep slopes
241.0	Shift south 170 feet	Move away from a residence
243.0	Shift north 780 feet	Eliminates side hill construction
252.85	Shift west 230 feet	Eliminates side hill construction
258.4-258.95	Shift north up to 220 feet	Eliminates side hill construction
258.95-259.35	Shift south up to 470 feet	Eliminates side hill construction and a 90 degree turn
260.3	Shift north 220 feet	Improve constructability on steep slopes and aligns the ROW for a more perpendicular stream crossing
261.1-261.7	Shift west up to 210 feet	Improve constructability on side slopes
262.0	Shift east 160 feet	Moved per landowner request
262.1	Shift west 330 feet	Moved per landowner request
263.65-264.4	Shift north up to 330 feet	Moved away from existing pond
265.8-266.6	Shift west up to 310 feet	Moved to the edge of an existing transmission line corridor
266.7-267.2	Shift north up to 800 feet	Moved per landowner request
267.35-268.2	Shift north up to 260 feet	Minimizes tree clearing and improve constructability
268.55	Shift north 150 feet	Improve constructability
269.0-269.5	Shift north up to 110 feet, including crossings of Jacks Creek Road and Holliday Lane	Improve constructability within transmission line corridor
269.85-270.3	Shift north up to 130 feet	Improve constructability within transmission line corridor
271.45	Shift south 30 feet	Improve constructability due to steep slope
274.65-275.0	Shift south up to 230 feet	Move further from landowner's pond
276.2-276.5	Shift north up to 280 feet	Move away from a residence
276.55	Shift south 100 feet	Move away from existing ponds
279.0-280.45	Shift south up to 370 feet	Eliminates side hill construction

Table 10-D-1

Minor Route Modifications Incorporated into the April 2015 Pipeline Route a/

MP	Description of Change	Reason for Change
280.6	Shift north 100 feet	Eliminates side hill construction
281.4	Shift north 110 feet	Eliminates side hill construction
281.9	Shift north 100 feet at crossing of Snowberry Road	Eliminates side hill construction
283.25-283.8	Shift north up to 210 feet	Move away from a residence
284.2	Shift south 80 feet at crossing of Climax Road	Move away from a residence
284.45	Shift north 140 feet	Improve constructability in clear cut area and get away from existing pond
288.8-289.15	Shift north and east up to 150 feet	Moved per landowner request
289.3	Shift north 110 feet, including crossings of railroad tracks and Dual Track Road	Constructability for railroad bore
290.9-291.5	Shift south up to 160 feet	Eliminates side hill construction
291.65-294.1	Shift east up to 400 feet, including crossing of Chalk Level Road	Move away from existing pond

a/ Includes changes from the pipeline route filed with FERC on December 1, 2014. Does not include minor adjustments (generally shifts less than 50-100 feet) made in open country and ridge tops to account for topography.

Table 10-D-2 Minor Route Modifications Incorporated into the Proposed Route a/		
MP	**Description of Change**	**Reason for Change**
0.0	Shift East 120 feet	To meet the Mobley Interconnect
7.8 - 8.1	Shift Northeast up to 300 feet	Landowner requested
10.85	Shift Northeast 22 feet	Improved constructability based on topography and contours
10.98	Shift West 24 feet	Improved constructability based on topography and contours
11.05	Shift East 24 feet	Improved constructability based on topography and contours
11.15	Shift Southwest 41 feet	Improved constructability based on topography and contours
11.25	Shift Northeast 10 feet	Improved constructability based on topography and contours
11.29	Shift Southwest 30 feet	Landowner requested reroute
11.31	Shift Northeast 25 feet	Landowner requested reroute
13.8 - 14.2	Shift East up to 46 feet	Improved constructability based on topography and contours
14.23 – 14.4	Shift Northeast up to 70 feet	Eliminates side hill construction
21 – 21.25	Shift Southeast 50 feet	Improved constructability based on topography and contours
21.3	Shift West 80 feet	Improved constructability based on topography and contours
21.4 – 21.65	Shift East up to 65 feet	Landowner requested reroute
22.7	Shift East 25 feet	Improved constructability based on topography and contours
22.8	Shift West 40 feet	Improved constructability based on topography and contours
22.95	Shift East 40 feet	Improved constructability based on topography and contours
24.75	Shift West 375 feet	Avoidance of stream
26.15	Shift Southwest 40 feet	Improved constructability based on topography and contours
26.21	Shift East 20 feet	Improved constructability based on topography and contours
26.25	Shift West 20 feet	Improved constructability based on topography and contours
26.29	Shift West 20 feet	Improved constructability based on topography and contours
28.99	Shift Northwest 80 feet	Avoidance of existing structures
29.65 – 30.67	Shift East up to1600 feet	Eliminates side hill construction and Avoidance of streams and wetland features, avoidance of historic feature
30.69	Shift Southeast 44 feet	Improved constructability based on topography and contours
31.35	Shift East 50 feet	Landowner requested reroute and Avoidance of pond
42.75	Shift West 110 feet	Improved constructability based on topography and contours

