



MVP Southgate Project

Docket No. PF18-4-000

Draft

Resource Report 10 – Alternatives

August 2018

MVP Southgate Project Draft Resource Report 10 – Alternatives

Resource Report 10 – Filing Requirements	
Information	Location in Resource Report
Minimum Filing Requirements	
1. Address the “no action” alternative (Sec. 380.12(l)(1)).	Section 10.2
2. For large projects, address the effect of energy conservation or energy alternatives to the project (Sec. 380.12(l)(1)).	Section 10.3
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
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
5. 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
Additional Information Often Missing and Resulting in Data Requests	
6. Ensure that project objectives that serve as the basis for evaluating alternatives are consistent with the purpose and need discussion in Resource Report 1.	Section 10.1.2
7. Identify and evaluate alternatives identified by stakeholders.	Section 10.5.3
8. Clearly identify and compare the corresponding segments of route alternatives and route variations to the segments of the proposed route that they would replace if adopted.	Section 10.5

**DRAFT RESOURCE REPORT 10
 SUMMARY OF ALTERNATIVES
 TABLE OF CONTENTS**

10.1	INTRODUCTION	10-1
10.1.1	Environmental Resource Report Organization	10-1
10.1.2	Purpose and Need	10-1
10.2	NO ACTION ALTERNATIVE	10-1
10.3	ENERGY ALTERNATIVES	10-2
10.3.1	Renewable Energy Sources	10-2
10.3.2	Energy Conservation	10-2
10.3.3	Alternative Fossil Fuels, Nuclear, and Fuel Cells	10-3
10.4	SYSTEM ALTERNATIVES	10-3
10.4.1	Surface Transportation System Alternatives	10-3
10.4.2	Transco Pipeline System and Cardinal Pipeline	10-4
10.4.3	Atlantic Coast Pipeline Project	10-5
10.4.4	East Tennessee Natural Gas System	10-5
10.4.5	Piedmont Natural Gas	10-6
10.4.6	PSNC Distribution System	10-6
10.5	ROUTE ALTERNATIVES	10-6
10.5.1	Pipeline Routing	10-6
10.5.2	Major Pipeline Route Alternatives	10-7
10.5.2.1	Route Alternative 1	10-9
10.5.2.2	Route Alternative 2	10-11
10.5.2.3	Route Alternative 3	10-13
10.5.3	FERC Requested Route Alternatives	10-15
10.6	ROUTE VARIATIONS	10-24
10.6.1	Robert Pollock-Hill View Farms Variation	10-24
10.6.2	MP 40.0 to MP 41.5 Variation	10-27
10.6.3	Route Variations Incorporated, Under Evaluation, or Eliminated	10-29
10.7	ABOVEGROUND FACILITY ALTERNATIVES	10-30
10.7.1	Compressor Station Alternatives	10-30
10.7.1.1	Lambert Compressor Station Alternative	10-30
10.7.1.2	Russell Compressor Station Alternatives	10-32
10.7.2	Electric Driven Compressor Units	10-35
10.7.3	Meter Station Alternatives	10-36
10.8	REFERENCES	10-36

LIST OF FIGURES

Figure 10.5-1:	Major Route Alternatives	10-8
Figure 10.6-1:	Robert Pollock-Hill Farms Variation	10-25
Figure 10.6-2:	MP 40.0 to MP 41.5 Variation	10-28

LIST OF TABLES

Table 10.5-1 Comparison of the Preferred Route and Route Alternative 1	10-10
Table 10.5-2 Comparison of the Preferred Route and Route Alternative 2	10-12
Table 10.5-3 Comparison of the Preferred Route and Route Alternative 3	10-14
Table 10.5-4 Comparison of the Preferred Route and FERC Alternative 1	10-16
Table 10.5-5 Comparison of the Preferred Route and FERC Alternative 2	10-18
Table 10.5-6 Comparison of the Preferred Route and FERC Alternative 3	10-19
Table 10.5-7 Comparison of the Preferred Route and FERC Alternative 4	10-20
Table 10.5-8 Comparison of the Preferred Route and FERC Alternative 5	10-22
Table 10.5-9 Comparison of the Preferred Route and FERC Alternative 6	10-23
Table 10.6-1 Comparison of the Preferred Route and Robert Pollok-Hill View Farms Variation	10-26
Table 10.6-2 Comparison of the Preferred Route and MP 40.0 to MP 41.5 Variation	10-29
Table 10.7-1 Comparison of the Proposed Lambert Compressor Station Site and Alternative 1	10-31
Table 10.7-2 Comparison of the Proposed Russell Compressor Station Site and Alternative Sites	10-33

LIST OF APPENDICES

Appendix 10-A	FERC Requested Route Alternative Figures
Appendix 10-B	Route Variations Incorporated, Under Evaluation, or Eliminated
Appendix 10-C	Compressor Station Site Alternatives Figures

**DRAFT RESOURCE REPORT 10
SUMMARY OF ALTERNATIVES****LIST OF ACRONYMS AND ABBREVIATIONS**

ACP	Atlantic Coast Pipeline
Bcf/d	billion cubic feet per day
Certificate	Certificate of Public Convenience and Necessity
East Tennessee	East Tennessee Natural Gas, LLC
EIA	U.S. Energy Information Administration
FERC or Commission	Federal Energy Regulatory Commission
LNG	liquefied natural gas
MMcf/d	million cubic feet per day
MMDth/d	million dekatherms per day
Mountain Valley	Mountain Valley Pipeline, LLC
MW	megawatt
NWI	National Wetland Inventory
Piedmont	Piedmont Natural Gas Company
PSNC Energy	PSNC Energy, a wholly owned subsidiary of SCANA Corporation
Project	MVP Southgate Project
Transco	Transcontinental Gas Pipe Line Company, LLC
U.S.	United States

RESOURCE REPORT 10 SUMMARY OF ALTERNATIVES

10.1 INTRODUCTION

Mountain Valley Pipeline, LLC (“Mountain Valley”) is seeking a Certificate of Public Convenience and Necessity (“Certificate”) from the Federal Energy Regulatory Commission (“FERC” or “Commission”) pursuant to Section 7(c) of the Natural Gas Act to construct and operate the MVP Southgate Project (“Project”). The Project will be located in Pittsylvania County, Virginia and Rockingham and Alamance counties, North Carolina. The Project proposes to construct approximately 72 miles of 24-inch-diameter natural gas pipeline (known as the H-650 pipeline) to provide timely, cost-effective access to new natural gas supplies to meet the growing needs of natural gas users in the southeastern United States (“U.S.”), including for the Project’s anchor shipper, a local distribution company serving customers in North Carolina. See Resource Report 1 (General Project Description) for additional Project information.

10.1.1 Environmental Resource Report Organization

Resource Report 10 is prepared and organized according to the FERC Guidance Manual for Environmental Report Preparation (February 2017). This report describes the no action alternative (Section 10.2), other energy alternatives (Section 10.3), system alternatives (Section 10.4), route alternatives (Section 10.5), route variations (Section 10.6), aboveground facility alternatives (Section 10.7), and presents references (Section 10.8). Appendix 1-N of Resource Report 1 provides a response matrix for FERC Comments on First Draft Resource Report 10.

10.1.2 Purpose and Need

See Resource Report 1 (General Project Description) for additional information on the Project purpose and need.

10.2 NO ACTION ALTERNATIVE

The No Action Alternative for the Project would avoid the temporary and permanent environmental impacts associated with construction and operation of the Project. However, the No Action Alternative would not achieve the Project’s purpose and need as stated in Resource Report 1 (General Project Description). Under the No Action Alternative, North Carolina and southern Virginia will not receive the significant benefits associated with the Project. In addition, the Project’s anchor shipper, PSNC Energy would experience a capacity shortfall as projected in their annual filing with the North Carolina Public Utilities Commission.

The Project would not be able to meet the specific transportation needs for natural gas as agreed to by its customers if the Project is not constructed. On a broader scale, implementing the No Action Alternative would not support the goal of increasing consumer access to stable and reliable natural gas supplies in the southeastern U.S. If adequate natural gas supplies were not available in the region, consumers would need to seek other fuel sources (e.g., renewables, fossil fuels, nuclear power, or fuel cells), many of which are environmentally less desirable.

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 U.S will increase from 27.6 trillion cubic feet in 2017 to 35.6 trillion cubic feet in 2050, with a large

portion of this increased demand occurring in the electric generation sector (EIA, 2018a). A sizable portion of growth in natural gas production is occurring in the Appalachian Basin, with Marcellus Shale production alone increasing from 10 billion cubic feet per day (“Bcf/d”) in 2013 to approximately 20 Bcf/d in October 2017 (EIA, 2018b). The increased demand for natural gas is expected to be especially high the southeastern U.S., and in particular North Carolina, as its population continues to grow. The Project will benefit North Carolina and southern Virginia by connecting the additional supply to the increased market demand. In doing so, the Project will bring clean-burning, domestically-produced natural gas supplies to support the growing demand for natural gas, provide increased supply diversity, and improve supply reliability.

If the purpose and need of the Project are to be met without construction of the Project facilities, other projects and activities would be needed resulting in their own environmental impacts. This would result in the transfer of environmental impacts from one project to another, but would not necessarily eliminate or reduce impacts. The No Action Alternative is not considered a viable option because it does not meet the objectives of the Project or its anchor shipper.

10.3 ENERGY ALTERNATIVES

Use of certain alternative fuels to supply the needs of the market served by the Project are unlikely alternatives to the Project. In general, potential alternative energy sources to the Project could include renewable energy, energy conservation, alternative fossil fuels, nuclear, and fuel cells.

10.3.1 Renewable Energy Sources

Renewable energy sources, such as wind, solar, geothermal, and biomass are increasing in capacity and benefit the energy market by diversifying the fuels used to generate electricity. However, these sources are not completely or economically interchangeable with natural gas. Renewable energy sources cannot meet the objectives of the Project or its anchor shipper to provide natural gas for typical local distribution uses (e.g., home heating, cooking and industrial uses). In addition, renewable energy does not meet the purpose of the Project to provide new natural gas transmission pipeline capacity that will increase competition and enhance the reliability and resiliency of the existing pipeline infrastructure in North Carolina and southern Virginia.

10.3.2 Energy Conservation

Energy conservation measures have an increasing role in reducing future energy demand in the U.S. The Energy Policy Act of 2005 provides guidelines to: (1) diversify America’s energy supply and reduce dependence on foreign sources of energy; (2) increase residential and business’ energy efficiency and conservation (e.g., Energy Star Program); (3) improve vehicular energy efficiency; and (4) modernize the domestic energy infrastructure.

Energy conservation reduces the demand or growth in demand for natural gas and other energy sources. It is possible that the development and implementation of additional cost-effective conservation measures could have some effect on the demand for natural gas. However, substantial new advances in technology would be needed before the magnitude of such energy conservation measures necessary to equal the amount of energy transported by the Project could be implemented.

10.3.3 Alternative Fossil Fuels, Nuclear, and Fuel Cells

While other fossil fuels (e.g., coal and oil), nuclear power, and fuel cells can be viable alternatives to generating electricity, these sources are not completely or economically interchangeable with natural gas. These alternative energy sources cannot meet the objectives of the Project or its anchor shipper to provide natural gas for typical local distribution uses (e.g., home heating, cooking and industrial uses). In addition, these alternative energy sources do not meet the purpose of the Project to provide new natural gas transmission pipeline capacity that will increase competition and enhance the reliability and resiliency of the existing pipeline infrastructure in North Carolina and southern Virginia.

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 purpose and need of the Project. If available as a viable alternative, a system alternative could make it unnecessary to construct all or part of the Project, although some modifications or additions to the alternative systems would 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 (including timing) made with shippers supporting the development of the Project. The systems evaluated as potential alternatives to the Project are discussed below.

10.4.1 Surface Transportation System Alternatives

A surface transportation system alternative would involve the liquefaction of natural gas at the receipt points along the H-650 pipeline and transportation of the liquefied natural gas (“LNG”) volumes to the delivery points where regasification facilities would be installed. To liquefy and transport natural gas, the temperature and pressure design points are -260 degree Fahrenheit and 4 pounds per square inch gauge. Converting the 300 million cubic feet per day (“MMcf/d”) of natural gas volumes that the Project will deliver to PSNC in North Carolina to LNG would require a production and transportation of approximately 3.7 million gallons per day. Transportation of the LNG would involve trucking on local and interstate highways to a centralized delivery point and transporting to regasification facilities at the delivery points along the H-650 pipeline. Given a truck tanker capacity of 10,850 gallons, it would take approximately 345 trucks per day to transport this volume with a truck limiting load rate of approximately 300 gallons per minute. To transport the LNG volumes, a 24-hour per day, simultaneous loading operations of approximately nine trucks would be required. Any additional natural gas volume increase would result in an incremental increase in the number of trucks per day.

Truck transportation options are not as safe and reliable as pipelines, as discussed and demonstrated statistically in Resource Report 11 (Reliability and Safety). Installation of processing facilities to liquefy and subsequently re-gasify natural gas would require extensive permitting; require large tracts of land for a regasification facility, and result in associated air emissions from the liquefaction/regasification process and the truck or rail traffic. In addition, the development or improvement of the industrial, roadway and rail infrastructure necessary to transport LNG gas would be required. Currently, there are no approved LNG rail tankers, and shipment of LNG in International Organization for Standardization containers by rail is very limited due to regulatory constraints. Therefore, new regulatory processes and approvals would be

required before LNG rail shipments would be possible. Since the LNG by rail alternative would not be available to meet the timeframe required for energy demands by the market, use of this alternative is not a viable alternative to the Project. Therefore, transporting the Project's natural gas volumes as LNG by trucks and rail is not considered a viable alternative to the Project pipeline facilities and was eliminated from further consideration.

10.4.2 Transco Pipeline System and Cardinal Pipeline

Transco Pipeline System

The Transcontinental Gas Pipe Line Company, LLC ("Transco") system encompasses approximately 10,200 miles from South Texas to New York City with a system peak design capacity of approximately 15 million dekatherms per day ("MMDth/d"). The Project's H-650 pipeline would be located adjacent to or in close proximity to Transco's system for approximately 23.0 miles, between approximate MP 0.4 and MP 32.9, in Virginia and North Carolina.

On April 11, 2018 Transco's filed an application with FERC for its proposed Southeastern Trail Expansion Project (Docket No. CP18-186). According to Transco, its project would provide 296.4 MMcf/ of natural gas per day of additional firm transportation to serve markets in the Mid-Atlantic and Southeastern states by November 2020. Transco states that the project would provide additional reliable service to utility and local distribution companies in the southeast including Virginia and North Carolina. Customers served by the project include: PSNC Energy (60 MMcf/d), South Carolina Electric and Gas (215 MMcf/d), Virginia Natural Gas (14.6 MMcf/d), and the Cities of Buford (3.8 MMcf/d) and LaGrange (3 MMcf/d) in Georgia. The project would involve construction and operation of approximately 7.7 miles of new natural gas pipeline (Manassas Loop) located along the existing Transco Mainline in Fauquier and Prince William Counties, Virginia; expansion of three existing compressor stations in Virginia (Stations 185, 175, and 165), and modification of 21 existing facilities in South Carolina, Georgia, and Louisiana. The Project also includes the retirement and abandonment of 10 compressor units and related buildings and ancillary equipment at Transco's existing Compressor Station 165 in Pittsylvania County, Virginia. Transco's Compressor Station 165 is located approximately 3.0 miles west of the Project's proposed Lambert Compressor Station. No facilities are proposed in North Carolina. Currently, Transco's pipeline system does not have the capacity to serve the Project's anchor shipper (PSNC Energy). In addition, use of a Transco system alternative would require additional gas delivery infrastructure. The Project provides a primary receipt and delivery forward haul transportation path that offers improved reliability as compared to the secondary-firm backhaul deliveries PSNC Energy currently receives from Transco. In addition, PSNC Energy considered other existing and proposed interstate pipeline providers, including Transco, to meet the purpose and need of the Project. PSNC Energy committed to the firm transportation service of the Project and entered into binding long-term agreements that made PSNC Energy an anchor shipper for the Project. Therefore, the Project does not consider Transco's system to be a reasonable alternative to the Project.

Cardinal Pipeline System

The Cardinal Pipeline Company is a 105-mile, 24-inch intrastate pipeline that extends from Rockingham County, North Carolina to a point southeast of Raleigh, North Carolina, with a design capacity of 279,000 dekatherms per day. The system serves Piedmont and PSNC Energy.

At its closest point, the Cardinal Pipeline System is approximately 2.0 miles west of MP 71.0 of the H-650 pipeline near the City Graham, North Carolina. To meet the objectives of the MVP Southgate Project, this pipeline system would require additional gas delivery infrastructure in North Carolina and Virginia that would result in environmental impacts similar to those that would occur as proposed by the Project. In addition, PSNC Energy considered other existing and proposed interstate pipeline providers, including the Cardinal Pipeline System; however, PSNC Energy committed to firm transportation service associated with the Project and entered into binding long-term agreements that made PSNC Energy an anchor shipper for the Project. Therefore, The Project does not consider the Cardinal Pipeline System to be a reasonable alternative to the Project.

10.4.3 Atlantic Coast Pipeline Project

The Atlantic Coast Pipeline Project, which is currently under construction, is expected to be in service in 2019. The project consists of approximately 600 miles of pipeline that originates in West Virginia, crosses Virginia, and then continues south into eastern North Carolina, ending in Robeson County. It also includes three new compressor stations. The Atlantic Coast Pipeline Project is designed to provide up to 1.5 MMDth/d of natural gas transportation service to consumers in Virginia and North Carolina including Dominion Energy, Duke Energy, Piedmont, Virginia Natural Gas, and PSNC Energy. This pipeline system is located approximately 100 miles east of the MVP Southgate Project. To meet the objectives of the MVP Southgate Project, this pipeline system would require over 100 miles of new pipeline infrastructure in North Carolina and/or Virginia that would result in environmental impacts greater than those that would occur as a result of the Project. In addition, PSNC Energy considered other existing and proposed interstate pipeline providers, including Atlantic Coast Pipeline. PSNC Energy committed to firm transportation service associated with the Project and entered into binding long-term agreements that made PSNC Energy an anchor shipper for the Project. Therefore, The Project does not consider the Atlantic Coast Pipeline to be a reasonable alternative to the Project.

10.4.4 East Tennessee Natural Gas System

The East Tennessee Natural Gas, LLC (“East Tennessee”) pipeline system consists of approximately 1,536 miles of pipeline in the Southeast and Mid-Atlantic. The system begins in Tennessee and extends to an area just south of Roanoke, Virginia. A segment of the system extends into southwest Virginia and northern North Carolina through a 95-mile natural gas pipeline that interconnects with the Transco system near Eden, North Carolina. East Tennessee interconnects with Texas Eastern Transmission, Tennessee Gas Pipeline, Columbia Gulf, Southern Natural Gas and Midwestern Gas Transmission. The East Tennessee system currently provides direct access to natural gas producers in the Appalachian region through multiple connections on its mainline.

While East Tennessee interconnects with the MVP Southgate Project at the LN 3600 Interconnect (approximately 1.1 miles west of MP 27.4) it cannot be considered a viable system alternative as it would need to build similar facilities as proposed by the Project to meet the Project objectives. Significant modifications to the East Tennessee system (and the existing pipelines interconnected to East Tennessee), including the construction of new pipeline facilities, would be needed to provide the necessary design pressure and capacity to serve the Project’s anchor shipper (PSNC Energy). Therefore, the Project does not consider this pipeline system to be a reasonable alternative to the Project.

10.4.5 Piedmont Natural Gas

Piedmont Natural Gas is a local distribution company operating in North Carolina. The anchor shipper for the Project (PSNC Energy) is also a local distribution company operating in North Carolina. Transporting gas volumes from one local distribution company to another does not meet the purpose and need for the Project. Local distribution systems are designed to meet the needs of their customers, not the needs of other distribution systems. It would also not provide the incremental volumes that PSNC Energy needs to meet growing system demand, as discussed in the purpose and need section in Resource Report 1. Further, Piedmont's system could not satisfy any of the other reasons cited by PSNC Energy for becoming a Project shipper, including transportation cost, supply cost, supply diversity, reliability/resiliency, and operational efficiencies. Therefore, Piedmont's system is not a viable alternative for the Project.