Table 10-D-2 Minor Route Modifications Incorporated into the Proposed Route a/		
MP	**Description of Change**	**Reason for Change**
42.95	Shift East 40 feet	Improved constructability based on topography and contours
43	Shift Northwest 30 feet	Improved constructability based on topography and contours
43.05	Shift West 24 feet	Improved constructability based on topography and contours
43.3	Shift East 70 feet	Improved constructability based on topography and contours and Reduction of impact to stream and wetland features
43.4 – 43.6	Shift East 275 feet	Avoid foreign pipeline crossing
46.4 – 46.7	Shift West 275 feet	Avoid foreign pipeline crossing, Avoidance of rock cliff, and Landowner Requested Reroute
46.75	Shift East 20 feet	Improved constructability based on topography and contours
46.78	Shift West 10 feet	Improved constructability based on topography and contours
46.8	Shift East 10 feet	Improved constructability based on topography and contours
46.85	Shift West 40 feet	Avoidance of steep rock cliffs/steep terrain
46.85 - 47	Shift East up to 120 feet	Avoidance of steep rock cliffs/steep terrain
47.3 – 47.45	Shift West 35 feet	Improved constructability based on topography and contours
47.45 – 47.59	Shift East up to 25 feet	Improved constructability based on topography and contours
47.65	Shift West 90 feet	Improved constructability based on topography and contours, Avoidance of stream crossing
47.7 – 47.9	Shift West up to 40 feet	Improved constructability based on topography and contours
48.15	Shift West 70 feet	Improved constructability based on topography and contours
48.69	Shift West 35 feet	Improved constructability based on topography and contours
50.85 – 51.3	Shift West up to 350 feet	Improved constructability based on topography and contours
51.3 – 51.45	Shift East 65 feet	Improved constructability based on topography and contours
51.5 – 51.6	Shift West 60 feet	Improved constructability based on topography and contours
52.55	Shift West 45 feet	Eliminates point of intersection
54.75	Shift East 30 feet	Improved constructability based on topography and contours
57.6 – 58.2	Shift East 20 feet	Improved constructability based on topography and contours
58.7	Shift West 20 feet	Avoidance of stream and wetland features
58.79	Shift East 20 feet	Improved constructability based on topography and contours, avoidance of steep rock cliff
59.35	Shift East 160 feet	Eliminates side hill construction
60.2	Shift East 20 feet	Improved constructability for Interstate bore crossing

Table 10-D-2 Minor Route Modifications Incorporated into the Proposed Route a/		
MP	**Description of Change**	**Reason for Change**
60.25	Shift East 15 feet	Improved constructability for Interstate bore crossing
60.4	Shift West 55 feet	Avoidance of wetland feature, Improved constructability for road crossing, Improved constructability based on topography and contours
60.41 – 60.6	Shift East up to 50 feet	Improved constructability for road crossing
61 – 63.1	Shift East up to 1750 feet	Landowner requested reroute
63.55	Shift Southwest 100 feet	Eliminates side hill construction
64	Shift East 30 feet	Improved constructability based on topography and contours
64.95	Shift East 160 feet	Improved constructability based on topography and contours
65.01 – 65.3	Shift West up to 80 feet	Eliminates side hill construction/Keeps pipeline centered on ridgetop
65.35	Shift Northeast 30 feet	Improved constructability based on topography and contours
65.5	Shift Southwest 140 feet	Improved constructability based on topography and contours, improved railroad crossing, avoid drainage features
66.54	Shift Southwest 28 feet	Improved constructability based on topography and contours
66.75	Shift West 40 feet	Eliminates side hill construction
67.0	Shift West 90 feet	Minimizes impact to the Weston Gauley Trail
68.8	Shift West 65 feet	Improved constructability based on topography and contours, minimize stream impact
68.99 – 69.31	Shift West up to 750 feet	Landowner requested reroute
69.31 – 69.57	Shift East up to 400 feet	Landowner requested reroute
69.6 – 72.15	Shift West up to 3060 feet	Avoid foreign pipeline crossing
73.45	Shift West 60 feet	Improved constructability based on topography and contours
73.85	Shift East 60 feet	Improved constructability based on topography and contours
74.01	Shift East 30 feet	Improved constructability based on topography and contours
74.11	Shift Southwest 38 feet	Improved constructability at stream crossing
74.17	Shift Northeast 30 feet	Improved constructability based on topography and contours
74.22	Shift East 20 feet	Improved constructability based on topography and contours
74.3	Shift East 27 feet	Improved constructability based on topography and contours
74.8	Shift West 54 feet	Avoidance of rock shelter
80.09	Shift Northeast 194 feet	Eliminates side hill construction
80.25	Shift Northeast 53 feet	Eliminates side hill construction
80.31	Shift Southwest 30 feet	Eliminates side hill construction
80.43	Shift East 112 feet	Eliminates side hill construction

Table 10-D-2 Minor Route Modifications Incorporated into the Proposed Route a/		
MP	**Description of Change**	**Reason for Change**
80.48 - 80.68	Shift West up to 55 feet	Improved constructability based on topography and contours, avoids steep slope
80.75	Shift West 50 feet	Improved constructability for road crossing and landowner requested reroute
80.85	Shift East 27 feet	Landowner requested reroute and Avoidance of wetland feature
80.91	Shift West 41 feet	Landowner requested reroute
80.95	Shift East 100 feet	Landowner requested reroute
81 – 81.1	Shift West 54 feet	Landowner requested reroute
81.6 – 81.7	Shift West up to 35 feet	Improved constructability and Improved stream crossing
81.7 – 82.25	Shift East up to 590 feet	Improved constructability and Avoidance of several stream and wetland features
82.3 – 82.5	Shift West 310 feet	Avoidance of stream and wetland features
82.6 – 82.8	Shift West up to 36 feet	Avoidance of stream and wetland features
83	Shift East 160 feet	Eliminates side hill construction
83.06	Shift West 30 feet	Improved constructability based on topography and contours
83.2	Shift East 46 feet	Improved constructability based on topography and contours
86.6	Shift East 65 feet	Eliminates point of intersection
89.38	Shift East 35 feet	Eliminates point of intersection
90.62	Shift West 50 feet	Eliminates point of intersection
92.3 – 92.5	Shift East 210 feet	Eliminates side hill construction/Improves wench hill construction
96.22	Shift West 51 feet	Eliminates point of intersection
98.15	Shift East 70 feet	Eliminates side hill construction/Improves wench hill construction
98.5	Shift Southwest 200 feet	Eliminates point of intersection
104.45 – 104.7	Shift East up to 395 feet	Landowner requested reroute
105.75	Shift East 90 feet	Improved constructability based on topography and contours
106.9 – 107	Shift Southeast up to 28 feet	Improved constructability based on topography and contours
107 - 107.15	Shift Southeast 65 feet	Improved constructability based on topography and contours
107.2 - 107.3	Shift East up to 35 feet	Improved constructability based on topography and contours
111.35 – 111.9	Shift West up to 1180 feet	Landowner requested reroute
113.05 – 114.3	Shift Southeast up to 1050 feet	Landowner requested reroute and Avoidance of numerous stream, wetland and pond features
114.4 – 114.8	Shift East up to 270 feet	Landowner requested reroute and Reduction of impact to stream and wetland features
115.2	Shift East up to 90 feet	Improved constructability based on topography and contours

Table 10-D-2

Minor Route Modifications Incorporated into the Proposed Route a/

MP	Description of Change	Reason for Change
115.3	Shift East 125 feet	Improved constructability based on topography and contours
115.8	Shift West 75 feet	Improved wench hill constructability
115.9	Shift East 290 feet	Improved wench hill constructability and Avoidance of stream features
122.1 – 122.6	Shift East 250 feet	Improved constructability based on topography and contours
123.8	Shift East 87 feet	Improved constructability based on topography and contours
123.9 – 124.2	Shift West up to 480 feet	Eliminates side hill construction
127.55 – 127.9	Shift East up to 470 feet	Improved constructability based on topography and contours on slopes and road crossing and eliminates stream and drainage feature crossings
128	Shift West 65 feet	Reduction in side hill constructability
128.55	Shift East 30 feet	Improved wench hill constructability
129.65 - 129.81	Shift West up to 135 feet	Eliminates side hill construction
132.7	Shift Southwest 120 feet	Eliminates point of intersection and avoids of sensitive site
137.3 – 137.43	Shift East up to 110 feet	Avoidance of stream and wetland features
139.4	Shift East 100 feet	Eliminates point of intersection
140.45	Shift Northwest 78 feet	Eliminates point of intersection and moves centerline away from road
141.35	Shift East 73 feet	Eliminates point of intersection
141.48	Shift East 120 feet	Eliminates point of intersection
141.75	Shift East 38 feet	Eliminates point of intersection
141.8	Shift East 99 feet	Eliminates point of intersection
142.75	Shift West 95 feet	Eliminates point of intersection
142.9	Shift Southwest 20 feet	Eliminates point of intersection
142.95	Shift Southwest 22 feet	Eliminates point of intersection
143.05	Shift East 104 feet	Eliminates side hill construction
143.4	Shift East up to 206 feet	Eliminates point of intersection
143.8	Shift East 212 feet	Avoidance of proposed recreational facility
144.05	Shift Southwest 143 feet	Improved constructability based on topography and contours
144.25 – 145.75	Shift East 1040 feet	Improved constructability based on topography and contours and landowner reroute
145.75 – 146	Shift West up to 50 feet	Avoidance of wetland features
146.35	Shift East 40 feet	Improved constructability based on topography and contours
146.5 – 146.65	Shift East up to 70 feet	Improved constructability based on topography and contours
147.2	Shift East 46 feet	Improved constructability based on topography and contours