10.4.6 PSNC Distribution System

The anchor shipper for the Project (PSNC Energy) is a local distribution company operating in three non-contiguous regions in North Carolina. As discussed in the purpose and need section in Resource Report 1, PSNC Energy solicited interest from existing and proposed interstate pipelines, and ultimately signed a long-term agreement with Mountain Valley for the Project, because it needs incremental volumes to meet growing system demand. PSNC Energy's existing pipelines are not a viable system alternative because they would not provide the incremental volumes PSNC Energy needs for its customers. In addition, as it is currently designed, during high demand times (i.e. peak winter demand scenarios) PSNC Energy's distribution system does not have the ability to serve all of its current customers through the Dan River Interconnect only. Due to current pipeline size and existing horsepower limitations, PSNC Energy requires supply of natural gas from both the Dan River Interconnect as well as the Haw River Interconnect to reliably serve its customers. Further, PSNC Energy's existing system could not satisfy any of the other reasons they cited for becoming a Project shipper, including transportation cost, supply cost, supply diversity, reliability/resiliency, and operational efficiencies. Therefore, PSNC Energy's own distribution system is not a viable alternative for the Project.

10.5 ROUTE ALTERNATIVES

10.5.1 Pipeline Routing

During Project development, the Project conducted an extensive review of potential pipeline routes to identify viable pipeline corridors, and then further refined the review to determine the most feasible route within the most favorable corridor. One of the Project's primary objectives with respect to pipeline routing was to avoid or minimize, to the extent possible crossings of major population centers and significant environmental resources. The Project also attempted to route its pipeline adjacent to existing rights-of-way, where feasible. The Project used field reconnaissance, aerial photography, topographic maps from the U.S. Geological Survey, and National Wetland Inventory maps during the route identification and evaluation processes.

As proposed, the Project includes the installation of approximately 72 miles of natural gas pipeline and appurtenant facilities (e.g., compressor station, meter stations, valve settings and launcher/ receiver equipment) within a new permanent right-of-way. As discussed further below, the Project has evaluated major and minor route alternatives to maximize constructability, minimize impacts to sensitive resources and avoid encroachments. Mountain Valley is committed to further refinement of the pipeline alignment,

as necessary, to ensure minimization of Project-related impacts on affected landowners and the environment.

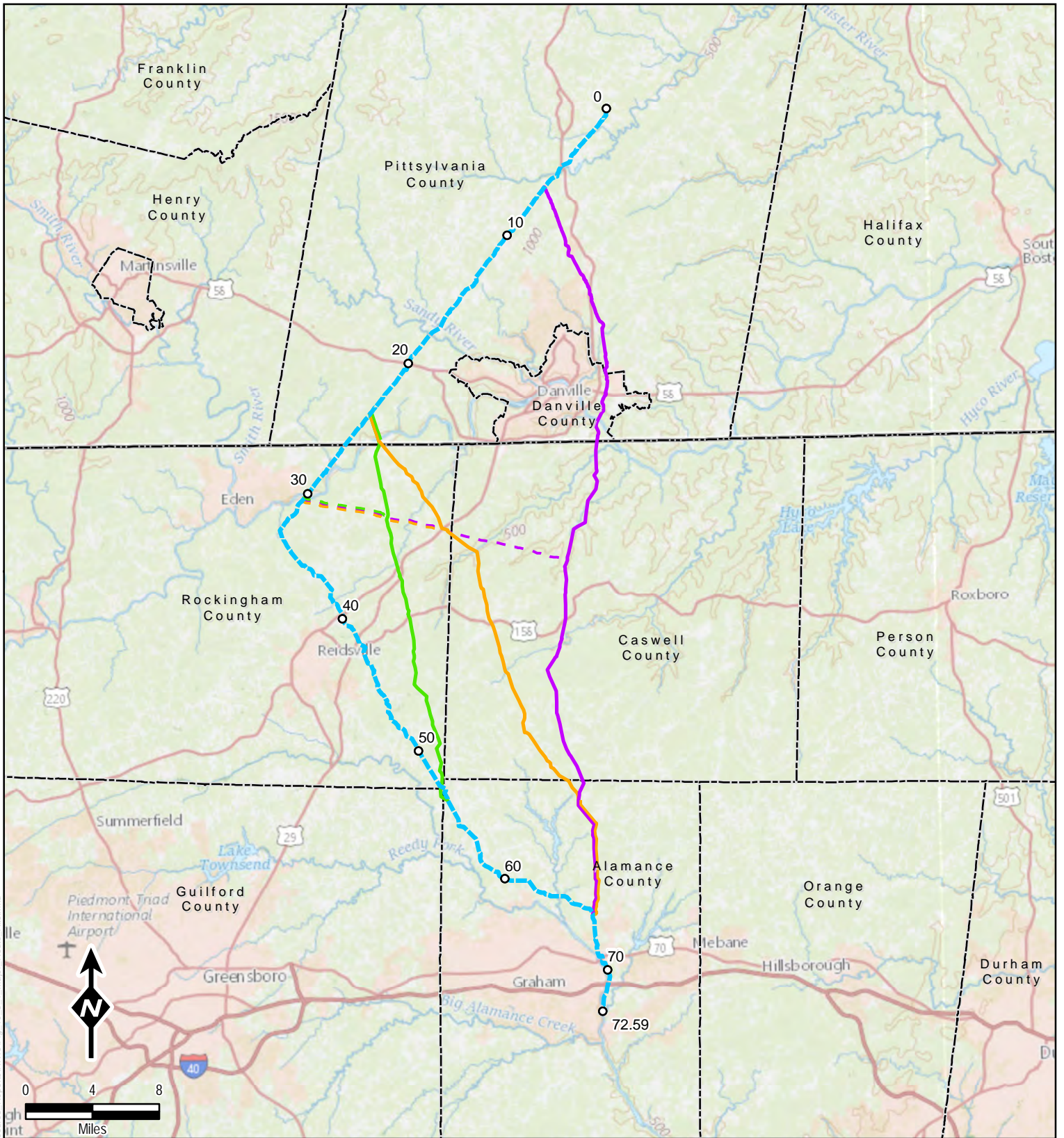
10.5.2 Major Pipeline Route Alternatives

Mountain Valley has evaluated major pipeline route alternatives as part of the planning and design process for the Project, and based the evaluation on environmental and land use impacts, as well as permanent easement acquisitions and overall Project costs. The primary objective in performing this analysis is to develop the most direct route that could connect customers to the available supply system while avoiding or minimizing potential adverse environmental impacts and engineering constraints to the greatest extent practicable. The Project evaluated pipeline routing options based on potential adverse environmental impacts, existing land usage, constructability, safety, and feasibility considerations.

The selection of the major route alternatives involves several steps.

- Development of routing criteria;
- Identification of potential routing alternatives;
- Collection of data relative to each alternative;
- Evaluation of potential environmental and land use impacts;
- Evaluation of routing alternatives against routing criteria; and
- Determination of the most cost-effective technical solution

This section describes and evaluates the major route alternatives identified during the initial planning stage of the Project. The major route alternatives are shown on Figure 10.5-1 and summarized in Tables 10.5-1 through 10.5-3 below.



S:\4-PROJECTS\NEXTEPBA\300423_MVP_South\Map\6\XX\DR\resource_Reports\RR10\Fin_10_5_1_Major_Route_Alt.mxd



Legend

- Mileposts
- Preferred Pipeline Route
- - - State Boundary
- - - County Boundary
- Alternative Route 1
- - - Alternative Route 1 Lateral
- Alternative Route 2
- - - Alternative Route 2 Lateral
- Alternative Route 3
- - - Alternative Route 3 Lateral

Data Sources: ESRI, USGS, TRC, EQT

1 inch = 8 miles
When Printed 8.5x11

Mountain Valley
PIPELINE, LLC

Figure 10.5-1

Major Route Alternatives

TRC
Results you can rely on

600 Willowbrook Ln
West Chester, PA 19382

10.5.2.1 Route Alternative 1

The Project evaluated Route Alternative 1 between MP 23.7 and MP 53.6 (see Figure 10.5-1). This alternative begins in Pittsylvania County, Virginia at MP 23.7 and extends in a southeasterly direction for approximately 1.9 miles to the North Carolina border. Within this segment, this alternative crosses Berry Hill Road/U.S. Highway 311, a railroad track, the Dan River, South River Road, and mixed forested and agricultural/open land. At the North Carolina border in Rockingham County, Route Alternative 1 continues in a south-southeasterly direction for approximately 21.7 miles. It crosses mixed forested and agricultural/open land; Berry Hill Ridge, Gravel Hill, and Dix roads; State Highway 700; Guerrant Springs Road; Worsham Mill Road; Quaqua Hill and Estes roads; U.S. Highway 29-BR, a railroad track, Benton Road, and U.S. Highway 29; and three existing utility easements. From this point, Route Alternative 1 continues in a south-southeasterly direction crossing U.S. Highway 58, Grooms Road, Tate Road, Rockingham Lake Road, and the Colonel Heritage Byway/State Route 150. Within this section, this alternative would be approximately 0.05 mile east of Williamsburg Wildlife Lake. From Colonel Heritage Byway/State Route 150, Route Alternative 1 continues to cross mixed forested and agricultural/open land; and County Line Creek; Trails End Road; State Route 87; Zeb, Kernodle, and Parkdale roads. Route Alternative 1 then extends south into Guilford County for approximately 0.6 mile and southeast into Alamance County for approximately 0.5 mile to rejoin the preferred route at MP 53.6. Route Alternative 1 includes an approximate 5.4-mile long lateral from the alternative route south of Guerrant Springs Road to an interconnect with PSNC Energy, east of the City of Eden, North Carolina.

As shown in Table 10.5-1, the primary advantages of Route Alternative 1 are:

- crosses three fewer waterbodies; and
- crosses slightly fewer areas with potential for shallow depth to bedrock.

The primary disadvantages of Route Alternative 1 are:

- greater length and associated land disturbance;
- collocates with existing rights-of-way for approximately 10.1 fewer miles;
- crosses five more parcels;
- affects six more residences within 50 feet of workspace;
- affects more forest land; and
- crosses more wetlands.

Because the primary disadvantages outweigh the primary advantages, the Project eliminated this alternative from further consideration as its preferred pipeline route.

Table 10.5-1

Comparison of the Preferred Route and Route Alternative 1

Feature	Preferred Route	Route Alternative 1	Difference
General			
Total length (miles) <u>a/</u>	29.8	30.1	+0.3
Length adjacent to existing ROW (miles)	14.7	4.6	-10.1
Land affected during construction (acres) <u>a/</u>	360.8	364.8	+4.0
Land affected during operation (acres) <u>a/</u>	180.6	182.2	+1.6
Land Use			
Populated areas within ½ mile (number)	0	0	0
National Forest System lands crossed (miles)	0	0	0
National Forest Wilderness crossed (miles)	0	0	0
Scenic Trail crossings (number)	0	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0	0
Landowner parcels crossed (number)	149	154	+5
Residences within 50 feet of construction work space (number)	5	11	+6
Resources			
Forested land crossed (miles)	13.9	16.5	+2.6
Forested land affected during construction (acres)	170.0	199.5	+29.5
Forested land affected during operation (acres)	84.6	100.0	+15.4
Wetlands (NWI) crossed (feet)	124	818	+694
Forested wetlands crossed (feet)	784	484	-300
Forested wetlands affected by construction (acres) <u>b/</u>	1.4	0.8	-0.6
Forested wetlands affected by operation (acres) <u>a/</u>	0.9	0.5	-0.4
Perennial waterbody crossings (number)	17	14	-3
Shallow bedrock crossed (miles)	4.0	3.8	-0.2
Karst area crossed (miles)	0	0	0

a/ Assuming 100-foot-wide construction ROW and 50-foot-wide permanent ROW. Includes a 5.4-mile long lateral from Alternative 1 to an interconnect with PSNC Energy, east of the City of Eden, North Carolina.

b/ Assuming 75-foot-wide construction ROW.

ROW = right-of-way. NWI = National Wetland Inventory. NRHP = National Register of Historic Places.

Information Sources:

GIS – Analysis based on Geodatabase layers and shapefiles.

NC Parcel Boundaries and Standard Fields - <http://data.nconemap.gov/geoportal/catalog/search/resource/details.page>

VA Parcel Boundaries and Standard Fields -

<https://www.arcgis.com/home/item.html?id=f1dcca1f42e40cbba791feae2e23690>

NLCD – 2006 National Land Cover Data - <http://www.epa.gov/mrlc/nlcd-2006.html>

NWI – National Wetlands Inventory - <http://www.fws.gov/wetlands/>

USGS – U.S. Geological Survey - <http://www.usgs.gov/>

NHD – National Hydrography Dataset - <http://nhd.usgs.gov/>

USDA - <https://data.fs.usda.gov/geodata/edw/datasets.php>

NRHP - National Register of Historic Places - https://www.nps.gov/nr/research/data_downloads.htm

ESRI - GIS Mapping - <http://www.esri.com/>

10.5.2.2 Route Alternative 2

The Project evaluated Route Alternative 2 between MP 23.9 and MP 66.1 (see Figure 10.5-1). This alternative begins in Pittsylvania County, Virginia at MP 23.9 and extends in a southeasterly direction for approximately 2.0 miles to the North Carolina border. Within this segment, this alternative crosses Berry Hill Road/U.S. Highway 311, a railroad track, the Dan River, South River Road, and mixed forested and agricultural/open land. At the North Carolina border, Route Alternative 2 continues in a south-southeasterly direction for approximately 7.0 miles within Rockingham County. It crosses mixed forested and agricultural/open land; Gravel Hill Road, Goose Pond Road, State Highway 700, an unnamed road, Service Road, U.S. Highway 29, a railroad track, and Old Highway 29. It then traverses Caswell County for approximately 17.3 miles and crosses mixed forested and agricultural/open land. It crosses several roadways including Anderson and Chapman roads, Hogans Creek, Park Springs Road, Allison Grove Road, and U.S. Highway 158. From this point, it continues in a south-southeasterly direction and crosses Bethesda Church Road twice, Holster Branch, Colonel Heritage Byway/State Route 150, Cherry Grove Road, Stadler Road, Milesville Road, Kerrs Chapel Road, and Old Stoney Mountain Road. Route Alternative 2 then continues in Alamance County for approximately 8.7 miles and rejoins the at MP 66.1. Within this section, this alternative crosses Toms Creek, Union Ridge Road, Jefferies Cross Road, State Route 63, and mixed forested and agricultural/open land. It continues in a southerly direction and crosses McCray Road, Deep Creek Church Road, North Fronville Road, Sandy Cross Road, and rejoins the preferred route at MP 66.1. Route Alternative 2 includes an approximate 8.8-mile long lateral from the alternative route north of U.S. Route 29 to an interconnect with PSNC Energy, east of the City of Eden, North Carolina.

As shown in Table 10.5-2, the primary advantage of Route Alternative 2 is:

- crosses fewer parcels.

The primary disadvantages of Route Alternative 2 are:

- greater length and land disturbance;
- collocates with existing rights-of-way for approximately 5.4 fewer miles;
- affects four more residences within 50 feet of workspace;
- affects more forested land;
- crosses more wetlands including forested wetlands; and
- crosses more shallow bedrock areas.

Because the primary disadvantages outweigh the primary advantages, the Project eliminated this alternative from further consideration as its preferred pipeline route.

Table 10.5-2

Comparison of the Preferred Route and Route Alternative 2

Feature	Preferred Route	Route Alternative 2	Difference
General			
Total length (miles) <u>a/</u>	42.2	43.8	+1.6
Length adjacent to existing ROW (miles)	20.0	14.6	-5.4
Land affected during construction (acres) <u>a/</u>	511.9	531.1	+19.2
Land affected during operation (acres) <u>a/</u>	254.5	265.5	+11.0
Land Use			
Populated areas within ½ mile (number)	0	0	0
National Forest System lands crossed (miles)	0	0	0
National Forest Wilderness crossed (miles)	0	0	0
Scenic Trail crossings (number)	0	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0	0
Landowner parcels crossed (number)	225	195	-30
Residences within 50 feet of construction work space (number)	7	11	+4
Resources			
Forested land crossed (miles)	19.0	20.7	+1.7
Forested land affected during construction (acres)	232.0	249.2	+17.2
Forested land affected during operation (acres)	115.6	124.9	+9.3
Wetlands (NWI) crossed (feet)	1,970	3,139	+1,169
Forested wetlands crossed (feet)	819	2,855	+2,036
Forested wetlands affected by construction (acres) <u>b/</u>	1.5	5.0	+3.5
Forested wetlands affected by operation (acres) <u>a/</u>	1.0	3.3	+2.3
Perennial waterbody crossings (number)	19	19	0
Shallow bedrock crossed (miles)	4.0	4.3	+0.3
Karst area crossed (miles)	0	0	0

a/ Assuming 100-foot-wide construction ROW and 50-foot-wide permanent ROW. Includes an 8.8-mile long lateral from Alternative 2 to an interconnect with PSNC Energy, east of the City of Eden, North Carolina.

b/ Assuming 75-foot-wide construction ROW.

ROW = right-of-way. NWI = National Wetland Inventory. NRHP = National Register of Historic Places.

Information Sources:

GIS – Analysis based on Geodatabase layers and shapefiles.

NC Parcel Boundaries and Standard Fields - <http://data.nconemap.gov/geoportal/catalog/search/resource/details.page>

VA Parcel Boundaries and Standard Fields - <https://www.arcgis.com/home/item.html?id=f1dcca1f42e40cbba791faae2e23690>

NLCD – 2006 National Land Cover Data - <http://www.epa.gov/mrlc/nlcd-2006.html>

NWI – National Wetlands Inventory - <http://www.fws.gov/wetlands/>

USGS – U.S. Geological Survey - <http://www.usgs.gov/>

NHD – National Hydrography Dataset - <http://nhd.usgs.gov/>

USDA - <https://data.fs.usda.gov/geodata/edw/datasets.php>

NRHP - National Register of Historic Places - https://www.nps.gov/nr/research/data_downloads.htm

ESRI - GIS Mapping - <http://www.esri.com/>

10.5.2.3 Route Alternative 3

The Project evaluated Route Alternative 3 between MP 6.3 and MP 66.1 (see Figure 10.5-1). This alternative begins in Pittsylvania County, Virginia at MP 6.3 and extends in a southerly direction for approximately 16.7 miles to the North Carolina border where it crosses mixed forested and agricultural/open land. Within this segment, this alternative primarily parallels an existing Duke Energy electric transmission easement and crosses White Oak Creek, Dry Fork Road, Hither Land and Court, R and L Smith Road, and Mountain View Road. Near Mountain View Road, this alternative deviates from the electric transmission easement to the west to minimize loss of vegetative buffer between the easement and nearby residences. Approximately 0.2 mile south of this location, this alternative deviates to the west to avoid utility congestion in the neighborhoods along Springlake Place, Springdale Drive, and Deerwood Drive. From this point, Route Alternative 3 continues in a southerly direction and crosses County Road 946, East Witt Road, Railroad Lane, and U.S. Highway 29-BR. Between Railroad Lane and U.S. Highway 29-BR, this alternative makes another deviation from the electric transmission easement to the west to avoid multiple utility easements on a residential property. From this point, this alternative crosses Landrum Road, U.S. Highway 29, Twin Arch Drive, and Old Richmond Road/State Route 30.