Table 10-D-2 Minor Route Modifications Incorporated into the Proposed Route a/		
MP	**Description of Change**	**Reason for Change**
147.25	Shift West 36 feet	Improved constructability based on topography and contours
147.8	Shift East 28 feet	Improved constructability based on topography and contours
148.5	Shift West up to 150 feet	Eliminates side hill construction
148.7 – 149.2	Shift West up to 550 feet	Avoidance of streams
149.9 – 150.55	Shift East up to 707 feet	Eliminates side hill construction
150.6	Shift West 71 feet	Eliminates side hill construction
150.7	Shift East 140 feet	Eliminates side hill construction
150.8	Shift West 107 feet	Eliminates side hill construction
151.05	Shift East 80 feet	Eliminates side hill construction
151.1	Shift West 36 feet	Eliminates side hill construction
153.6	Shift East up to 45 feet	Eliminates side hill construction
154.45	Shift West 175 feet	Improved constructability based on topography and contours for road crossing and reduction of impact to stream and wetland features
154.6 – 154.8	Shift West up to 118 feet	Improved constructability based on topography and contours for road crossing
154.9	Shift East 80 feet	Improved constructability based on topography and contours
155.0 – 155.55	Shift West up to 413 feet	Improved constructability based on topography and contours
155.59	Shift East 91 feet	Improved constructability based on topography and contours
155.65	Shift West 44 feet	Improved constructability based on topography and contours
155.8	Shift East up to 368 feet	Avoidance of pond feature
156.25	Shift West 50 feet	Improved constructability based on topography and contours
156.35	Shift East up to 79 feet	Improved constructability for Interstate bore crossing
157.2	Shift West up to 387 feet	Eliminates side hill construction
157.65	Shift East up to 207 feet	Eliminates side hill construction
157.8	Shift West 59 feet	Eliminates side hill construction
158.0	Shift West up to 133 feet	Eliminates side hill construction
158.2 – 158.4	Shift West up to 200 feet	Eliminates side hill construction
158.4 – 158.75	Shift West up to 640 feet	Eliminates side hill construction
160.8	Shift East 98 feet	Eliminates side hill construction
162.8	Shift West 48 feet	Improved constructability based on topography and contours
163.0	Shift Northeast 41 feet	Improved constructability based on topography and contours
164.4	Shift East 65 feet	Improved constructability based on topography and contours

Table 10-D-2 Minor Route Modifications Incorporated into the Proposed Route a/		
MP	**Description of Change**	**Reason for Change**
164.5	Shift West up to 565 feet	Improved constructability based on topography and contours
164.9	Shift East up to 225 feet	Eliminates side hill construction
165.1	Shift West up to 159 feet	Eliminates side hill construction
165.2	Shift East 24 feet	Eliminates side hill construction
165.3	Shift West up to 58 feet	Eliminates side hill construction
165.5	Shift West 25 feet	Eliminates side hill construction
165.8	Shift East 22 feet	Eliminates side hill construction
166.0	Shift East up to 45 feet	Eliminates side hill construction
166.35	Shift West 38 feet	Eliminates side hill construction
166.4	Shift East 33 feet	Improved constructability based on topography and contours
166.45	Shift West 112 feet	Improved constructability based on topography and contours
168.1	Shift Northeast 89 feet	Eliminates side hill construction
170.1	Shift East up to 95 feet	Improved constructability based on topography and contours
170.3	Shift East up to 70 feet	Improved constructability based on topography and contours
170.5	Shift East up to 134 feet	Improved constructability for road crossing
171.1	Shift East 29 feet	Improved constructability based on topography and contours
172.9	Shift East 30 feet	Improved constructability based on topography and contours
173.8	Shift East 42 feet	Improved constructability based on topography and contours
173.9	Shift East 29 feet	Improved constructability based on topography and contours
174.4	Shift East 32 feet	Improved constructability based on topography and contours
175.0	Shift East 68 feet	Eliminates point of intersection
178.2	Shift Northwest 44 feet	Improved constructability for road crossing
178.8	Shift West up to 56 feet	Improved constructability for road crossing
179.25	Shift West 48 feet	Improved constructability based on topography and contours
184.7	Shift West up to 176 feet	Improved constructability based on topography and contours
184.9	Shift West up to 118 feet	Improved constructability based on topography and contours
185.1	Shift East 29 feet	Improved constructability based on topography and contours
185.2	Shift West 41 feet	Improved constructability based on topography and contours

Table 10-D-2 Minor Route Modifications Incorporated into the Proposed Route a/		
MP	**Description of Change**	**Reason for Change**
185.9	Shift East up to 751 feet	Improved constructability based on topography and contours
186.5	Shift Southwest up to 269 feet	Improved constructability based on topography and contours
186.9	Shift East up to 285 feet	Improved constructability based on topography and contours
187.4	Shift East up to 257 feet	Improved constructability based on topography and contours
187.6	Shift East up to 279 feet	Improved constructability based on topography and contours
187.9	Shift West 69 feet	Improved constructability based on topography and contours
188.1	Shift West up to 278 feet	Improved constructability based on topography and contours
188.3	Shift East up to 120 feet	Improved constructability based on topography and contours
188.4	Shift East up to 86 feet	Improved constructability based on topography and contours
188.6 – 188.9	Shift West up to 84 feet	Improved constructability based on topography and contours
188.9 – 189.2	Shift West up to 274 feet	Improved constructability based on topography and contours
189.3	Shift West up to 47 feet	Improved constructability based on topography and contours
189.5	Shift East 110 feet	Improved constructability based on topography and contours
189.65	Shift West up to 84 feet	Improved constructability based on topography and contours
189.75	Shift East 68 feet	Improved constructability based on topography and contours
189.8	Shift West up to 255 feet	Improved constructability based on topography and contours
190.0 – 190.25	Shift East up to 220 feet	Improved constructability based on topography and contours
190.3	Shift West up to 52 feet	Improved constructability based on topography and contours
190.6	Shift West up to 374 feet	Improved constructability based on topography and contours
190.8	Shift West up to 26 feet	Improved constructability based on topography and contours
191.1	Shift West up to 180 feet	Improved constructability based on topography and contours
191.3	Shift East up to 48 feet	Improved constructability based on topography and contours
191.4	Shift West 65 feet	Improved constructability based on topography and contours
191.5	Shift East 49 feet	Improved constructability based on topography and contours
191.55	Shift West 55 feet	Improved constructability based on topography and contours

Table 10-D-2 Minor Route Modifications Incorporated into the Proposed Route a/		
MP	**Description of Change**	**Reason for Change**
191.7	Shift East up to 70 feet	Improved constructability based on topography and contours
191.8	Shift West 30 feet	Improved constructability based on topography and contours
191.9	Shift Southeast up to 161 feet	Eliminates side hill construction
192.1	Shift West 37 feet	Eliminates side hill construction
192.2	Shift East up to 90 feet	Eliminates side hill construction
192.35	Shift West up to 40 feet	Eliminates side hill construction
192.55	Shift Southeast 56 feet	Eliminates side hill construction
192.6	Shift Northwest up to 177 feet	Eliminates side hill construction
192.9	Shift Southeast up to 91 feet	Eliminates side hill construction
193.0	Shift Northwest 66 feet	Eliminates side hill construction
193.1	Shift Southeast 51 feet	Eliminates side hill construction
193.2	Shift Northwest up to 74 feet	Eliminates side hill construction
193.3	Shift East 60 feet	Eliminates side hill construction
193.4	Shift West up to 57 feet	Eliminates side hill construction
193.6 – 193.9	Shift West up to 391 feet	Eliminates side hill construction
194.3 – 197.0	Shift East up to 1300 feet	Avoid karst features
197.15	Shift East up to 232 feet	Improved constructability based on topography and contours
197.4	Shift West up to 335 feet	Improved constructability based on topography and contours
197.6	Shift West 116 feet	Improved constructability based on topography and contours
197.7	Shift East 46 feet	Improved constructability based on topography and contours
197.8	Shift West up to 100 feet	Improved constructability based on topography and contours
198.0	Shift West 75 feet	Eliminates side hill construction
198.5	Shift West 206 feet	Improved constructability for road crossing
198.85	Shift West 60 feet	Eliminates side hill construction
198.9	Shift East up to 494 feet	Eliminates side hill construction
199.35	Shift East 52 feet	Improved constructability based on topography and contours
199.53	Shift West 18 feet	Improved constructability based on topography and contours
199.59	Shift West 17 feet	Improved constructability based on topography and contours
199.8	Shift West 22 feet	Improved constructability based on topography and contours
199.95	Shift West 25 feet	Improved constructability based on topography and contours