Route Alternative 3 then crosses the Danville City limits including residential, commercial, and industrial areas; several roadways, and mixed forested and agricultural/open land. Once south of the City of Danville, this alternative enters Caswell County, North Carolina for approximately 21.9 miles where it crosses mixed forested and agricultural/open land. It crosses Walter's Mill Road twice, Hogan's Creek, an unnamed road, Moon Creek Lane, and Old State Highway 86-North. It continues in a south-southwesterly direction and crosses State Route 86, Foster Road, East Prong Moon Creek, Hodges Dairy Road, and Colonel Heritage Byway/State Route 150. Route Alternative 3 would be approximately 0.2 mile west of the Caswell Airpark. It crosses County Road, County Line Creek, Cherry Gove Road, Senior Alfred Road, Byrd's Sawmill Road, Kerr's Chapel Road, and two Duke Energy electric transmission easements. Route Alternative 3 then continues in Alamance County for approximately 8.7 miles and rejoins the at MP 66.1. Within this section, this alternative crosses Roscoe Road, Toms Creek, Union Ridge Road, Jefferies Cross Road, State Route 63, and mixed forested and agricultural/open land. It continues in a southerly direction and crosses McCray Road, Deep Creek Church Road, North Fronville Road, Sandy Cross Road, and rejoins the preferred route at MP 66.1. Route Alternative 3 includes an approximate 16.6-mile long lateral from the alternative route, approximately 2.3 miles south of Foster Road, to an interconnect with PSNC Energy, east of the City of Eden, North Carolina.

As shown in Table 10.5-3, the primary advantage of Route Alternative 3 is:

- crosses 1.4 fewer miles of potential karst.

The primary disadvantages of Route Alternative 3 are:

- greater length and land disturbance;
- collocates with existing rights-of-way for approximately 1.5 fewer miles;
- affects twelve more residences within 50 feet of workspace;
- affects more forested land;
- crosses more wetlands including forested wetlands;
- crosses more waterbodies; and
- crosses more shallow bedrock areas.

Because the primary disadvantages outweigh the primary advantages, the Project eliminated this alternative from further consideration as its preferred pipeline route.

Table 10.5-3			
Comparison of the Preferred Route and Route Alternative 3			
Feature	Preferred Route	Route Alternative 3	Difference
General			
Total length (miles) <u>a/</u>	59.8	63.9	+4.1
Length adjacent to existing ROW (miles)	26.9	25.4	-1.5
Land affected during construction (acres) <u>a/</u>	724.8	774.5	+49.7
Land affected during operation (acres) <u>a/</u>	362.4	387.3	+24.9
Land Use			
Populated areas within ½ mile (number)	0	1	+1
National Forest System lands crossed (miles)	0	0	0
National Forest Wilderness crossed (miles)	0	0	0
Scenic Trail crossings (number)	0	0	0
NRHP designated or eligible historic districts crossed (miles)	0	0	0
Landowner parcels crossed (number)	315	373	+58
Residences within 50 feet of construction work space (number)	11	23	+12
Resources			
Forested land crossed (miles)	24.8	33.9	+9.1
Forested land affected during construction (acres)	306.1	407.9	+108.8
Forested land affected during operation (acres)	151.8	204.8	+53
Wetlands (NWI) crossed (feet)	2,386	3,591	+1,205
Forested wetlands crossed (feet)	819	1,797	+978
Forested wetlands affected by construction (acres) <u>b/</u>	1.5	2.9	+1.4
Forested wetlands affected by operation (acres) <u>a/</u>	1.0	1.9	+0.9
Perennial waterbody crossings (number)	29	31	+2
Shallow bedrock crossed (miles)	4.8	10.4	+5.6
Karst area crossed (miles)	2.0	0.6	-1.4

Table 10.5-3

Comparison of the Preferred Route and Route Alternative 3

Feature	Preferred Route	Route Alternative 3	Difference
<p>a/ Assuming 100-foot-wide construction ROW and 50-foot-wide permanent ROW. Includes a 16.6-mile long lateral from Alternative 3 to an interconnect with PSNC Energy, east of the City of Eden, North Carolina.</p> <p>b/ Assuming 75-foot-wide construction ROW.</p> <p>ROW = right-of-way. NWI = National Wetland Inventory</p> <p><u>Information Sources:</u></p> <p>GIS – Analysis based on Geodatabase layers and shapefiles.</p> <p>NC Parcel Boundaries and Standard Fields - http://data.nconemap.gov/geoportal/catalog/search/resource/details.page</p> <p>VA Parcel Boundaries and Standard Fields - https://www.arcgis.com/home/item.html?id=f1dcca1f42e40cbba791feae2e23690</p> <p>NLCD – 2006 National Land Cover Data - http://www.epa.gov/mrlc/nlcd-2006.html</p> <p>NWI – National Wetlands Inventory - http://www.fws.gov/wetlands/</p> <p>USGS – U.S. Geological Survey - http://www.usgs.gov/</p> <p>NHD – National Hydrography Dataset - http://nhd.usgs.gov/</p> <p>USDA - https://data.fs.usda.gov/geodata/edw/datasets.php</p> <p>NRHP - National Register of Historic Places - https://www.nps.gov/nr/research/data_downloads.htm</p> <p>ESRI - GIS Mapping - http://www.esri.com/</p>			

10.5.3 FERC Requested Route Alternatives

The FERC requested that Mountain Valley evaluate six route alternatives to avoid or reduce impacts along its preferred pipeline route. The desktop analysis included: length of pipeline; acreage of permanent and temporary rights-of-way; number of parcels crossed; number of residences within 25 and 50 feet of the edge of the construction right-of-way; number of waterbodies and wetlands crossed, and the length of each crossing; acres of agricultural and forested land affected; and the miles of right-of-way that would be parallel or adjacent to existing rights-of-way. The desktop analyses of these alternatives are presented below.

FERC Alternative 1 (MP 63.9 to MP 72.5)

The Project evaluated FERC Alternative 1 between MP 63.9 and MP 72.5 (see Figure 10.5-2, Appendix 10-A). At MP 63.9, FERC Alternative 1 extends in a southerly direction for approximately 4.69 miles to MP 68.6 of the preferred route. Within this section, the alternative crosses agricultural and forested land, Deep Creek Church Road, Sandy Cross Road, and Meeting Ground Road. It then collocates with the existing Cardinal Pipeline Company, LLC (“Cardinal Pipeline”) on the east side of the Haw River for approximately 2.2 miles. At MP 68.6 of the preferred route, FERC Alternative 1 extends southwest for approximately 0.1 mile and crosses agricultural land and the Haw River. At this point, the alternative remains on the west side of the Haw River and turns in a more southerly direction continuing to be collocated with the existing Cardinal Pipeline for approximately 3.4 miles. Within this segment, the alternative crosses mixed forested and agricultural land, West Main Street, parallels the eastern boundary of the Challenge Golf Club for approximately 1.3 miles, and crosses Interstate 40/85. FERC Alternative 1 turns west, southwest, south, and southeast and crosses forested and agricultural land, State Highway 54/E. Harden Street, Cooper Road, and the Haw River to rejoin the preferred route at MP 72.5.

As shown in Table 10.5-4, the primary advantages of FERC Alternative 1 are:

- crosses 33 fewer parcels;
- affects fewer residences within 50 feet of workspace;
- collocates with existing rights-of-way for approximately 5.7 more miles; and
- affects 0.8 fewer acres of forested land.

The primary disadvantages of FERC Alternative 1 are:

- greater length and land disturbance;
- crosses six more waterbodies and eight more wetlands; and
- affects 6.6 more acres of wetlands and 7.4 more acres of agricultural land.

Potential constructability concerns of FERC Alternative 1 are:

- two crossings of the Haw River;
- limited area for workspace layout at the Haw River crossings and along the alternative route due to an existing golf course, existing utility infrastructure and residential areas;
- access to the alternative route is limited and would likely need to be constructed.

Because the primary disadvantages outweigh the primary advantages, the Project eliminated this alternative from further consideration as its preferred pipeline route.

Feature	Preferred Route	FERC Alternative 1	Difference
Total length (miles)	8.7	8.8	+0.1
Construction right-of-way (acres) <u>a/</u>	105.4	106.3	+0.9
Permanent right-of-way (acres) <u>a/</u>	52.7	53.1	+0.04
Total number of parcels crossed	87	54	-33
Number of residences within 25 and 50 feet of the edge of the construction ROW (and associated additional temporary workspace)	1 / 3	1 / 1	0 / -2
Number of waterbodies crossed	17	23	+6
Number of NWI wetlands crossed	1	9	+8
Total NWI wetland crossing length (feet)	26	3,990	+3,964
NWI wetlands within construction ROW (acres) <u>b/</u>	0.2	6.8	+6.6
Agricultural land within construction ROW (acres)	26.9	19.5	-7.4
Forested land within construction ROW (acres)	53.4	52.6	-0.8
Length parallel or adjacent to existing ROW (miles)	0.25	5.95	+5.7

Table 10.5-4			
Comparison of the Preferred Route and FERC Alternative 1			
Feature	Preferred Route	FERC Alternative 1	Difference
a/ Assuming 100-foot-wide construction ROW and 50-foot-wide permanent ROW. b/ Assuming 75-foot-wide construction ROW. ROW = right-of-way. NWI = National Wetland Inventory <u>Information Sources:</u> GIS – Analysis based on Geodatabase layers and shapefiles. NC Parcel Boundaries and Standard Fields - http://data.nconemap.gov/geoportal/catalog/search/resource/details.page NLCD – 2006 National Land Cover Data - http://www.epa.gov/mrlc/nlcd-2006.html NWI – National Wetlands Inventory - http://www.fws.gov/wetlands/ USGS – U.S. Geological Survey - http://www.usgs.gov/ NHD – National Hydrography Dataset - http://nhd.usgs.gov/ ESRI - GIS Mapping - http://www.esri.com/			

FERC Alternative 2 (MP 68.6 to MP 72.5)

The Project evaluated FERC Alternative 2 between MP 68.6 and MP 72.5 (see Figure 10.5-3, Appendix 10-A). This portion of FERC Alternative 2 is the same as FERC Alternative 1 from MP 68.6 and MP 72.5 described above. At MP 68.6, FERC Alternative 2 turns southwest for approximately 0.1 mile and crosses agricultural land and the Haw River. It then turns in a more southerly direction and is collocated with the existing Cardinal Pipeline for approximately 3.4 miles and crosses mixed forested and agricultural land, West Main Street, parallels the eastern boundary of the Challenge Golf Club for approximately 1.3 miles, and crosses Interstate 40/85. FERC Alternative 2 then turns west, southwest, south, and southeast and crosses forested and agricultural land, State Highway 54/E. Harden Street, Cooper Road, and the Haw River to rejoin the preferred route at MP 72.5.

As shown in Table 10.5-5, the primary advantages of FERC Alternative 2 are:

- crosses 13 fewer parcels,
- affects fewer residences within 25 and 50 feet of workspace;
- collocates with existing rights-of-way for approximately 3.3 more miles; and
- affects 3.2 fewer acres of forested land.

The primary disadvantages of FERC Alternative 2 are:

- greater length and land disturbance;
- crosses four more waterbodies and nine more wetlands; and
- affects 6.8 more acres of wetlands and 0.4 more acre of agricultural land.

Potential constructability concerns of FERC Alternative 2 are:

- two crossings of the Haw River; and
- limited area for workspace layout at the Haw River crossings and along the alternative route due to an existing golf course, existing utility infrastructure and residential areas.

Because the primary disadvantages outweigh the primary advantages, the Project eliminated this alternative from further consideration as its preferred pipeline route.

Feature	Preferred Route	FERC Alternative 2	Difference
Total length (miles)	3.9	4.1	+0.2
Construction right-of-way (acres) <u>a/</u>	47.9	49.5	+1.6
Permanent right-of-way (acres) <u>a/</u>	23.9	24.7	+0.8
Total number of parcels crossed	44	31	-13
Number of residences within 25 and 50 feet of the edge of the construction ROW (and associated additional temporary workspace)	1 / 3	0 / 0	-1 / -3
Number of waterbodies crossed	8	12	+4
Number of NWI wetlands crossed	0	9	+9
Total NWI wetland crossing length (feet)	0	4,162	+4,162
NWI wetlands within construction ROW (acres) <u>b/</u>	0.1	6.9	+6.8
Agricultural land within construction ROW (acres)	6.5	6.9	+0.4
Forested land within construction ROW (acres)	23.4	20.2	-3.2
Length parallel or adjacent to existing ROW (miles)	0.2	3.6	+3.4
<u>a/</u> Assuming 100-foot-wide construction ROW and 50-foot-wide permanent ROW. <u>b/</u> Assuming 75-foot-wide construction ROW. ROW = right-of-way. NWI = National Wetland Inventory <u>Information Sources:</u> GIS – Analysis based on Geodatabase layers and shapefiles. NC Parcel Boundaries and Standard Fields - http://data.ncnemap.gov/geoportal/catalog/search/resource/details.page NLCD – 2006 National Land Cover Data - http://www.epa.gov/mlrc/nlcd-2006.html NWI – National Wetlands Inventory - http://www.fws.gov/wetlands/ USGS – U.S. Geological Survey - http://www.usgs.gov/ NHD – National Hydrography Dataset - http://nhd.usgs.gov/ ESRI - GIS Mapping - http://www.esri.com/			

FERC Alternative 3 (MP 65.45 to MP 67.0)

The Project evaluated FERC Alternative 3 between MP 65.45 and MP 67.0 (see Figure 10.5-4, Appendix 10-A). At MP 65.45, FERC Alternative 3 extends northeast and east for approximately 0.7 mile and crosses agricultural and forested land and North Fonville Road. It then turns in a more southerly direction for approximately 1.3 miles and crosses agricultural and forested land, Sandy Cross Road, and an existing electric transmission easement. It rejoins the Preferred Route at MP 67.0.

As shown in Table 10.5-6, the primary advantages of FERC Alternative 3 are:

- crosses two fewer parcels; and
- affects 0.4 fewer acres of forested land.

The primary disadvantages of FERC Alternative 3 are:

- greater length and land disturbance; and
- affects 5.0 more acres of agricultural land.

Potential constructability concerns of FERC Alternative 3 are:

- none identified based on initial review.

Based upon the results of the initial evaluation, the Project continues to evaluate FERC Alternative 3 for potential incorporation into the preferred route. The Project will provide the results of its evaluation in the final Resource Reports included with its Certificate application.

Feature	Preferred Route	FERC Alternative 3	Difference
Total length (miles)	1.5	2.0	+0.5
Construction right-of-way (acres) <u>a/</u>	18.9	24.7	+5.8
Permanent right-of-way (acres) <u>a/</u>	9.4	12.3	+2.9
Total number of parcels crossed	16	14	-2
Number of residences within 25 and 50 feet of the edge of the construction ROW (and associated additional temporary workspace)	0 / 0	0 / 0	0 / 0
Number of waterbodies crossed	3	3	0
Number of NWI wetlands crossed	0	0	0
Total NWI wetland crossing length (feet)	0	0	0
NWI wetlands within construction ROW (acres) <u>b/</u>	0	0	0
Agricultural land within construction ROW (acres)	6.6	11.6	+5.0
Forested land within construction ROW (acres)	10.9	10.5	-0.4
Length parallel or adjacent to existing ROW (miles)	0	0	0

a/ Assuming 100-foot-wide construction ROW and 50-foot-wide permanent ROW.
b/ Assuming 75-foot-wide construction ROW.
 ROW = right-of-way. NWI = National Wetland Inventory

Information Sources:
 GIS – Analysis based on Geodatabase layers and shapefiles.
 NC Parcel Boundaries and Standard Fields - <http://data.nconemap.gov/geoportal/catalog/search/resource/details.page>
 NLCD – 2006 National Land Cover Data - <http://www.epa.gov/mrlc/nlcd-2006.html>
 NWI – National Wetlands Inventory - <http://www.fws.gov/wetlands/>
 USGS – U.S. Geological Survey - <http://www.usgs.gov/>
 NHD – National Hydrography Dataset - <http://nhd.usgs.gov/>
 ESRI - GIS Mapping - <http://www.esri.com/>

FERC Alternative 4 (MP 65.6 to MP 70.4)

The Project evaluated FERC Alternative 4 between MP 65.6 and MP 70.4 (see Figure 10.5-5, Appendix 10-A). At MP 65.6, FERC Alternative 4 extends in an easterly direction for approximately 3.8 miles and crosses agricultural and forested land. Within this segment, the alternative route crosses North Forville Road, State Highway 49, and Johnson Road. It then turns in a south-southwest direction for approximately

5.8 miles and crosses agricultural and forested land, and several road / railroads including Mebane Rodgers Road/State Route 1921, Dewitt Drive, Bason Road/State Route 1927, U.S. Highway 70/E. Main Street, a railroad track, Stone Street Extension/State Route 1936, and Tollingwood Road. It rejoins the preferred route at MP 70.4.

As shown in Table 10.5-7, the primary advantages of FERC Alternative 4 are:

- affects fewer residences within 25 and 50 feet of workspace; and
- collocates with existing rights-of-way for an additional 1.8 miles.

The primary disadvantages of FERC Alternative 4 are:

- greater length and land disturbance;
- affects three more parcels;
- crosses two more waterbodies and four more wetlands; and
- affects 0.5 more acre of wetlands, 30 more acres of agricultural land, and 18.7 more acres of forested land.

Potential constructability concerns of FERC Alternative 4 are:

- none identified based on initial review.

Based upon the results of the initial evaluation, the Project continues to evaluate FERC Alternative 4 for potential incorporation into the preferred route. The Project will provide the results of its evaluation in the final Resource Reports included with its Certificate application.

Feature	Preferred Route	FERC Alternative 4	Difference
Total length (miles)	4.8	9.6	+4.8
Construction right-of-way (acres) <u>a</u> /	58.5	117.0	+58.5
Permanent right-of-way (acres) <u>a</u> /	29.2	58.5	+29.3
Total number of parcels crossed	54	57	+3
Number of residences within 25 and 50 feet of the edge of the construction ROW (and associated additional temporary workspace)	1 / 2	0 / 0	-1 / -2
Number of waterbodies crossed	12	14	+2
Number of NWI wetlands crossed	1	5	+4
Total NWI wetland crossing length (feet)	26	321	+295
NWI wetlands within construction ROW (acres) <u>b</u> /	0.2	0.7	+0.5
Agricultural land within construction ROW (acres)	7.4	37.4	+30
Forested land within construction ROW (acres)	36.4	55.1	+18.7
Length parallel or adjacent to existing ROW (miles)	0.2	2.0	+1.8

Table 10.5-7

Comparison of the Preferred Route and FERC Alternative 4

Feature	Preferred Route	FERC Alternative 4	Difference
<p>a/ Assuming 100-foot-wide construction ROW and 50-foot-wide permanent ROW. b/ Assuming 75-foot-wide construction ROW. ROW = right-of-way. NWI = National Wetland Inventory <u>Information Sources:</u> GIS – Analysis based on Geodatabase layers and shapefiles. NC Parcel Boundaries and Standard Fields - http://data.nconemap.gov/geoportal/catalog/search/resource/details.page NLCD – 2006 National Land Cover Data - http://www.epa.gov/mrlc/nlcd-2006.html NWI – National Wetlands Inventory - http://www.fws.gov/wetlands/ USGS – U.S. Geological Survey - http://www.usgs.gov/ NHD – National Hydrography Dataset - http://nhd.usgs.gov/ ESRI - GIS Mapping - http://www.esri.com/</p>			

FERC Alternative 5 (MP 71.4 to MP 72.5)

The Project evaluated FERC Alternative 5 between MP 71.4 and MP 72.5 (see Figure 10.5-6, Appendix 10-A). At MP 71.4, FERC Alternative 5 extends in an east/southeast direction for approximately 0.6 mile and crosses agricultural and forested land and Jimmie Kerr Road. It then turns in a south-southwest direction for approximately 1.7 miles and crosses agricultural and forested land, Cherry Lane, Jimmie Kerr Road, and State Highway 54/E. Harden Street before rejoining the preferred route at MP 72.5.

As shown in Table 10.5-8, the primary advantages of FERC Alternative 5 are:

- affects fewer residences within 50 feet of workspace; and
- affects 0.2 fewer acres of forested land.

The primary disadvantages of FERC Alternative 5 are:

- greater length and land disturbance; and
- affects four more parcels and 8.5 additional acres of agricultural land.

Potential constructability concerns of FERC Alternative 5 are:

- none identified based on initial review.

Based upon the results of the initial evaluation, the Project continues to evaluate FERC Alternative 5 for potential incorporation into the preferred route. The Project will provide the results of its evaluation in the final Resource Reports included with its Certificate application.