Table 10-D-2

Minor Route Modifications Incorporated into the Proposed Route a/

MP	Description of Change	Reason for Change
200.18	Shift Southwest 17 feet	Improved constructability based on topography and contours
200.35	Shift Southwest 20 feet	Improved constructability based on topography and contours
200.6	Shift Southwest 16 feet	Improved constructability based on topography and contours
200.68	Shift Northeast 20 feet	Improved constructability based on topography and contours
200.8	Shift East 62 feet	Improved constructability based on topography and contours
200.83	Shift East 19 feet	Improved constructability based on topography and contours
200.9	Shift West 12 feet	Improved constructability based on topography and contours
201.0 – 201.6	Shift Southwest up to 161 feet	Improved constructability based on topography and contours
201.6 – 201.95	Shift Northeast up to 378 feet	Eliminates side hill construction
201.99	Shift Southwest 42 feet	Eliminates side hill construction
202.0	Shift Northeast 30 feet	Eliminates side hill construction
202.1 – 202.3	Shift Southwest up to 70 feet	Eliminates side hill construction
202.35 – 202.55	Shift Southwest up to 320 feet	Improved constructability based on topography and contours
202.6 – 202.8	Shift Northeast up to 130 feet	Improved constructability based on topography and contours
203.0	Shift Northeast up to 514 feet	Improved constructability based on topography and contours
203.4 – 203.9	Shift Southwest up to 147 feet	Improved constructability based on topography and contours
204.1	Shift Northeast 147 feet	Eliminates side hill construction, Avoidance of karst feature, and Eliminates two drain crossings
204.1 – 204.95	Shift West up to 98 feet	Improved constructability based on topography and contours
204.95 – 205.65	Shift Northeast up to 658 feet	Improved constructability based on topography and contours
205.65 – 207.0	Shift South up to 219 feet	Improved constructability based on topography and contours
207.0 – 207.59	Shift Northeast 159 feet	Improved constructability based on topography and contours
207.6 – 209.6	Shift Southwest up to 1850 feet	Avoidance of karst features
209.6 – 213.1	Shift Southwest up to 3707 feet	avoid constructability issues relating to encroachment on AEP Transmission Line right-of-way, several areas of karst topography with known sinkholes and caves, construction near residential homes and private water wells
213.1 – 221.8	Shift Northeast up to 14,441 feet	avoid constructability issues relating to encroachment on AEP Transmission Line right-of-way, several areas of karst topography with known sinkholes and caves, construction near residential homes and private water wells

Table 10-D-2

Minor Route Modifications Incorporated into the Proposed Route a/

MP	Description of Change	Reason for Change
221.9	Shift Southwest 276 feet	Improved constructability based on topography and contours
222.75	Shift Northeast 94 feet	Improved constructability based on topography and contours
222.9	Shift Southwest 231 feet	Improved constructability based on topography and contours
223.55	Shift Southwest 489 feet	Avoidance of karst feature
223.8 – 225.3	Shift Northeast up to 257 feet	Improved constructability based on topography and contours
225.4	Shift Southwest 316 feet	Improved constructability based on topography and contours
225.7	Shift Northeast 357 feet	Improved constructability based on topography and contours
225.9 – 226.2	Shift West up to 169 feet	Improved constructability based on topography and contours
226.2 – 226.79	Shift East up to 249 feet	Improved constructability based on topography and contours
226.8 – 227.5	Shift Southwest up to 676 feet	Improved constructability based on topography and contours
227.55 – 229.0	Shift Northeast up to 186 feet	Improved constructability based on topography and contours and Avoidance of wetland, stream and pond features
229.05 – 229.45	Shift Southwest up to 388 feet	Avoidance of stream crossing
229.5	Shift Southwest 61 feet	Improved constructability based on topography and contours
229.7	Shift Southwest 50 feet	Improved constructability based on topography and contours
229.8 – 230.05	Shift Southwest up to 134 feet	Eliminates side hill construction
230.1	Shift Northeast 53 feet	Eliminates side hill construction
230.25 – 230.6	Shift Southwest up to 71 feet	Eliminates side hill construction
230.65	Shift Northeast 29 feet	Eliminates side hill construction
230.65 – 230.9	Shift Southwest up to 86 feet	Eliminates side hill construction
231.0	Shift Northeast 75 feet	Eliminates side hill construction
231.1	Shift Southwest 51 feet	Eliminates side hill construction
231.15 – 231.45	Shift Southwest up to 153 feet	Eliminates side hill construction
231.6	Shift Southwest 60 feet	Eliminates side hill construction
231.8	Shift Northeast 35 feet	Eliminates side hill construction
231.9 – 232.6	Shift East up to 1109 feet	Reduction of impact to Virginia Outdoors Foundation Conservation easement
232.7	Shift East 95 feet	Improved constructability based on topography and contours
232.9	Shift Southwest 113 feet	Improved constructability based on topography and contours
233.0	Shift Northeast 53 feet	Improved constructability based on topography and contours

Table 10-D-2 Minor Route Modifications Incorporated into the Proposed Route a/		
MP	**Description of Change**	**Reason for Change**
233.1	Shift Southwest 156 feet	Improved constructability based on topography and contours
233.65	Shift West 100 feet	Improved constructability based on topography and contours
233.95	Shift West 89 feet	Improved constructability based on topography and contours
234.0 – 239.6	Shift West up to 3322 feet	Avoidance of Spring Hollow Reservoir and Camp Roanoke
239.65	Shift East 154 feet	Improved constructability based on topography and contours
239.85	Shift East 70 feet	Improved constructability based on topography and contours
240.0	Shift West 50 feet	Improved constructability based on topography and contours
240.1 – 240.3	Shift East up to 45 feet	Improved constructability based on topography and contours
240.3 – 241.5	Shift West up to 823 feet	Eliminates impact to Blue Ridge Land Conservancy parcel
241.65	Shift East 240 feet	Improved constructability for road crossing
243.5	Shift West 215 feet	Improved constructability based on topography and contours
243.8	Shift Southwest 109 feet	Avoidance and reduction of stream and wetland features
244.05	Shift Southwest 53 feet	Improved constructability based on topography and contours
245.7	Shift Southwest up to 251 feet	Eliminates side hill construction
245.8	Shift Northeast 202 feet	Eliminates side hill construction
246.1	Shift East 541 feet	Eliminates side hill construction
246.3	Shift Northeast 122 feet	Eliminates side hill construction
247.2	Shift Southwest 50 feet	Reduction of wetland impact
247.5	Shift Northeast up to 254 feet	Improved constructability based on topography and contours
247.8	Shift Northeast 227 feet	Improved constructability based on topography and contours
247.9 – 256.3	Shift Southwest up to 2617 feet	Avoidance a water source treatment plant, improved constructability based on topography and contours, avoids crossing a rural historic district.
256.4	Shift East 351 feet	Improved constructability based on topography and contours
256.65	Shift East 66 feet	Improved constructability based on topography and contours
256.85	Shift Southwest 131 feet	Avoidance of streams and a wetland
256.9 – 257.7	Shift East up to 619 feet	Improved constructability based on topography and contours, and avoidance of existing structures
257.75	Shift West 147 feet	Improved constructability for road crossing
257.83	Shift Southwest 73 feet	Improved constructability for road crossing

Table 10-D-2

Minor Route Modifications Incorporated into the Proposed Route a/

MP	Description of Change	Reason for Change
258.0 – 258.3	Shift Southwest up to 399 feet	Avoidance of stream feature
258.55	Shift Southwest 111 feet	Improved constructability based on topography and contours
258.9	Shift Southwest 128 feet	Improved constructability based on topography and contours
259.1 – 259.3	Shift West 40 feet	Improved constructability based on topography and contours
259.5 – 259.7	Shift East 37 feet	Improved constructability based on topography and contours
259.8 – 260.4	Shift Northeast up to 480 feet	Eliminates side hill construction and stream crossing
260.55	Shift East 139 feet	Improved constructability for road crossing
260.65	Shift West 231 feet	Improved constructability for road crossing
260.8 – 261.8	Shift Northeast up to 1771 feet	Improved constructability for road crossing and avoidance of existing structures
262.0	Shift Northeast 237 feet	Landowner requested reroute
262.1	Shift Southwest 29 feet	Landowner requested reroute
262.25	Shift Northeast 83 feet	Landowner requested reroute
262.35	Shift Southwest 24 feet	Landowner requested reroute
262.4	Shift Southwest 25 feet	Landowner requested reroute
262.5 – 262.7	Shift East up to 30 feet	Improved constructability for road and stream crossings
263.0	Shift Southwest up to 354 feet	Improved constructability for road crossing and avoidance of existing structures
263.1	Shift West 108 feet	Improved constructability based on topography and contours
263.4	Shift West 201 feet	Improved constructability based on topography and contours
263.9	Shift Northeast 514 feet	avoidance of existing structures
264.1	Shift East 61 feet	avoidance of existing structures
264.2	Shift East 265 feet	Improved constructability based on topography and contours
264.3 – 264.8	Shift East up to 136 feet	Improved constructability based on topography and contours
264.9	Shift West 37 feet	Improved constructability based on topography and contours
265.15	Shift West 33 feet	Eliminates point of intersection
266.6	Shift East 38 feet	Eliminates point of intersection
266.9	Shift East 25 feet	Eliminates point of intersection
266.95	Shift West 25 feet	Eliminates point of intersection
267.0	Shift West 26 feet	Eliminates point of intersection
267.85	Shift East 37 feet	Eliminates point of intersection
268.4	Shift East 417 feet	Eliminates point of intersection

Table 10-D-2 Minor Route Modifications Incorporated into the Proposed Route a/		
MP	**Description of Change**	**Reason for Change**
268.65	Shift East 28 feet	avoidance of existing structures
268.85	Shift West 96 feet	avoidance of existing structures
268.9 – 269.3	Shift East up to 197 feet	Improved constructability for road crossing and reduction in stream impacts
269.3 – 269.9	Shift West up to 592 feet	Avoidance of wetland features and sensitive area
270.05	Shift East 40 feet	Eliminates point of intersection
270.8	Shift West 61 feet	Improved constructability for road crossing
271.6	Shift West 36 feet	Avoidance of wetland features
272.0	Shift West 30 feet	Improved constructability for road crossing
272.1 – 272.3	Shift East 48 feet	Improved constructability for road crossing
273.25	Shift West 36 feet	Improved constructability for road crossing
273.75	Shift East 38 feet	Avoidance of wetland and stream features
274.9	Shift East 59 feet	Eliminates point of intersection
275.02	Shift East 49 feet	Eliminates point of intersection
275.12	Shift East 38 feet	Eliminates point of intersection
275.21	Shift East 55 feet	Eliminates point of intersection
275.8	Shift East 29 feet	Eliminates point of intersection
275.9	Shift East 51 feet	Eliminates point of intersection
277.0	Shift East 136 feet	reduction of stream impacts
277.2	Shift West 69 feet	Improve constructability for stream crossing
277.35	Shift East 32 feet	Improved constructability for road crossing
277.7	Shift West 143 feet	Avoidance of sensitive areas
278.35	Shift East 63 feet	Eliminates point of intersection
278.7	Shift West 188 feet	Eliminates side hill construction and Improved constructability for road crossing
279.2	Shift West 40 feet	Improved constructability based on topography and contours
279.29	Shift West 45 feet	Improved constructability based on topography and contours
280.0	Shift West 21 feet	Straightening of GPS alignment/Eliminates unnecessary PI
280.7	Shift East 18 feet	Eliminates point of intersection
280.93	Shift West 29 feet	Eliminates point of intersection
280.96	Shift East 25 feet	Eliminates point of intersection
281.55	Shift East 22 feet	Eliminates point of intersection
281.6	Shift West 44 feet	Eliminates point of intersection
281.9	Shift East 58 feet	Eliminates point of intersection