Table 10.5-8

Comparison of the Preferred Route and FERC Alternative 5

Feature	Preferred Route	FERC Alternative 5	Difference
Total length (miles)	1.2	2.3	+1.1
Construction right-of-way (acres) <u>a/</u>	14.8	28.2	+13.4
Permanent right-of-way (acres) <u>a/</u>	7.4	14.1	+6.7
Total number of parcels crossed	16	20	+4
Number of residences within 25 and 50 feet of the edge of the construction ROW (and associated additional temporary workspace)	0 / 1	0 / 0	0 / -1
Number of waterbodies crossed	3	3	0
Number of NWI wetlands crossed	0	0	0
Total NWI wetland crossing length (feet)	0	0	0
NWI wetlands within construction ROW (acres) <u>b/</u>	0	0	0
Agricultural land within construction ROW (acres)	3.0	11.5	+8.5
Forested land within construction ROW (acres)	9.5	9.3	-0.2
Length parallel or adjacent to existing ROW (miles)	0.1	0	-0.1

a/ Assuming 100-foot-wide construction ROW and 50-foot-wide permanent ROW.

b/ Assuming 75-foot-wide construction ROW.

ROW = right-of-way. NWI = National Wetland Inventory

Information Sources:

GIS – Analysis based on Geodatabase layers and shapefiles.

NC Parcel Boundaries and Standard Fields - <http://data.nconemap.gov/geoportal/catalog/search/resource/details.page>

NLCD – 2006 National Land Cover Data - <http://www.epa.gov/mlc/nlcd-2006.html>

NWI – National Wetlands Inventory - <http://www.fws.gov/wetlands/>

USGS – U.S. Geological Survey - <http://www.usgs.gov/>

NHD – National Hydrography Dataset - <http://nhd.usgs.gov/>

ESRI - GIS Mapping - <http://www.esri.com/>

FERC Alternative 6 (MP 58.2 to MP 62.0)

The Project evaluated FERC Alternative 6 between MP 58.2 and MP 62.0 (see Figure 10.5-7, Appendix 10-A). At MP 58.2, FERC Alternative 6 extends south and is collocated with a Duke Energy electric transmission easement for approximately 2.9 miles. It crosses agricultural and forested land, Burch Bridge Road and Iseley School Road. The alternative is collocated with an existing utility easement between Iseley School Road and Huffinese Drive (approximately 0.9 mile). It continues in an easterly direction and crosses agricultural and forested land before it rejoins the preferred route at MP 62.0.

As shown in Table 10.5-9, the primary advantages of FERC Alternative 6 are:

- affects 4.0 fewer acres of agricultural land; and
- collocates with existing rights-of-way for an additional 1.6 miles.

The primary disadvantages of FERC Alternative 6 are:

- greater length and land disturbance;
- affects seven more parcels;
- affects more residences within 25 and 50 feet of workspace;

- crosses five more waterbodies and one more wetland; and
- affects 0.2 more acre of wetlands and 3.6 additional acres of forested land.

Potential constructability concerns of FERC Alternative 6 are:

- none identified based on initial review.

Based upon the results of the initial evaluation, the Project continues to evaluate FERC Alternative 6 for potential incorporation into the preferred route. The Project will provide the results of its evaluation in the final Resource Reports included with its Certificate application.

Feature	Preferred Route	FERC Alternative 6	Difference
Total length (miles)	3.7	4.4	+0.7
Construction right-of-way (acres) <u>a/</u>	45.6	53.3	+7.7
Permanent right-of-way (acres) <u>a/</u>	22.7	26.6	+3.9
Total number of parcels crossed	21	28	+7
Number of residences within 25 and 50 feet of the edge of the construction ROW (and associated additional temporary workspace)	0 / 0	1 / 1	+1 / +1
Number of waterbodies crossed	5	10	+5
Number of NWI wetlands crossed	1	2	+1
Total NWI wetland crossing length (feet)	35	131	+96
NWI wetlands within construction ROW (acres) <u>b/</u>	0.1	0.3	+0.2
Agricultural land within construction ROW (acres)	21.8	17.8	-4
Forested land within construction ROW (acres)	21.3	24.9	+3.6
Length parallel or adjacent to existing ROW (miles)	0.9	2.5	+1.6
<p><u>a/</u> Assuming 100-foot-wide construction ROW and 50-foot-wide permanent ROW. <u>b/</u> Assuming 75-foot-wide construction ROW. ROW = right-of-way. NWI = National Wetland Inventory <u>Information Sources:</u> GIS – Analysis based on Geodatabase layers and shapefiles. NC Parcel Boundaries and Standard Fields - http://data.nconemap.gov/geoportal/catalog/search/resource/details.page NLCD – 2006 National Land Cover Data - http://www.epa.gov/mrlc/nlcd-2006.html NWI – National Wetlands Inventory - http://www.fws.gov/wetlands/ USGS – U.S. Geological Survey - http://www.usgs.gov/ NHD – National Hydrography Dataset - http://nhd.usgs.gov/ ESRI - GIS Mapping - http://www.esri.com/</p>			

10.6 ROUTE VARIATIONS

Route variations differ from route alternatives as they consist of alignment adjustments that enhance constructability, reduce impacts on localized features, sensitive resources, terrain, and/or provide appropriate space to allow for the safe operation and maintenance of the pipeline. They are typically shorter than route alternatives and may not always display a clear environmental advantage other than avoiding or reducing the impact to site-specific features or resources. After selection of the preferred route, the Project evaluated potential route variations using both desktop and field survey data to address construction constraints and to reduce impacts to landowners and sensitive environmental resources.

The FERC requested that the Project evaluate two route variations to minimize effects on the Robert Pollok-Hill View Farms at approximately MP 15.0 in Pittsylvania County, Virginia and residences between MP 40.2 and MP 41.0 in Rockingham County, North Carolina. These variations are described below.

10.6.1 Robert Pollock-Hill View Farms Variation

The Project evaluated the Robert Pollok-Hill View Farms Variation between MP 14.8 and MP 15.8 to reduce impact on the farm (see Figure 10.6-1). At MP 14.8, this variation extends west of the preferred route and continues in a southwest direction for approximately 1.0 mile. It parallels an existing utility easement, crosses mostly agricultural and open land, Whitmell School Road/County Road 750, and rejoins the preferred route at MP 15.8.

As shown in Table 10.6-1, the primary advantages of the Robert Pollok-Hill View Farms Variation are:

- affects one less residences within 50 feet of workspace; and
- affects less agricultural land.

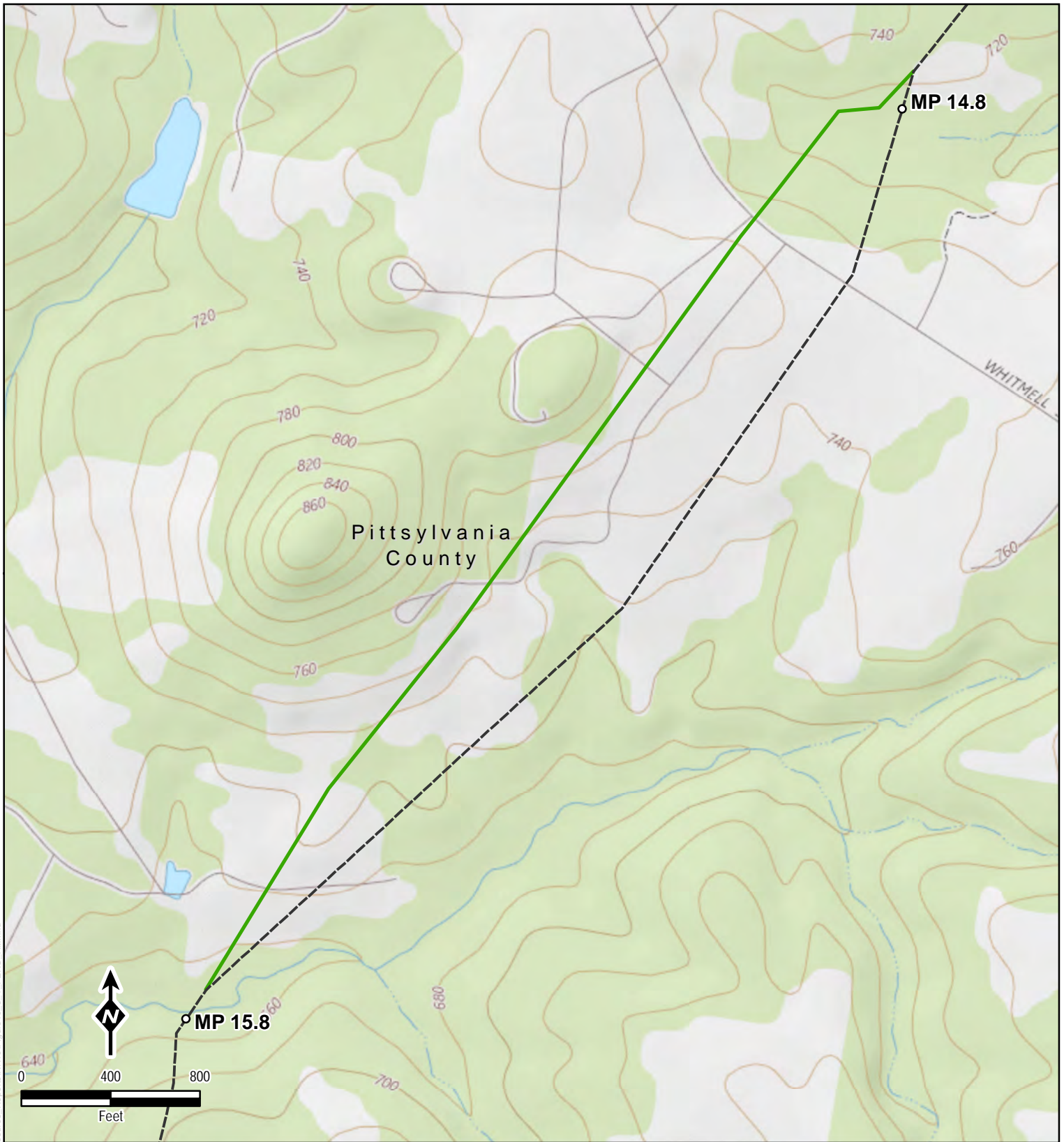
The primary disadvantages of the Robert Pollok-Hill View Farms Variation are:

- affect more forested land.

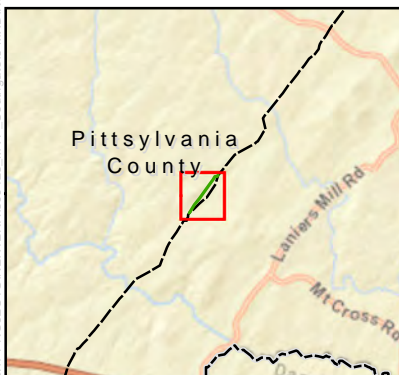
Potential constructability concerns of the Robert Pollok-Hill View Farms Variation are:

- none identified based on initial review.

Based upon the results of the initial evaluation, the Project continues to evaluate the Robert Pollok-Hill View Farms Variation for potential incorporation into the preferred route. The Project will provide the results of its evaluation in the final Resource Reports included with its Certificate application.



S:\PROJECTS\NEXT\ERA300423_MVP_Southern\16-MXD\Bresource_Reports\PR10\Figure10_6_1_FERC_Alt.mxd



- Legend**
- Mileposts
 - Preferred Pipeline Route
 - Robert Pollock-Hill Farms Variation
 - County Boundary

Data Sources: ESRI, USGS, TRC, EQT

1 inch = 600 feet
When Printed 8.5x11





Figure 10.6-1
Sheet 1 of 1

Robert Pollock-Hill Farms Variation
(USGS Topographic)



600 Willowbrook Ln
West Chester, PA 19382

Table 10.6-1

Comparison of the Preferred Route and Robert Pollok-Hill View Farms Variation

Feature	Preferred Route	Robert Pollok-Hill View Farms Variation	Difference
Total length (miles)	1.0	1.0	0
Construction right-of-way (acres) <u>a/</u>	12.3	12.3	0
Permanent right-of-way (acres) <u>a/</u>	6.1	6.1	0
Total number of parcels crossed	7	6	1
Number of residences within 25 and 50 feet of the edge of the construction ROW (and associated additional temporary workspace)	0/1	0/0	0/-1
Number of waterbodies crossed	0	0	0
Number of NWI wetlands crossed	0	0	0
Total NWI wetland crossing length (feet)	0	0	0
NWI wetlands within construction ROW (acres) <u>b/</u>	0	0	0
Agricultural land within construction ROW (acres)	9.1	8.6	-0.5
Forested land within construction ROW (acres)	1.9	2.0	+0.1
Length parallel or adjacent to existing ROW (miles)	0	1	+1

a/ Assuming 100-foot-wide construction ROW and 50-foot-wide permanent ROW.

b/ Assuming 75-foot-wide construction ROW.

ROW = right-of-way. NWI = National Wetland Inventory

Information Sources:

GIS – Analysis based on Geodatabase layers and shapefiles.

NC Parcel Boundaries and Standard Fields - <http://data.nconemap.gov/geoportal/catalog/search/resource/details.page>

NLCD – 2006 National Land Cover Data - <http://www.epa.gov/mrlc/nlcd-2006.html>

NWI – National Wetlands Inventory - <http://www.fws.gov/wetlands/>

USGS – U.S. Geological Survey - <http://www.usgs.gov/>

NHD – National Hydrography Dataset - <http://nhd.usgs.gov/>

ESRI - GIS Mapping - <http://www.esri.com/>

10.6.2 MP 40.0 to MP 41.5 Variation

The Project evaluated a route variation between MP 40.0 and MP 41.5 to reduce the number of residences potentially affected by the Project (see Figure 10.6-2). At MP 40.0, this variation extends south-southwest for approximately 0.8 mile and crosses forested and open land and Narrow Gauge Road. It then turns east-southeast for approximately 0.7 mile and crosses mostly forested land before it rejoins the preferred route at MP 41.5.

As shown in Table 10.6-2, the primary advantages of the MP 40.0 and MP 41.5 Variation are:

- affects one less residences within 25 and 50 feet of workspace; and
- affects less forested land.

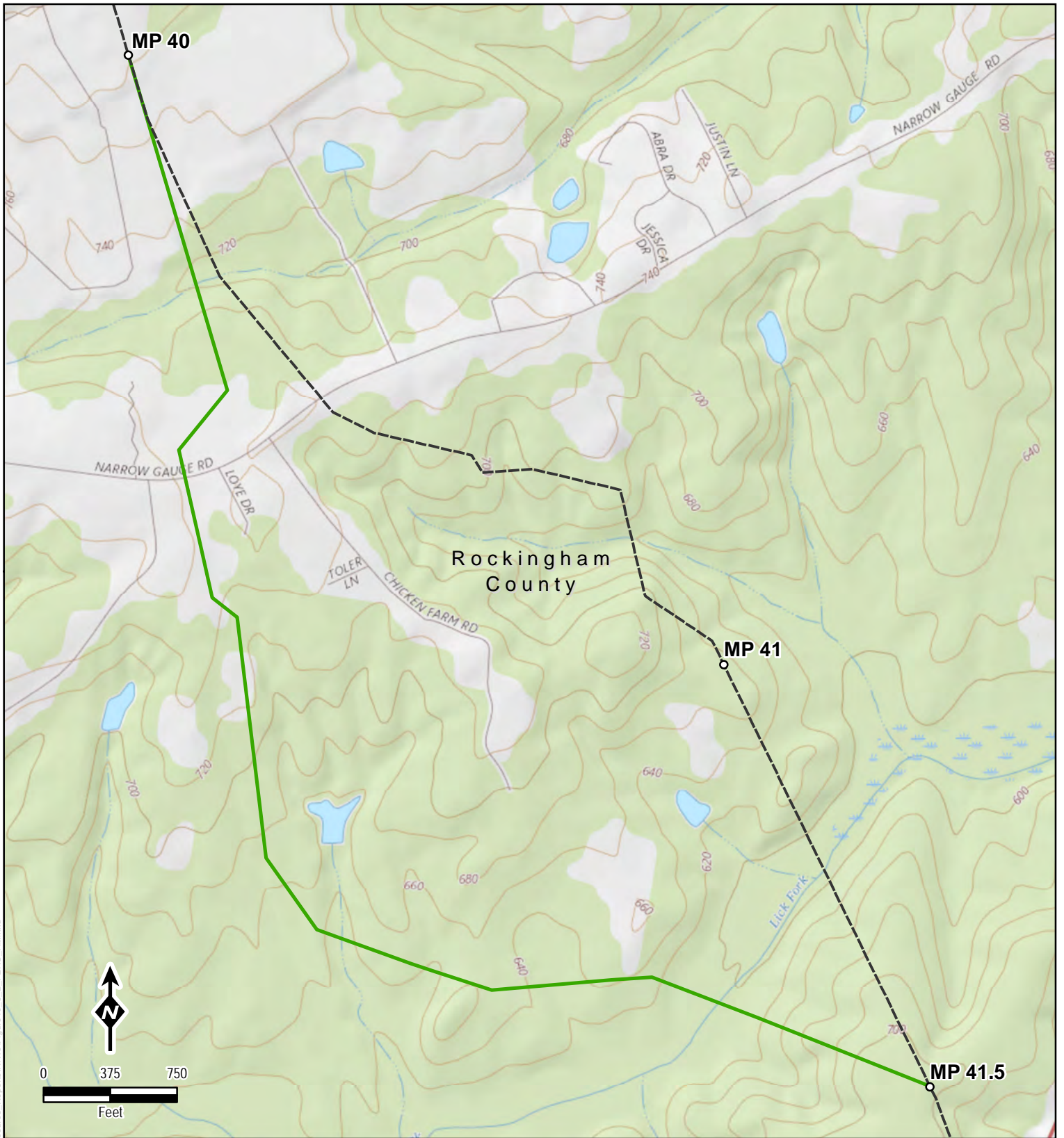
The primary disadvantages of the MP 40.0 and MP 41.5 Variation are:

- greater length and associated land disturbance; and
- affects more wetlands and agricultural land.

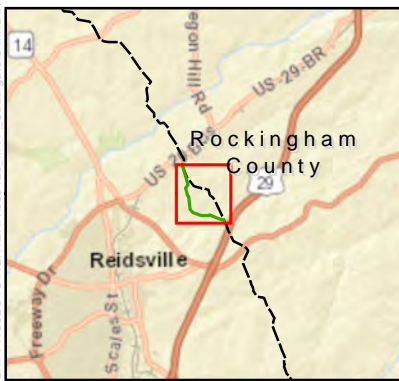
Potential constructability concerns of the MP 40.0 and MP 41.5 Variation are:

- none identified based on initial review.

Based upon the results of the initial evaluation, the Project continues to evaluate the MP 40.0 and MP 41.5 Variation for potential incorporation into the preferred route. The Project will provide the results of its evaluation in the final Resource Reports included with its Certificate application.



S:\PROJECTS\NEXTERA\300423_MVP_Southpole\6_MXD\Bresource_Reports\RR10\Figure10_6_2_FERC_Alt.mxd



- Legend**
- Mileposts
 - Preferred Pipeline Route
 - MP 40.0 to MP 41.5 Variation
 - County Boundary

Data Sources: ESRI, USGS, TRC, EQT

1 inch = 750 feet
When Printed 8.5x11





Figure 10.6-2
Sheet 1 of 1

MP 40.0 to MP 41.5 Variation
(USGS Topographic)



600 Willowbrook Ln
West Chester, PA 19382

Feature	Preferred Route	MP 40.25 to MP 41.0 Variation	Difference
Total length (miles)	1.5	1.7	+0.2
Construction right-of-way (acres) <u>a/</u>	18.4	20.6	+2.2
Permanent right-of-way (acres) <u>a/</u>	9.1	10.3	+1.2
Total number of parcels crossed	26	18	-8
Number of residences within 25 and 50 feet of the edge of the construction ROW (and associated additional temporary workspace)	1/1	0/0	-1/-1
Number of waterbodies crossed	3	3	0
Number of NWI wetlands crossed	1	1	0
Total NWI wetland crossing length (feet)	204.9	282.7	+77.8
NWI wetlands within construction ROW (acres) <u>b/</u>	0.3	0.5	+0.2
Agricultural land within construction ROW (acres)	0.9	2.2	+1.3
Forested land within construction ROW (acres)	12.9	11.1	-1.8
Length parallel or adjacent to existing ROW (miles)	0.5	0.2	-0.3
<p><u>a/</u> Assuming 100-foot-wide construction ROW and 50-foot-wide permanent ROW. <u>b/</u> Assuming 75-foot-wide construction ROW. ROW = right-of-way. NWI = National Wetland Inventory</p> <p><u>Information Sources:</u> GIS – Analysis based on Geodatabase layers and shapefiles. NC Parcel Boundaries and Standard Fields - http://data.nconemap.gov/geoportal/catalog/search/resource/details.page NLCD – 2006 National Land Cover Data - http://www.epa.gov/mrlc/nlcd-2006.html NWI – National Wetlands Inventory - http://www.fws.gov/wetlands/ USGS – U.S. Geological Survey - http://www.usgs.gov/ NHD – National Hydrography Dataset - http://nhd.usgs.gov/ ESRI - GIS Mapping - http://www.esri.com/</p>			

10.6.3 Route Variations Incorporated, Under Evaluation, or Eliminated

The Project has currently identified 92 route variations during preliminary routing and stakeholder outreach efforts. Of these, the Project has incorporated 48 of these into the proposed current preferred route. These are shown in Table 10.6-3 in Appendix 10-B.

The Project is currently evaluating an additional 38 route variations (see Table 10.6-4 in Appendix 10-B). Six of the 38 route variations have been eliminated from further consideration due to site-specific engineering, construction, and/or environmental constraints and are shown in Table 10.6-5 in Appendix 10-B. The Project continues to evaluate these variations and will continue to refine the route as necessary through the remainder of the field survey process. In addition, the Project will continue to coordinate with stakeholders with respect to developing route variations for site-specific concerns and will provide the FERC with a summary of alignment revisions in the final Resource Reports included with the Certificate application.

10.7 ABOVEGROUND FACILITY ALTERNATIVES

10.7.1 Compressor Station Alternatives

The Project conducted a hydraulic analysis to determine the optimum horsepower and compression to provide the increased volumes of natural gas necessary to meet the purpose and need of the Project. As a result, the Project determined that two new compressor stations were necessary to meet the compression requirements for the increased delivery volume and delivery locations. The compressor station site selection-process used multiple factors including: engineering design and construction, pipeline design limitations, land/workspace requirements, site elevation, road access, interconnecting pipe, land availability, and environmental effects.

The Project evaluated alternative sites for its proposed Lambert and Russell Compressor Station sites, as described below.

10.7.1.1 Lambert Compressor Station Alternative

The Project considered one alternative site for the location of the Lambert Compressor Station in Pittsylvania County, Virginia. The proposed Lambert Compressor Station site is located approximately 0.2 mile east of approximate MP 0.3 of the H-650 pipeline route (see Figure 10.7-1, Appendix 10-C). Land use at the proposed compressor station site consists of forested and agricultural land. Table 10.7-1 provides an analysis of the proposed Lambert Compressor Station site and the alternative site.

Lambert Compressor Station Alternative 1

The Lambert Compressor Station Alternative 1 site is located near MP 0.0 of the H-650 pipeline approximately 0.3 mile northwest of the proposed compressor station site (see Figure 10.7-1, Appendix 10-C). The alternative site consists of forested land, is surrounded by forested land, and would require a new permanent access road from Transco Road/County Road 692 located approximately 0.4 mile to the northeast. An existing electric powerline is located approximately 0.6 mile to the northwest of the alternative site. Two residences are located approximately 0.3 and 0.4 mile northeast and northwest of the alternative site, respectively, and a third residence is located approximately 0.5 mile to the southwest. Transco's compressor facilities (Stations 165 and 166) are located approximately 0.2 mile to the east of the Lambert Compressor Station Alternative 1 site.

As shown in Table 10.7-1, the primary advantages of the Lambert Compressor Station Alternative 1 are:

- smaller site size and associated land disturbance;
- shorter pipeline length to reach the site; and
- shorter access road length to reach the site.

The primary disadvantages of the Lambert Compressor Station Alternative 1 are:

- unknown availability of land;
- more noise sensitive areas within 1.0 mile of the site.

Potential constructability concerns of the Lambert Compressor Station Alternative 1 are:

- future natural gas infrastructure associated with the Mountain Valley Pipeline to be placed within the site.

Because the Lambert Compressor Station Alternative 1 would be within 1.0 mile of more noise sensitive areas, be located in an area of future natural gas infrastructure, and does not offer a constructability advantage, the Project eliminated this alternative site from further consideration as its preferred compressor station site.

Table 10.7-1

Comparison of the Proposed Lambert Compressor Station Site and Alternative 1

Feature	Proposed Lambert Compressor Station	Alternative 1
Land availability (Yes/No)	Yes	Unknown
Total land to be acquired (estimated acres)	To Be Determined	Unknown
Construction workspace (acres)	18.6	14.5
Operation workspace (acres)	4.1	Unknown
Length of pipeline required to reach the site (miles)	0.2	<0.1
Length of access road required to reach the site (miles)	0.5	0.4
Existing land use (type)	Forested/Agriculture	Forested
Construction/operation impact on prime farmland soils (acres)	4.1 / 4.1	14.5 / Unknown
Construction/operation impact on NWI wetlands (acres)	0 / 0	0 / 0
Presence of critical habitat or federally endangered or threatened species (Yes/No)	No	Unknown
Presence of NRHP-eligible sites (Yes/No)	No	No
Number of NSAs within 1 mile of the site	43	55
Zoning	Unknown	Unknown
NWI = National Wetland Inventory; NRHP = National Register of Historic Places; NSAs = Noise Sensitive Areas; <u>Information Sources:</u> GIS – Analysis based on Geodatabase layers and shapefiles. NLCD – 2006 National Land Cover Data - http://www.epa.gov/mrlc/nlcd-2006.html NWI – National Wetlands Inventory - http://www.fws.gov/wetlands/ USGS – U.S. Geological Survey - http://www.usgs.gov/ NHD – National Hydrography Dataset - http://nhd.usgs.gov/ ESRI - GIS Mapping - http://www.esri.com/		

10.7.1.2 Russell Compressor Station Alternatives

The Project considered four alternative sites for the location of the Russell Compressor Station in Rockingham County, North Carolina. The proposed Russell Compressor Station site is located approximately 1.2 miles west of approximate MP 26.9 of the H-650 pipeline (see Figure 10.7-2, Appendix 10-C). Land use at the proposed compressor station site consists of forested land. Table 10.7-2 provides an analysis of the proposed Russell Compressor Station site and the four alternative sites.

Russell Compressor Station Alternative 1

The Russell Compressor Station Alternative 1 site is located in Rockingham County, North Carolina approximately 0.3 mile southeast of MP 29.0 of the H-650 pipeline and approximately 0.3 mile west of the Dan River (see Figure 10.7-2, Appendix 10-C). The alternative site consists of forested land, is surrounded by forested land, and would require a new an approximate 0.4-mile long permanent access road to the west, from Pineknoll Drive. Pineknoll Drive connects with East Stadium Drive/County Road 1747 and traverses residential areas. The Alternative 1 site is not located near existing electric transmission or distribution lines. The nearest residences, and residential neighborhoods, are located approximately 0.5 west of the alternative site.

As shown in Table 10.7-2, the primary advantages of the Russell Compressor Station Alternative 1 are:

- smaller site size and associated land disturbance; and
- shorter pipeline length to reach the site.

The primary disadvantages of the Russell Compressor Station Alternative 1 are:

- unknown availability of land;
- longer access road through residential areas to reach the site and;
- more noise sensitive areas within 1.0 mile of the site.

Potential constructability concerns of the Russell Compressor Station Alternative 1 are:

- topography less desirable.

Because the Russell Compressor Station Alternative 1 has unknown land availability, would require a longer access through residential areas, be located within 1.0 mile of more noise sensitive areas, has undesirable site topography, and is not located near existing electric transmission or distribution lines, the Project eliminated this alternative site from further consideration as its preferred compressor station site.

Table 10.7-2

Comparison of the Proposed Russell Compressor Station Site and Alternative Sites

Feature	Proposed Russell Compressor Station	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Land availability (Yes/No)	Yes	Unknown	Unknown	No	Unknown
Total land to be acquired (estimated acres)	To Be Determined	Unknown	Unknown	Unknown	Unknown
Construction workspace (acres)	20.6	17.3	14.7	9.7	14.4
Operation workspace (acres)	4.1	Unknown	Unknown	Unknown	Unknown
Length of pipeline required to reach the site (miles)	1.2	0.3	0.3	0.1	0.1
Length of access road required to reach the site (miles)	0.2	0.4	0.1	0.1	0.2
Existing land use (type)	Forested	Forested	Agricultural	Forested	Forested
Construction/operation impact on prime farmland soils (acres)	1.6 / 1.6	9 / Unknown	14.7 / Unknown	9.7 / Unknown	12.5 / Unknown
Construction/operation impact on NWI wetlands (acres)	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
Presence of critical habitat or federally endangered or threatened species (Yes/No)	Unknown	Unknown	Unknown	Unknown	Unknown
Presence of NRHP-eligible sites (Yes/No)	No	No	No	No	No
Number of NSAs within 1 mile of the site	19	96	11	5	5
Zoning	Unknown	Unknown	Unknown	Unknown	Unknown
NWI = National Wetland Inventory; NRHP = National Register of Historic Places; NSAs = Noise Sensitive Areas; <u>Information Sources:</u> GIS – Analysis based on Geodatabase layers and shapefiles. NLCD – 2006 National Land Cover Data - http://www.epa.gov/mrlc/nlcd-2006.html NWI – National Wetlands Inventory - http://www.fws.gov/wetlands/ USGS – U.S. Geological Survey - http://www.usgs.gov/ NHD – National Hydrography Dataset - http://nhd.usgs.gov/ ESRI - GIS Mapping - http://www.esri.com/					

Russell Compressor Station Alternative 2

The Russell Compressor Station Alternative 2 site is located in Rockingham County, North Carolina approximately 0.3 mile west of MP 27.7 of the H-650 pipeline (see Figure 10.7-2, Appendix 10-C). The alternative site consist of agricultural land and forested windrows, is surround by mostly agricultural land. Dry Creek is located along the southern boundary of the alternative site and a tributary to the Dan River is located approximately 0.3 mile to the east. The alternative site would require a new permanent access road from U.S. Highway 311 located approximately 0.1 mile to the north. The Alternative 2 site is not located near existing electric transmission or distribution lines. The nearest residences is located along Willow Oak Drive, approximately 0.3 southwest of the alternative site.

As shown in Table 10.7-2, the primary advantages of the Russell Compressor Station Alternative 2 are:

- smaller site size and associated land disturbance;
- shorter pipeline length to reach the site;
- shorter access road length to reach the site; and
- fewer noise sensitive areas within 1.0 mile of the site.

The primary disadvantages of the Russell Compressor Station Alternative 2 are:

- unknown availability of land.

Potential constructability concerns of the Russell Compressor Station Alternative 2 are:

- situated within a 100 year floodplain.

Because the Russell Compressor Station Alternative 2 has unknown land availability, is situated within a 100-year floodplain, and is not located near existing electric transmission or distribution lines, the Project eliminated this alternative site from further consideration as its preferred compressor station site.

Russell Compressor Station Alternative 3

The Russell Compressor Station Alternative 3 site is located in Rockingham County, North Carolina approximately 0.1 mile west of MP 26.6 of the H-650 pipeline (see Figure 10.7-2, Appendix 10-C). The alternative site consist of forested land, is surrounded by forested land to the west, northeast, and southwest, and open/agricultural land to the east. The alternative site would require a new permanent access road from U.S. Highway 311 located approximately 0.1 mile to the south. The Alternative 3 site is not located near existing electric transmission or distribution lines. The nearest residences is located on the east side of U.S. Highway 311 and is approximately 0.2 mile southeast of the alternative site.

As shown in Table 10.7-2, the primary advantages of the Russell Compressor Station Alternative 3 are:

- smaller site size and associated land disturbance;
- shorter pipeline length to reach the site;
- shorter access road length to reach the site; and
- fewer noise sensitive areas within 1.0 mile of the site.

The primary disadvantages of the Russell Compressor Station Alternative 3 are:

- land not available.

Potential constructability concerns of the Russell Compressor Station Alternative 3 are:

- none identified.

Because the land for Russell Compressor Station Alternative 3 is not available, the Project eliminated this alternative site from further consideration as its preferred compressor station site.

Russell Compressor Station Alternative 4

The Russell Compressor Station Alternative 4 site is located in Pittsylvania, Virginia less than 0.1 mile east of MP 25.2 of the H-650 pipeline (see Figure 10.7-2, Appendix 10-C). The alternative site consists of forested land and is surrounded by forested land to the west. The alternative site would require a new permanent access road from U.S. Highway 311 located approximately 0.2 mile to the southeast. The Alternative 4 site is not located near existing electric transmission or distribution lines. The nearest residences are located approximately 1.0 mile to the west and southeast of the alternative site.

As shown in Table 10.7-2, the primary advantages of the Russell Compressor Station Alternative 4 are:

- smaller site size and associated land disturbance;
- shorter pipeline length to reach the site; and
- fewer noise sensitive areas within 1.0 mile of the site.

The primary disadvantages of the Russell Compressor Station Alternative 4 are:

- unknown availability of land.

Potential constructability concerns of the Russell Compressor Station Alternative 4 are:

- topography less desirable.

Because the Russell Compressor Station Alternative 4 has unknown land availability, undesirable site topography, and is not located near existing electric transmission or distribution lines, the Project eliminated this alternative site from further consideration as its preferred compressor station site.

10.7.2 Electric Driven Compressor Units

The proposed Project compressor stations will include centrifugal turbines powered by natural gas with the natural gas obtained directly from the pipeline. While electric motor-driven compressors can power compressor stations in some instances, this is not feasible for the Project due to the lack of sufficient electricity required for each compressor station site.

To use electric driven compressor units, electric power at high voltage would need to be supplied by overhead transmission lines to a substation that would be located at each compressor station site. The compressor stations are not located near existing high voltage electric transmission lines. The substation would step down the voltage for electric driven compressor motors and other miscellaneous loads. Additionally, electric driven motors located at each compressor station could require a liquid cooled variable frequency drive, primarily to start the motor and then for speed control of the compressor. For

these reasons, the use of electric driven compressor units is not a reasonable alternative for the proposed Project compressor stations.

10.7.3 Meter Station Alternatives

The proposed Lambert Interconnect, LN 3600 Interconnect, T-15 Dan River Interconnect, and T-21 Haw River Interconnect locations reflect customer and system requirements. There are no alternatives that would satisfy all of these requirements; therefore, no alternatives were considered.

10.8 REFERENCES

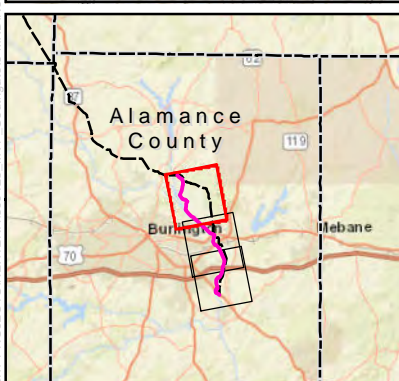
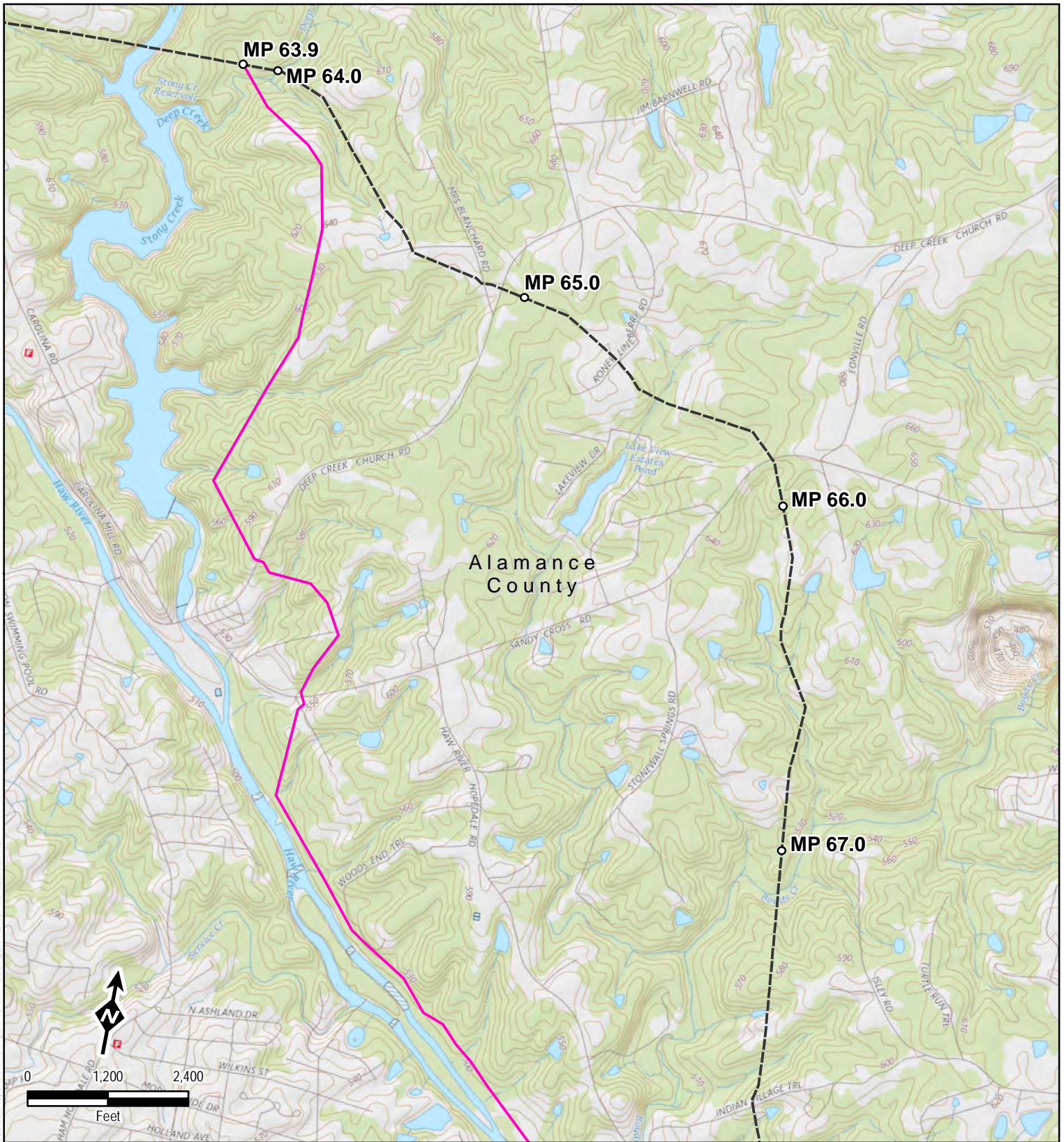
- U.S. Energy Information Agency (EIA). 2017a. State Profile and Energy Estimates – Virginia. Available online at: <https://www.eia.gov/state/analysis.php?sid=VA> Accessed June 3, 2018.
- U.S. Energy Information Agency (EIA). 2017b. State Profile and Energy Estimates – North Carolina. Available online at: <https://www.eia.gov/state/analysis.php?sid=NC> Accessed June 3, 2018.