Table 10-D-2 Minor Route Modifications Incorporated into the Proposed Route a/		
MP	**Description of Change**	**Reason for Change**
282.85	Shift West 80 feet	Eliminates point of intersection
283.5	Shift West 131 feet	Eliminates wetland crossing
284.0	Shift West 24 feet	Landowner requested reroute
284.2	Shift West 38 feet	Landowner requested reroute
284.3 – 284.7	Shift West 28 feet	Landowner requested reroute
284.8	Shift West 61 feet	Eliminates point of intersection
285.0	Shift East 27 feet	Eliminates point of intersection
285.6	Shift East 40 feet	Avoidance of sensitive areas
286.1	Shift West 20 feet	Eliminates point of intersection
286.4	Shift East 54 feet	Eliminates point of intersection
286.5	Shift East 36 feet	Eliminates point of intersection
286.65	Shift East 89 feet	Avoidance of wetland feature
286.8	Shift East 61 feet	Improved constructability for road crossing
287.25	Shift East 255 feet	Improved constructability for road crossing
287.75	Shift East 83 feet	Eliminates point of intersection and Reduction of impact to stream and wetland features
287.8	Shift East 25 feet	Eliminates point of intersection
287.95	Shift West 23 feet	Improved constructability based on topography and contours
288.08	Shift West 37 feet	Improved constructability based on topography and contours
288.3	Shift West 42 feet	Improved constructability based on topography and contours
288.55	Shift East 38 feet	Improved constructability based on topography and contours
288.65	Shift West up to 34 feet	Improved constructability based on topography and contours
288.7	Shift East 18 feet	Improved constructability based on topography and contours
288.9	Shift East 52 feet	Improved constructability based on topography and contours
289.0	Shift East 15 feet	Improved constructability based on topography and contours
289.1	Shift West 51 feet	Improved constructability based on topography and contours
289.25	Shift West 33 feet	Avoidance of wetland feature
289.5 – 292.7	Shift West up to 3938 feet	Landowner requested reroute
292.7 – 293.4	Shift East up to 796 feet	Landowner requested reroute
293.8	Shift West 216 feet	Avoidance of sensitive area and reduction of impact to streams and wetland features
294.05	Shift East 72 feet	Improved constructability on steep terrain based on topography and contours

Table 10-D-2

Minor Route Modifications Incorporated into the Proposed Route a/

MP	Description of Change	Reason for Change
294.2 – 294.5	Shift West up to 50 feet	Improved constructability for road crossing
294.5 – 295.0	Shift East up to 233 feet	Avoidance of stream and wetland features
295.1	Shift East 77 feet	Landowner requested reroute
295.2	Shift East 195 feet	Improved constructability for road crossing and avoidance of streams and sensitive areas
295.3 – 295.9	Shift East up to 1138 feet	Avoidance of streams and sensitive areas
296.35	Shift East 43 feet	Eliminates point of intersection
296.45	Shift East 40 feet	Eliminates point of intersection
296.9	Shift West 55 feet	Eliminates point of intersection
297.05	Shift East 34 feet	Eliminates point of intersection
297.1	Shift West 30 feet	Eliminates point of intersection
297.65	Shift East 32 feet	Eliminates point of intersection
297.85	Shift East 46 feet	Eliminates point of intersection
297.95	Shift West 39 feet	Eliminates point of intersection
298.3 – 299.0	Shift West up to 383 feet	Avoidance of city dump trash dump and stream and wetland features
299.05	Shift East 90 feet	Improved constructability based on topography and contours
299.4 – 300.75	Shift West up to 2100 feet	Avoidance of streams, wetlands, and sensitive areas
300.97	Shift East 1229 feet	Improved constructability based on topography and contours to tie into Transco Station 165

a/ Includes changes from the pipeline route filed with FERC on April 14, 2015.