MVP Southgate Project

Docket No. PF18-4-000

Draft Resource Report 10

Appendix 10-A
FERC Requested Route Alternative Figures



- Legend**
- Mileposts
 - Preferred Pipeline Route
 - FERC Alternative 1
 - County Boundary

Data Sources: ESRI, USGS, TRC, EQT



Figure 10.5-2
Sheet 1 of 3

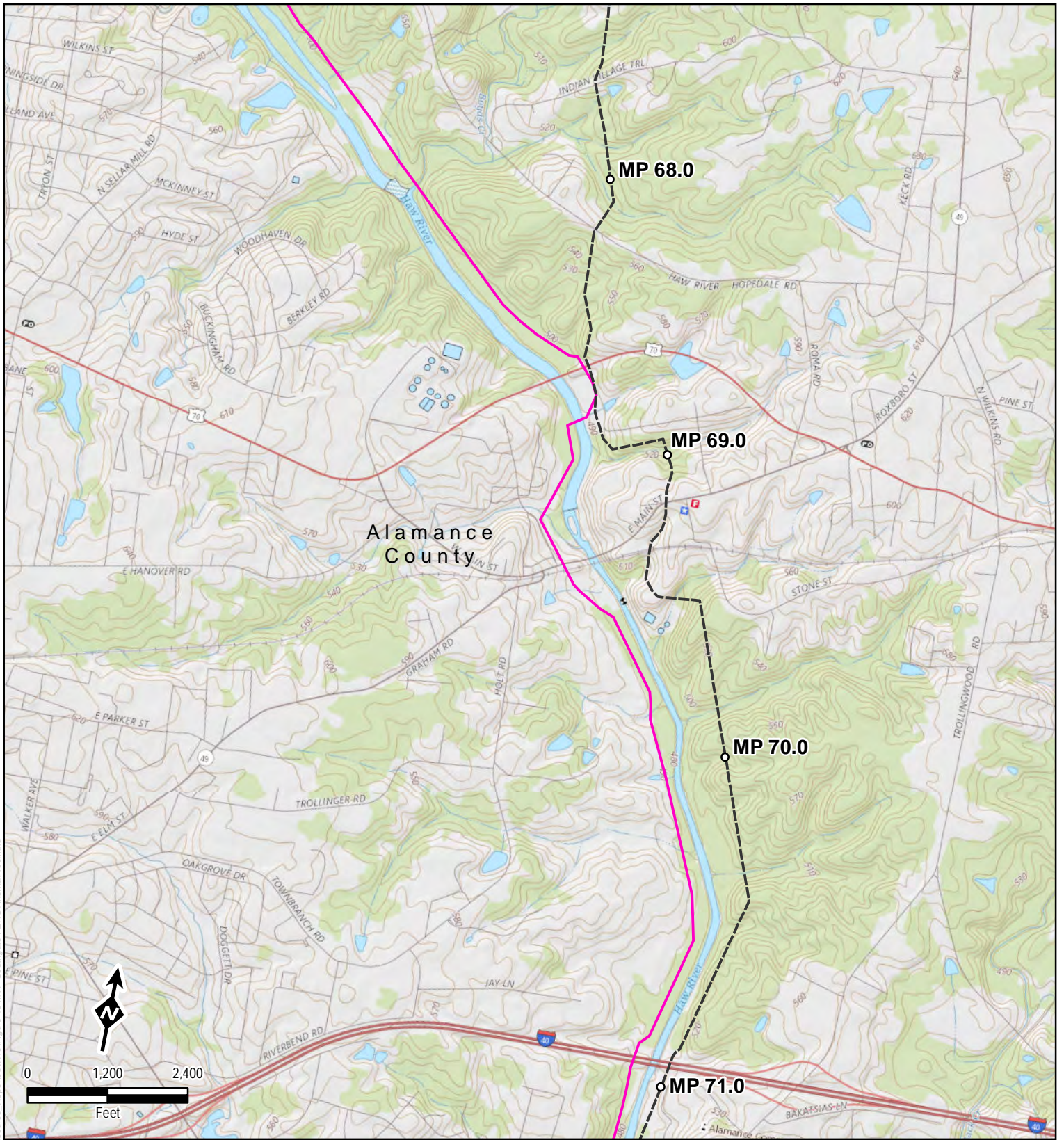
FERC Alternative 1
(USGS Topographic)



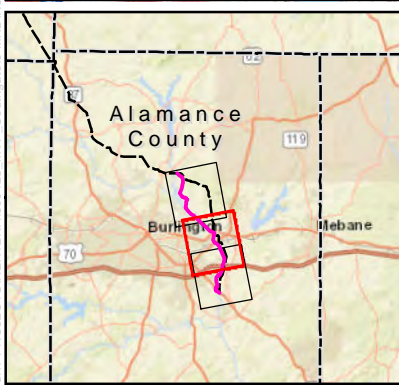
600 Willowbrook Ln
West Chester, PA 19382

1 inch = 24,000 inches
When Printed 8.5x11

S:\PROJECTS\NEXT\TBA\300423_MVP_Southbottle6\MXD\Bresource_Reports\B10\Figure_10.MVP_Southbottle_FERC_Alternatives.mxd



S:\4-PROJECTS\NEXT\TERRA\300423_MVP_Southbottle\6-MXD\B-resource_Reports\10-Figure_10-MVP_Southbottle_FERC_Alternatives.mxd



Legend

- Mileposts
- Preferred Pipeline Route
- FERC Alternative 1
- County Boundary

Data Sources: ESRI, USGS, TRC, EQT



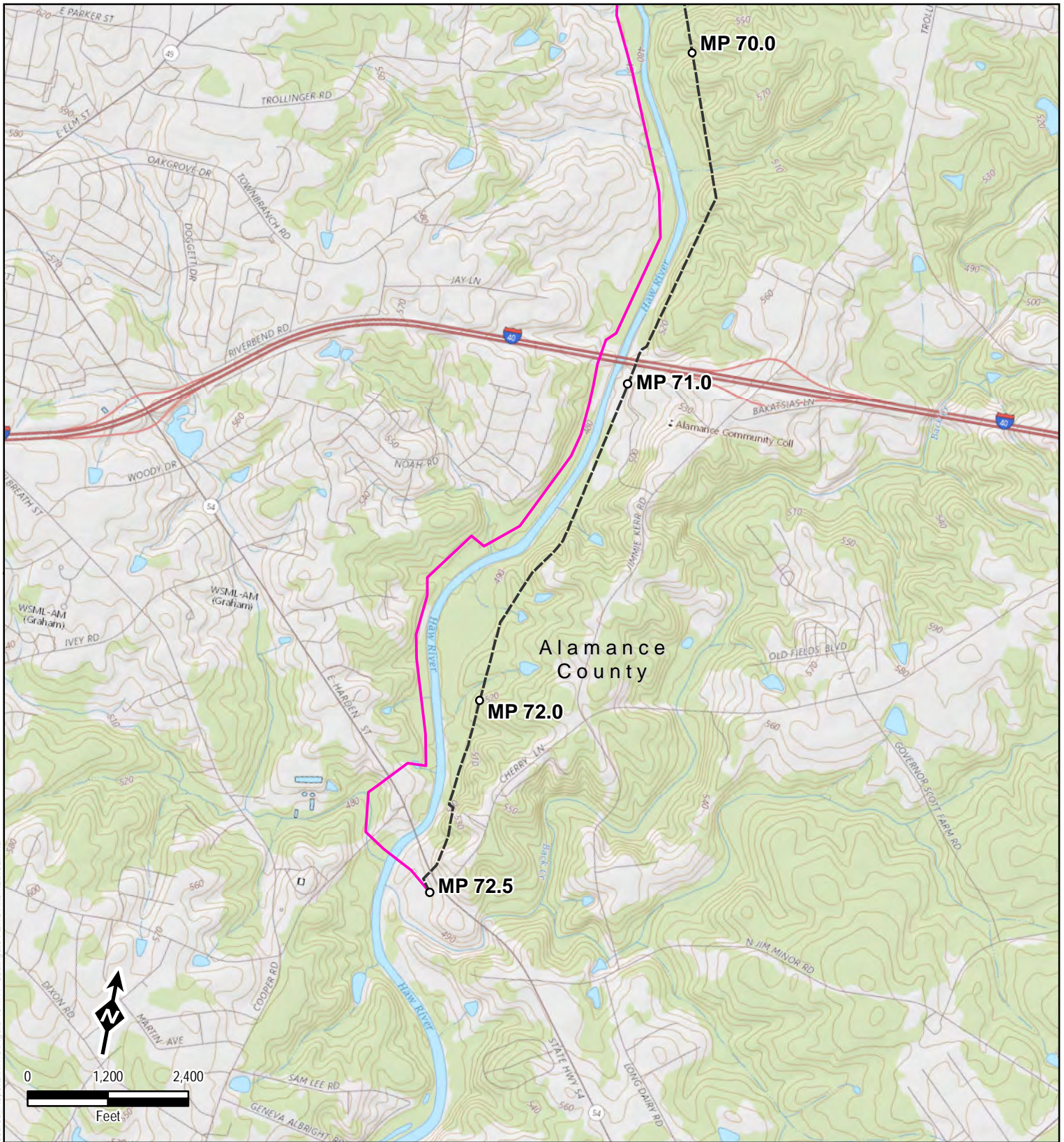
Figure 10.5-2
Sheet 2 of 3

FERC Alternative 1
(USGS Topographic)

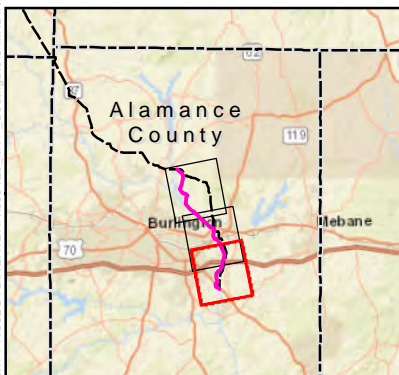
1 inch = 24,000 inches
When Printed 8.5x11



600 Willowbrook Ln
West Chester, PA 19382



S:\4-PROJECTS\NEXT\TERRA\300423_MVP_Southbottle\6-MXD\B-resource_Reports\B10\Figure_10.MVP_Southbottle_FERC_Alternatives.mxd



- Legend**
- Mileposts
 - Preferred Pipeline Route
 - FERC Alternative 1
 - County Boundary

Data Sources: ESRI, USGS, TRC, EQT



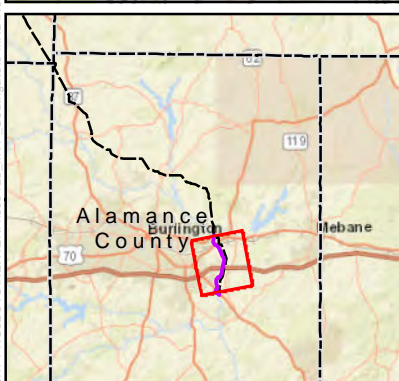
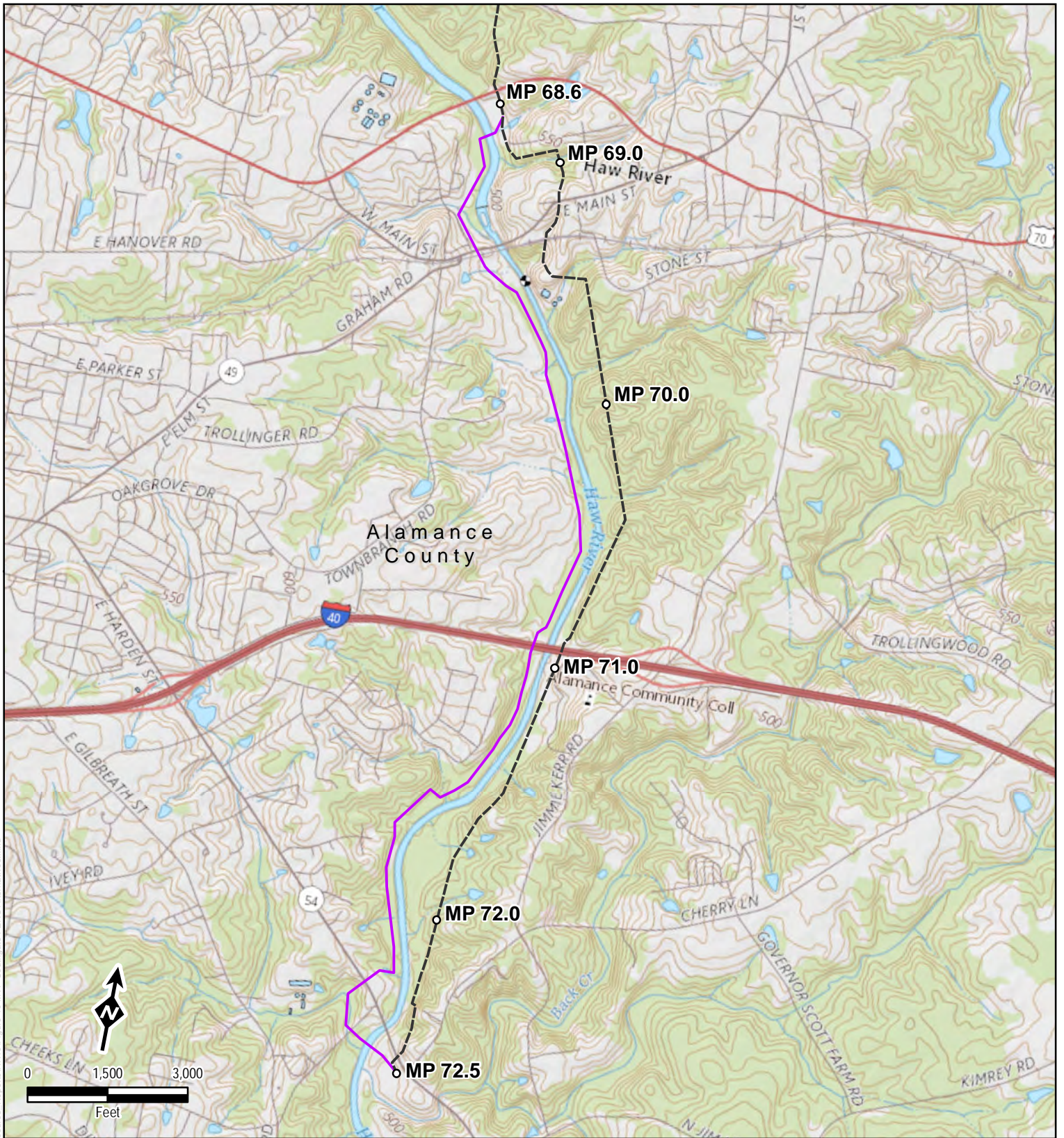
Figure 10.5-2
Sheet 3 of 3

FERC Alternative 1
(USGS Topographic)

1 inch = 24,000 inches
When Printed 8.5x11



600 Willowbrook Ln
West Chester, PA 19382



- Legend**
- Mileposts
 - Preferred Pipeline Route
 - FERC Alternative 2
 - County Boundary

Data Sources: ESRI, USGS, TRC, EQT

1 inch = 30,000 inches
When Printed 8.5x11



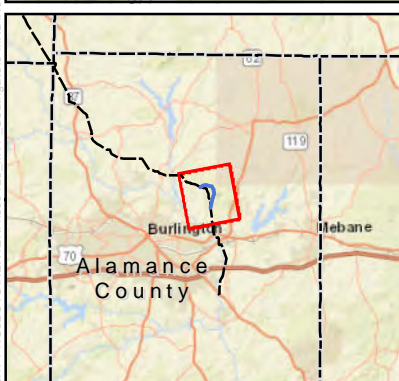
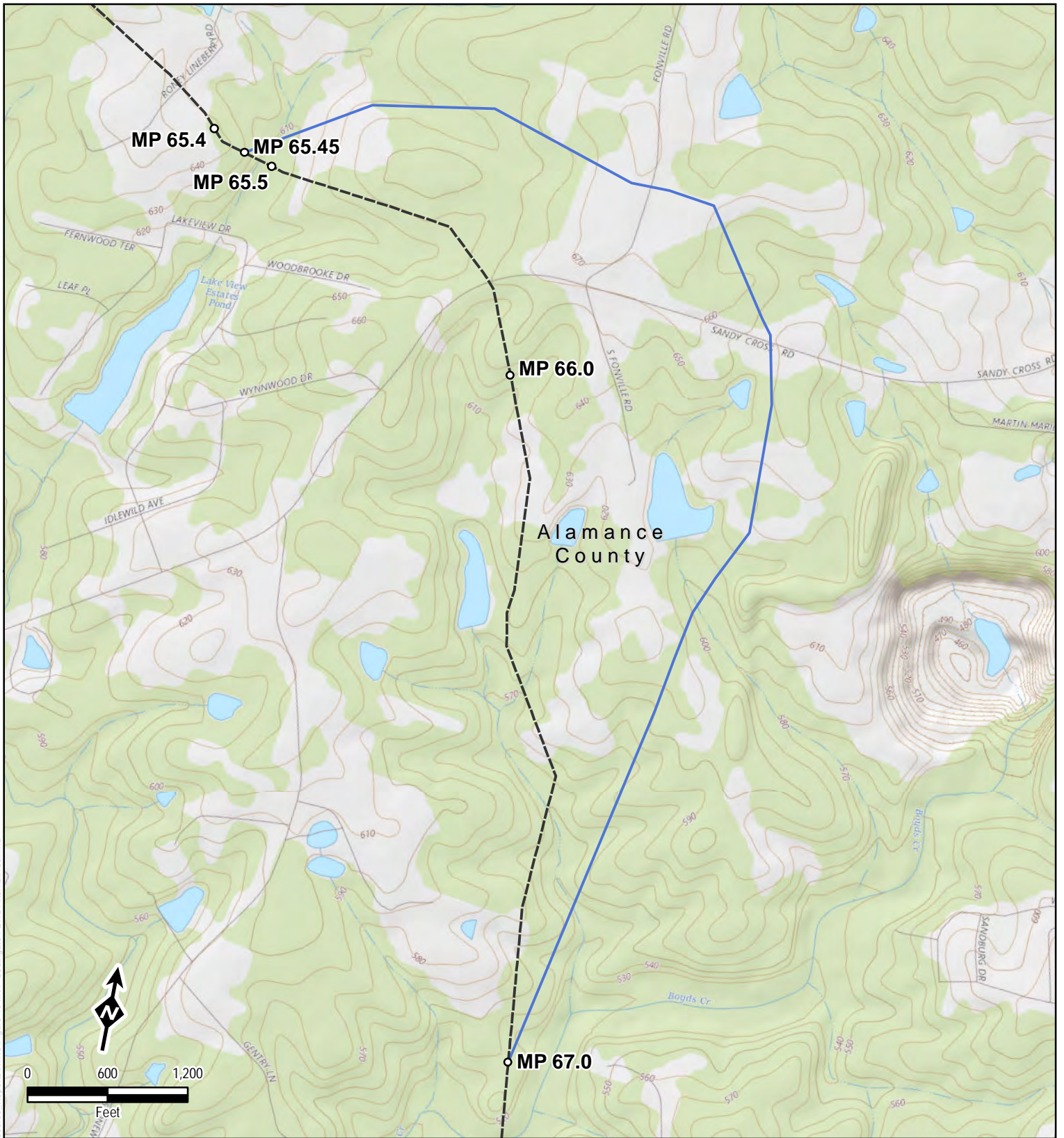
Figure 10.5-3
Sheet 1 of 1

FERC Alternative 2
(USGS Topographic)



600 Willowbrook Ln
West Chester, PA 19382

S:\PROJECTS\NEXT\TBA\300423_MVP_South\mvp\6-MXD\Bresource_Reports\B10\Figure_10.MVP_South\ferc\Alternatives.mxd



- Legend**
- Mileposts
 - Preferred Pipeline Route
 - FERC Alternative 3
 - County Boundary

Data Sources: ESRI, USGS, TRC, EQT

1 inch = 12,000 inches
When Printed 8.5x11



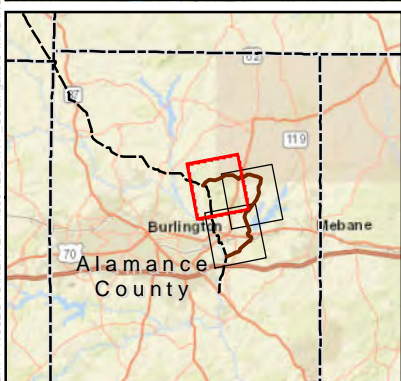
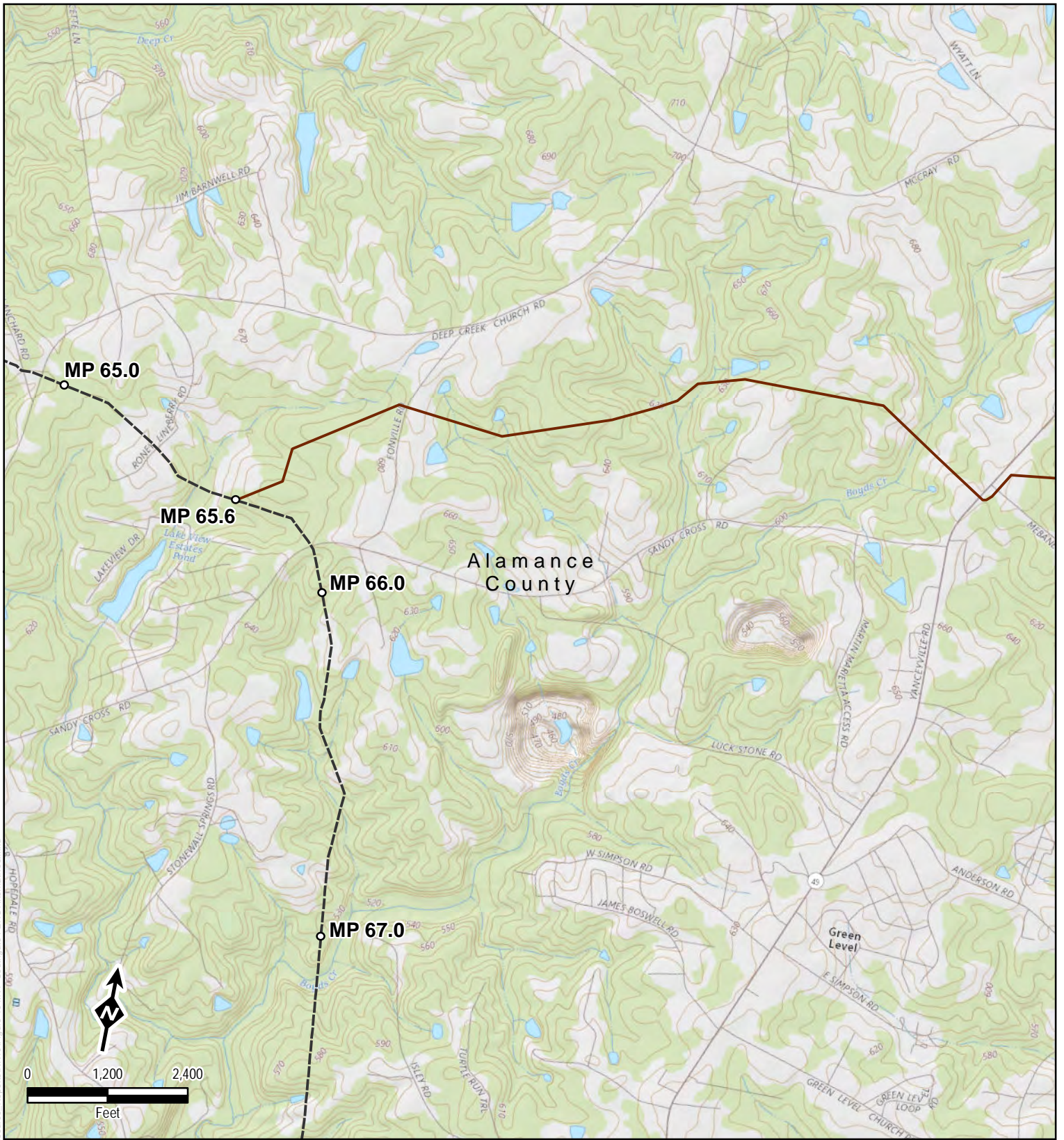
Figure 10.5-4
Sheet 1 of 1

FERC Alternative 3
(USGS Topographic)



600 Willowbrook Ln
West Chester, PA 19382

S:\PROJECTS\NEXTERRA\300423_MVP_SouthState\6-MXD\Bresource_Reports\RR10\Figure_10.MVP_SouthState_FERC_Alternatives.mxd



Legend

- Mileposts
- Preferred Pipeline Route
- FERC Alternative 4
- County Boundary

Data Sources: ESRI, USGS, TRC, EQT

1 inch = 24,000 inches
When Printed 8.5x11



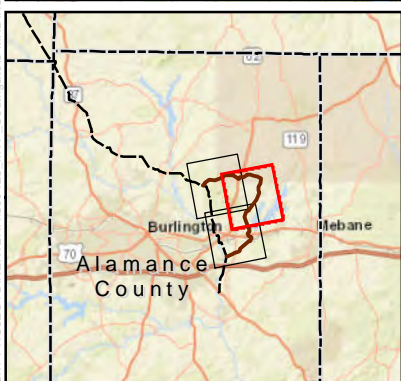
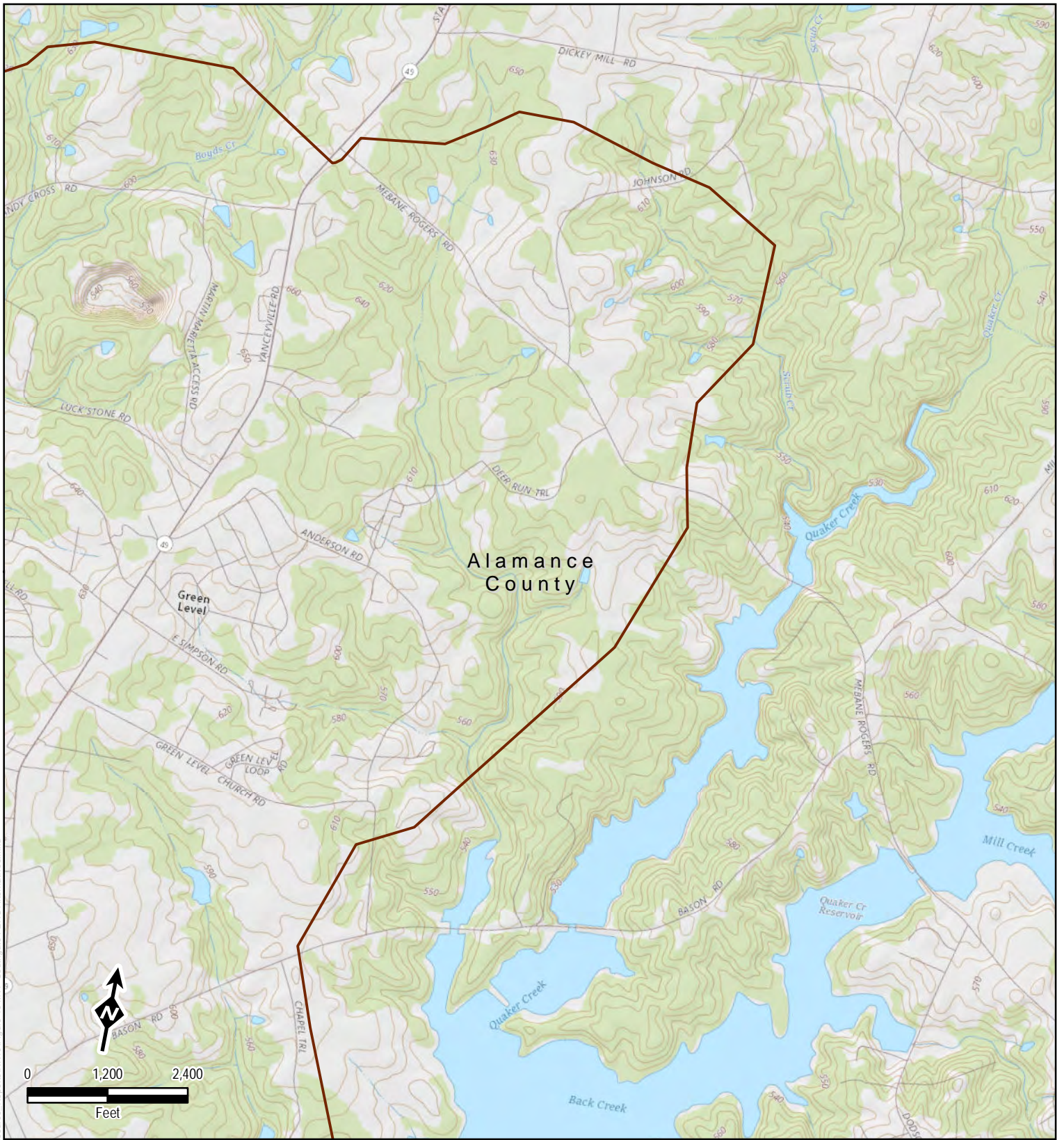
Figure 10.5-5
Sheet 1 of 3

FERC Alternative 4
(USGS Topographic)



600 Willowbrook Ln
West Chester, PA 19382

S:\PROJECTS\NEXT\BA300423_MVP_Southbottle6-MXD\B-resource_Reports\10.5-5_Southbottle_FERC Alternatives.mxd



Legend

- FERC Alternative 4
- County Boundary

Data Sources: ESRI, USGS, TRC, EQT

1 inch = 24,000 inches
When Printed 8.5x11



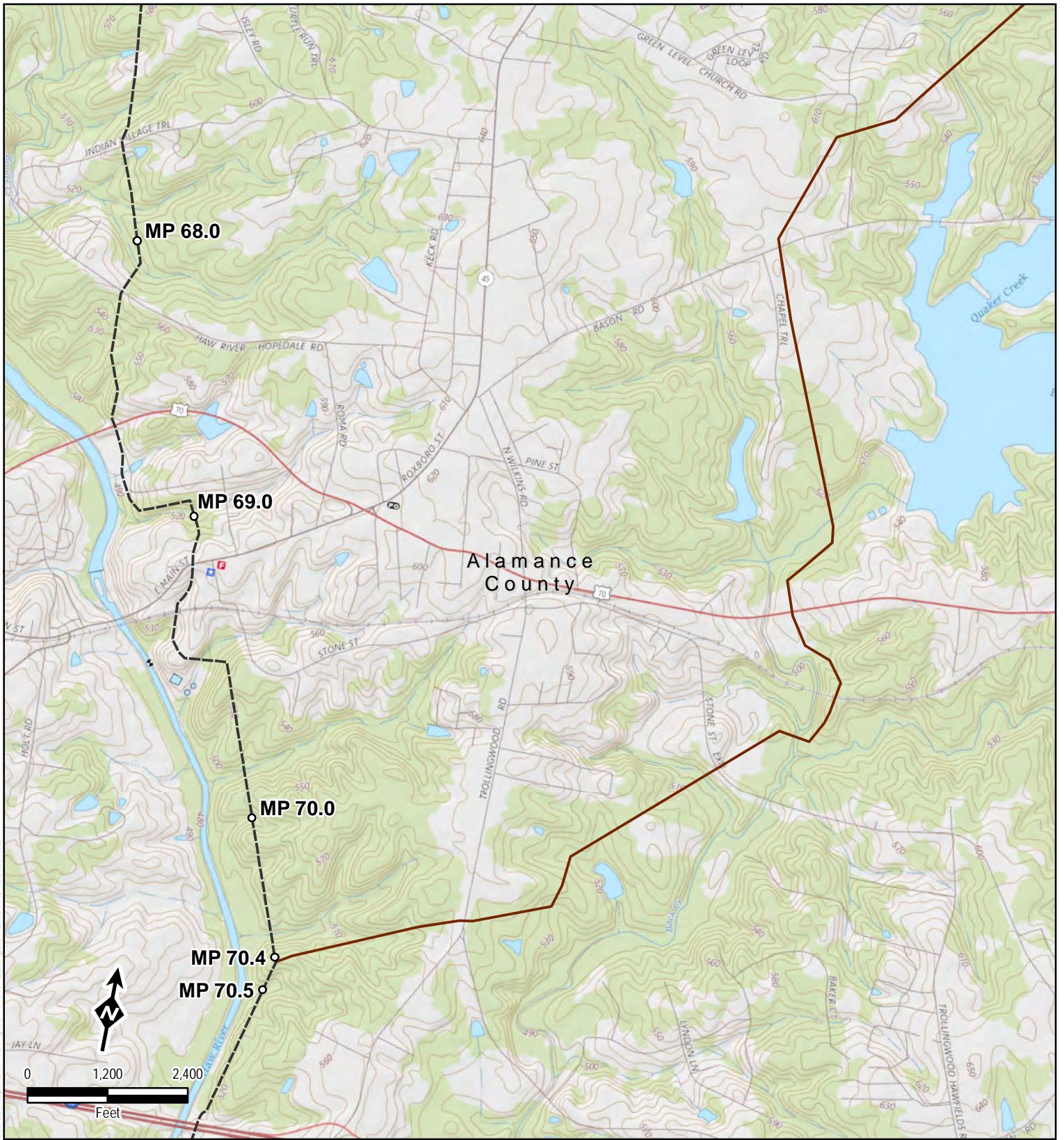
Figure 10.5-5
Sheet 2 of 3

FERC Alternative 4
(USGS Topographic)

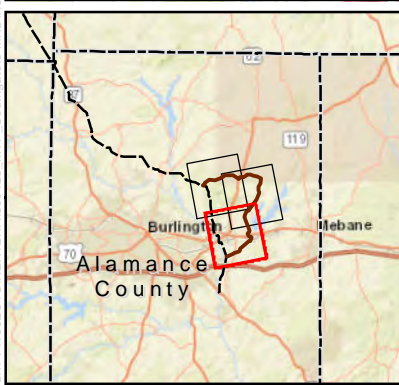


600 Willowbrook Ln
West Chester, PA 19382

S:\PROJECTS\NEXTEBA\300423_MVP_Southbottle\6-MXD\B-resource_Reports\B10\Figure_10.MVP_Southbottle_FERC_Alternatives.mxd



S:\PROJECTS\NEXTERRA\300423_MVP_Southbottle\6-MXD\Bresource_Reports\B10\Figure_10.MVP_Southbottle_FERC_Alternatives.mxd



- Legend**
- Mileposts
 - Preferred Pipeline Route
 - FERC Alternative 4
 - County Boundary

Data Sources: ESRI, USGS, TRC, EQT

1 inch = 24,000 inches
When Printed 8.5x11

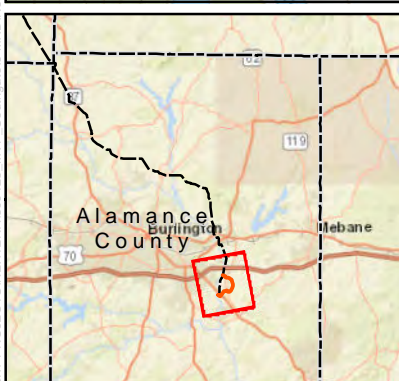
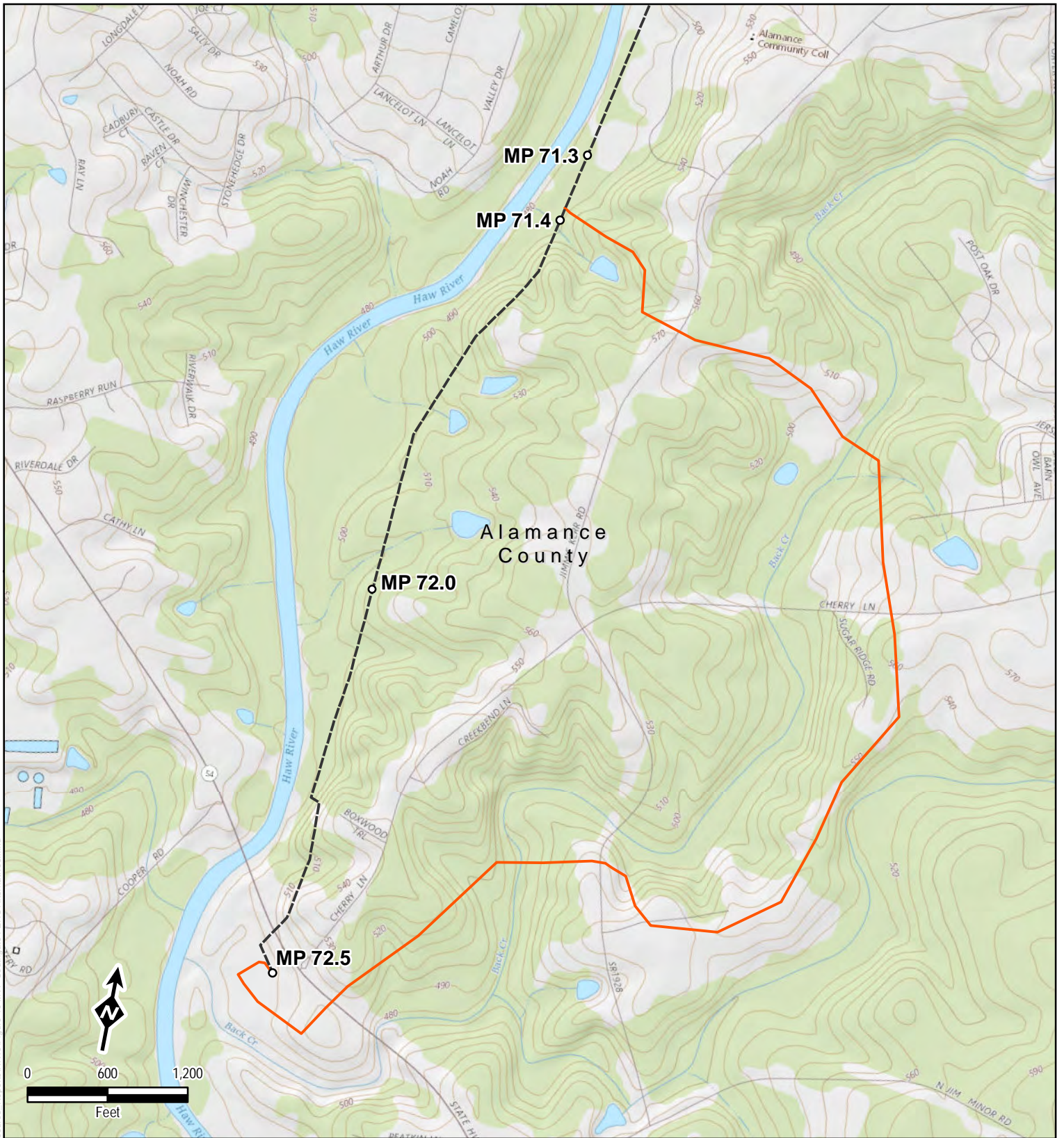


Figure 10.5-5
Sheet 3 of 3

FERC Alternative 4
(USGS Topographic)



600 Willowbrook Ln
West Chester, PA 19382



- Legend**
- Mileposts
 - Preferred Pipeline Route
 - FERC Alternative 5
 - County Boundary

Data Sources: ESRI, USGS, TRC, EQT



Figure 10.5-6
Sheet 1 of 1

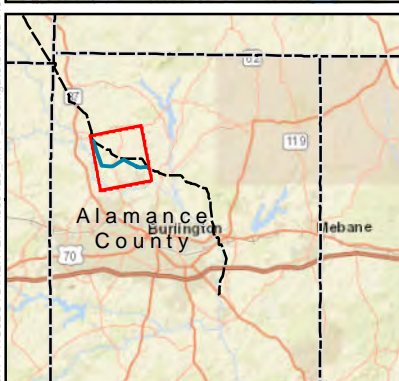
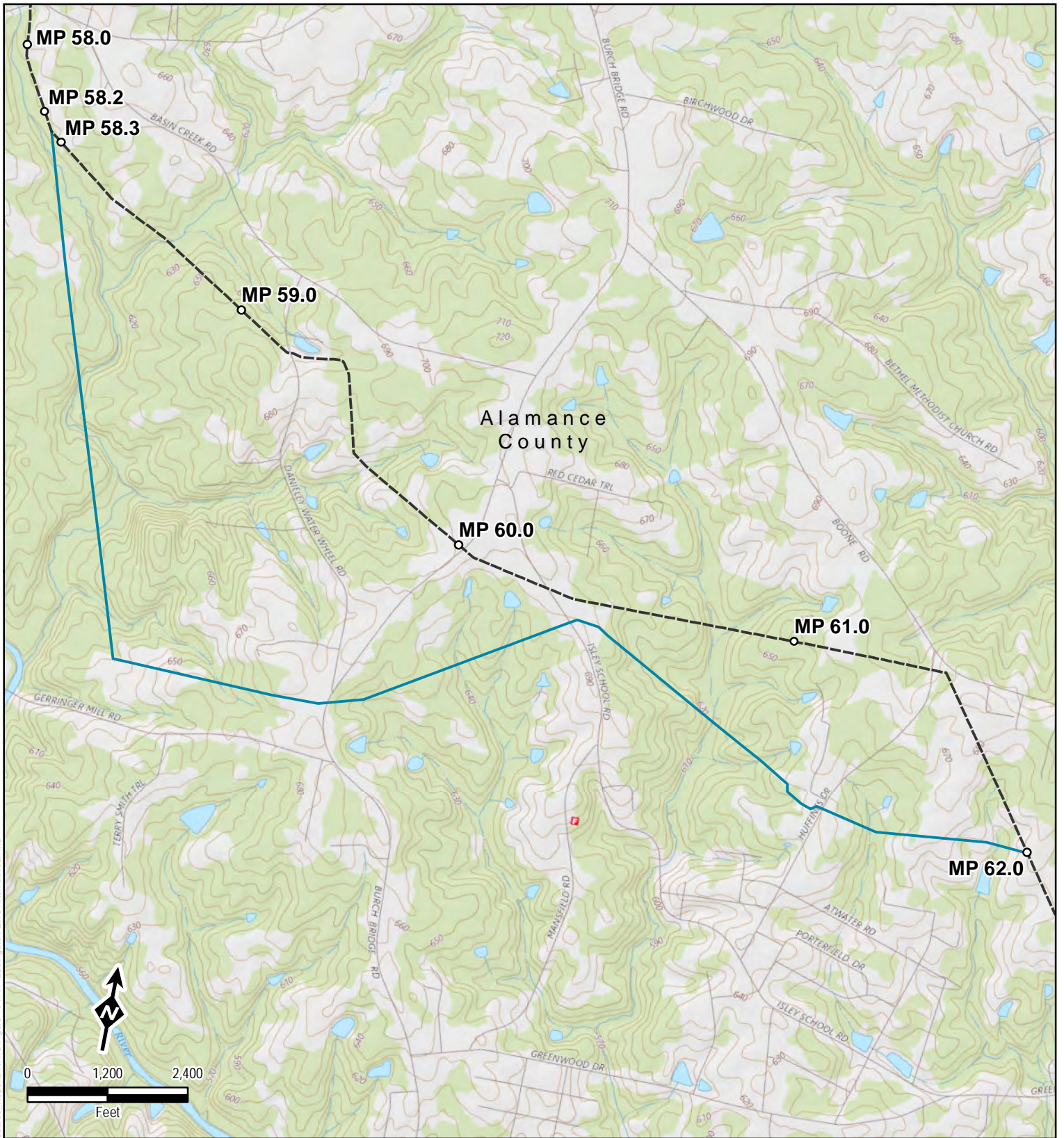
FERC Alternative 5
(USGS Topographic)

1 inch = 12,000 inches
When Printed 8.5x11



600 Willowbrook Ln
West Chester, PA 19382

S:\4\PROJECTS\NEXT\TERRA\300423_MVP_South\mvp\6\MXD\Bresource_Reports\10\Figure_10.MVP_South\FERC_Alternatives.mxd



Legend

- Mileposts
- Preferred Pipeline Route
- FERC Alternative 6
- County Boundary

Data Sources: ESRI, USGS, TRC, EQT

1 inch = 24,000 inches
 When Printed 8.5x11

Mountain Valley
 PIPELINE LLC

Figure 10.5-7
 Sheet 1 of 1

FERC Alternative 6
 (USGS Topographic)

TRC
 Results you can rely on

600 Willowbrook Ln
 West Chester, PA 19382

S:\PROJECTS\NEXT\TBA\300423_MVP_South\mvp\6-MXD\Bresource_Reports\BB10\Figure_10.MVP_South\State_FERC_Alternatives.mxd

MVP Southgate Project

Docket No. PF18-4-000

Draft Resource Report 10

Appendix 10-B

**Route Variations Incorporated, Under Evaluation, or
Eliminated**

TABLE 10.6-3

Route Variations Incorporated into the Proposed MVP Southgate Project Pipeline Route

Tract ID	Reroute No.	Approx. Begin MP	Approx. End MP	Length (miles)	Variation Description	Justification
VA-PI-008.000 VA-PI-009.000	MVP-RA-143-1526	1.2	1.5	0.3	Adjust centerline ("CL") to be next to existing ROW	Adjust CL to be next to existing ROW
VA-PI-014.000	MVP-RA-143-1527	2.6	2.9	0.3	Adjust CL to be next to existing ROW	Adjust CL to be next to existing ROW
VA-PI-029.000 VA-PI-030.000 VA-PI-031.000 VA-PI-032.000	MVP-RA-143-1528	4.5	4.6	0.1	Removed Point of Intersections ("PI's")	The removal of the PI's makes it better for an horizontal directional drill ("HDD") or a conventional bore
VA-PI-032.000	MVP-RA-143-1529	4.8	5.1	0.3	Adjust CL to be next to existing ROW	Adjust CL to be next to existing ROW
VA-PI-034.000	MVP-RA-143-1530	5.2	5.3	0.1	Minimize creek crossing and adjust PI away from creek crossing	Minimize creek crossing and adjust PI away from creek crossing
VA-PI-034.000 VA-PI-034.000.RR VA-PI-035.000	MVP-RA-183-0855	5.2	5.5	0.3	Adjust CL to avoid being in stream for approximately 600 feet.	Adjust CL to avoid being in stream for approximately 600 feet.
VA-PI-037.000	MVP-RA-153-1208	6.5	6.7	0.2	Adjust CL to be next to existing ROW	Adjust CL to be next to existing ROW
VA-PI-041.000	MVP-RA-153-1215	7.4	7.5	0.1	Adjust CL to be next to existing ROW	Adjust CL to be next to existing ROW
VA-PI-084.000	MVP-RA-153-1249	12.9	13.2	0.3	Adjust CL to be next to existing ROW	Adjust CL to be next to existing ROW
VA-PI-094.000	MVP-RA-153-1254	14.3	14.5	0.2	Adjust CL to be next to existing ROW	Adjust CL to be next to existing ROW
VA-PI-094.000 VA-PI-095.000 VA-PI-096.000	MVP-RA-153-1257	14.8	15.0	0.1	Adjust CL to reduce the number of PIs. There is a hill side in this area but it's very slight	Adjust CL to reduce the number of PIs. There is a hill side in this area but it's very slight
VA-PI-100.000 VA-PI-099.000 VA-PI-101.000	MVP-RA-153-1303	15.3	15.6	0.3	Adjust CL to reduce the number of PIs in this location. No side slope in the location.	Adjust CL to reduce the number of PIs in this location. No side slope in the location.
VA-PI-120.000 VA-PI-121.000 VA-PI-122.000.ABU VA-PI-123.000 VA-PI-124.000	MVP-RA-163-1213	18.1	18.6	0.4	Adjust CL to be next to the existing pipeline ROW. There is an old farm house and barn next to the existing pipeline ROW, potential karts area.	Adjust CL to be next to the existing pipeline ROW. There is an old farm house and barn next to the existing pipeline ROW, potential kart area.
VA-PI-150.000 VA-PI-151.000	MVP-RA-153-1458	19.9	20.3	0.4	This will reduce the number of Pi's needed and this route will miss the structure.	This will reduce the number of Pi's needed and this route will miss the structure.

TABLE 10.6-3

Route Variations Incorporated into the Proposed MVP Southgate Project Pipeline Route

Tract ID	Reroute No.	Approx. Begin MP	Approx. End MP	Length (miles)	Variation Description	Justification
VA-PI-152.000 VA-PI-155.000 VA-PI-156.000						
VA-PI-157.000 VA-PI-158.000 VA-PI-160.000	MVP-RA-184-1341	20.4	20.5	0.1	Currently the building is in the temporary workspace ("TWS"), adjust CL to stay away from building.	Currently the building is in the TWS, adjust CL to stay away from building.
VA-PI-160.000 VA-PI-161.000 VA-PI-162.000 VA-PI-163.000	MVP-RA-155-1441	20.6	21.3	0.7	Adjust CL to be next to existing ROW	Adjust CL to be next to existing ROW
VA-PI-163.000 VA-PI-165.000	MVP-RA-155-1446	21.5	21.8	0.3	Adjust CL to be next to existing ROW	Adjust CL to be next to existing ROW
VA-PI-171.000 VA-PI-172.000 VA-PI-173.000	MVP-RA-155-1449	22.3	22.9	0.6	Adjust CL to be next to existing ROW	Adjust CL to be next to existing ROW
VA-PI-174.000 VA-PI-175.000	MVP-RA-177-1447	23.3	23.8	0.5	Adjust CL to be next to existing ROW	Adjust CL to be next to existing ROW
VA-PI-178.000	MVP-RA-177-1449	24.5	24.8	0.3	Adjust CL to be next to existing ROW	Adjust CL to be next to existing ROW
NC-RO-002.000	MVP-RA-157-1313	26.4	26.6	0.2	Adjust CL to be next to existing ROW	Adjust CL to be next to existing ROW
NC-RO-006.000	MVP-RA-153-1309	28.4	28.4	0.0	Move the additional temporary workspace ("ATWS") to stay out of large wetland	The previous location of this ATWS was in a large wetland. This location had no wetlands
NC-RO-007.000	MVP-RA-159-1655	29.4	29.7	0.3	There is side hill construction in this area, adjust CL to be on top of the hill	There is side hill construction in this area, adjust CL to be on top of the hill
NC-RO-025.000 NC-RO-027.000 NC-RO-029.000	MVP-RA-159-1700	31.3	31.5	0.2	Adjust CL to reduce the amount of stream impact and to avoid side hill construction	Adjust CL to reduce the amount of stream impact and to avoid side hill construction
NC-RO-029.000 NC-RO-030.000	MVP-RA-179-1146	31.5	31.7	0.2	Adjust CL to stay away from the cemetery and bring the PI closer to the top of the hill	Adjust CL to stay away from the cemetery and bring the PI closer to the top of the hill
NC-RO-033.000 NC-RO-034.000	MVP-RA-159-1706	31.7	32.0	0.3	Adjust CL to avoid side hill and multiple ravines	Adjust CL to avoid side hill and multiple ravines
NC-RO-035.000 NC-RO-037.000	MVP-RA-159-1717	32.1	32.2	0.1	Adjust CL to avoid side hill construction	Adjust CL to avoid side hill construction

TABLE 10.6-3

Route Variations Incorporated into the Proposed MVP Southgate Project Pipeline Route

Tract ID	Reroute No.	Approx. Begin MP	Approx. End MP	Length (miles)	Variation Description	Justification
NC-RO-047.000 NC-RO-048.000 NC-RO-049.000 NC-RO-050.000 NC-RO-051.000 NC-RO-052.000 NC-RO-053.000 NC-RO-054.000 NC-RO-055.000 NC-RO-056.000 NC-RO-057.000	MVP-RA-162-1521	34.3	35.4	1.1	Adjust CL to avoid side hill construction, baptism area around MP 34.6 and family cemetery around MP 34.9	Adjust CL to avoid side hill construction, baptism area around MP 34.6 and family cemetery around MP 34.9
NC-RO-058.000 NC-RO-060.000 NC-RO-061.000	MVP-RA-162-1535	36.0	36.4	0.4	Adjust CL to avoid side hill construction and to stay off of "NO" tract	Adjust CL to avoid side hill construction and to stay off of "NO" tract
NC-RO-084.000 NC-RO-085.000 NC-RO-086.000 NC-RO-087.000 NC-RO-088.000 NC-RO-089.000 NC-RO-090.000	MVP-RA-143-1533	38.1	38.9	0.9	Avoid Side Hill Construction	Avoid Side Hill Construction
NC-RO-091.000 NC-RO-092.000 NC-RO-094.000	MVP-RA-162-1541	39.1	39.5	0.4	Adjust CL to avoid side hill construction	Adjust CL to avoid side hill construction
NC-RO-100.000 NC-RO-101.000	MVP-RA-163-1116	40.1	40.3	0.2	Adjust CL to stay away from washout ditch	Adjust CL to stay away from washout ditch
NC-RO-109.000	MVP-RA-153-1317	40.8	41.0	0.2	Adjust CL to avoid side hill construction	Adjust CL to avoid side hill construction
NC-RO-112.000	MVP-RA-153-1320	41.7	41.8	0.1	Straighten out this road crossing to follow the power lines.	Straighten out this road crossing to follow the power lines.
NC-RO-112.000	MVP-RA-157-1325	42.0	42.2	0.3	Adjust CL to stay away from small cemetery.	Adjust CL to stay away from small cemetery.
NC-RO-140.000 NC-RO-142.000	MVP-RA-153-1324	45.5	45.8	0.3	CL adjustment to route around pasture.	CL adjustment to route around pasture.
NC-RO-153.000	MVP-RA-153-1329	47.4	47.6	0.2	Straighten out to reduce the number of Pls	Straighten out to reduce the number of Pls

TABLE 10.6-3

Route Variations Incorporated into the Proposed MVP Southgate Project Pipeline Route

Tract ID	Reroute No.	Approx. Begin MP	Approx. End MP	Length (miles)	Variation Description	Justification
NC-RO-154.000	MVP-RA-153-1333	47.7	47.8	0.1	Straighten out to reduce the number of PIs	Straighten out to reduce the number of PIs
NC-RO-156.000	MVP-RA-153-1338	48.1	48.2	0.1	Straighten out to reduce the number of PIs	Straighten out to reduce the number of PIs
NC-AL-018.000 NC-AL-019.000 NC-AL-021.000 NC-AL-022.000 NC-AL-023.000 NC-AL-024.000 NC-AL-025.000 NC-AL-025.100.AR NC-AL-027.000	MVP-RA-153-1347	55.6	56.4	0.8	Adjust CL to reduce the number of PIs and to reduce the amount of tree clearing needed	Adjust CL to reduce the number of PIs and to reduce the amount of tree clearing needed
NC-AL-028.000	MVP-RA-153-1356	56.4	56.4	0.0	Move ATWS to the road crossing because the ATWS at MP 56.7 is on top of a pond	Move ATWS to the road crossing because the ATWS at MP 56.7 is on top of a pond
NC-AL-042.000 NC-AL-043.000	MVP-RA-186-1423	57.4	57.8	0.4	LiDAR suggests that the PI is in the pond. This adjustment is avoid the pond	LiDAR suggests that the PI is in the pond. This adjustment is avoid the pond
NC-AL-076.100.AR NC-AL-076.000 NC-AL-074.450.AR NC-AL-074.000	MVP-RA-153-1402	60.9	60.9	0.0	This property owner has an existing access road to the backfield that has been logged and cleared.	This could be an area for a large laydown yard. The existing access could be squared up to Boone road for better turning and the current route has a few tight turns in it that could be straightened out to reduce the number of turns for large trucks.
NC-AL-076.100.AR NC-AL-076.200.AR NC-AL-076.400.AR NC-AL-076.500.AR NC-AL-076.000 NC-AL-074.450.AR NC-AL-076.000 NC-AL-074.100.AR NC-AL-074.000	MVP-RA-172-0945	60.9	60.9	0.0	The landowner walked with the civil crew to show them where he wants the access road to be.	The landowner walked with the civil crew to show them where he wants the access road to be.
NC-AL-085.000 NC-AL-086.000	MVP-RA-165-0832	62.3	62.5	0.2	The land owner mentioned that in the field of tract NC-AL-085.000 they would like to put a subdivision in the future	The land owner mentioned that in the field of tract NC-AL-085.000 they would like to put a subdivision in the future

TABLE 10.6-3

Route Variations Incorporated into the Proposed MVP Southgate Project Pipeline Route

Tract ID	Reroute No.	Approx. Begin MP	Approx. End MP	Length (miles)	Variation Description	Justification
NC-AL-096.000 NC-AL-097.000 NC-AL-098.000	MVP-RA-143-1534	63.1	63.5	0.4	Extend PI out of creek	Extend PI out of creek
NC-AL-104.000 NC-AL-106.000 NC-AL-107.000	MVP-RA-180-1405	64.0	64.6	0.6	According to the LiDAR info. the TWS on the west side could be in a stream ~70 feet and there is a slight side hill slope ~18.8% (10.7 deg)	According to the LiDAR info. the TWS on the west side could be in a stream ~70 feet and there is a slight side hill slope ~18.8% (10.7 deg)
NC-AL-182.000 NC-AL-182.100.ABU NC-AL-184.000	MVP-RA-156-1740	69.4	69.6	0.2	Adjust CL to avoid abandoned building and to stay away from steep hill side	Adjust CL to avoid abandoned building and to stay away from steep hill side

TABLE 10.6-4

Route Variations Under Evaluation for the MVP Southgate Project Pipeline Route

Tract ID	Reroute No.	Approx. Begin MP	Approx. End MP	Length (miles)	Variation Description	Justification
NC-RO-112.200 NC-RO-112.300 NC-RO-112.400 NC-RO-117.000	MVP-RR-162-1547	42.4	43.1	0.7	Adjust CL to avoid AT&T tower	Adjust CL to avoid AT&T tower
NC-AL-008.000 NC-AL-009.000	MVP-RR-165-1051	54.9	55.1	0.2	Adjust CL to avoid pond / swamp area	Adjust CL to avoid pond / swamp area
NC-RO-117.000 NC-RO-118.000.ABU NC-RO-122.000	MVP-RR-177-1515	42.6	43.5	0.9	Adjust CL to stay away from large cemetery	Adjust CL to stay away from large cemetery
---	MVP-RR-149-1648	15.6	16.5	0.9	Hylton Alternative	Hylton Alternative
---	MVP-RR-149-1651	62.9	68.1	5.2	Landowner requested alternatives	Saves footage *Impacts a lower number of landowners *Avoids the risks and cost of mitigation due to mining *if Avoids new home construction on Adams tract (MP 66.15).
---	MVP-RR-163-1422	33.2	34.0	0.9	Landowner Tract Avoidance	Landowner Tract Avoidance
---	MVP-RR-149-1649	48.8	49.8	1.1	Landowner Alternative	Landowner Alternative
---	MVP-RR-163-1429	44.3	45.0	0.7	Landowner Tract Avoidance	6 New Landowners, 6 New Tracts, No Env Impact but there will be additional tree clearing.
---	MVP-RR-149-1650	50.6	51.1	0.5	Landowner Alternative	Adds 2 Road Crossings, May push route into a new HCA
---	MVP-RR-163-1426	35.7	36.7	1.0	Landowner Tract Avoidance	Landowner Tract Avoidance
---	MVP-RR-163-1452	61.1	61.5	0.4	Construction Company Tract Avoidance	Awaiting updated re-route
---	MVP-RR-149-1646	71.4	72.6	1.2	Proposed Reroute	Proposed Reroute
---	MVP-RR-163-1448	57.0	60.0	3.0	Landowner Tracts Avoidance	Landowner Tracts Avoidance
---	MVP-RR-163-1502	69.5	70.4	0.9	Landowner Tract Avoidance	Landowner Tract Avoidance
NC-AL-126.000 NC-AL-128.000 NC-AL-129.000 NC-AL-130.000	MVP-RR-179-1209	66.2	67.0	0.8	Adjust CL to avoid a stream that meanders back and forth and to avoid a large wetland	Adjust CL to avoid a stream that meanders back and forth and to avoid a large wetland

TABLE 10.6-4

Route Variations Under Evaluation for the MVP Southgate Project Pipeline Route

Tract ID	Reroute No.	Approx. Begin MP	Approx. End MP	Length (miles)	Variation Description	Justification
NC-AL-131.000 NC-AL-132.000 NC-AL-133.000 NC-AL-134.000 NC-AL-135.000						
VA-PI-053.000	MVP-RR-183-0859	9.9	10.1	0.3	Adjust CL to avoid large cemetery	Adjust CL to avoid large cemetery
VA-PI-053.000	MVP-RR-183-0902	9.8	9.8	0.0	Adjust access road to avoid cemetery	Adjust access road to avoid cemetery
VA-PI-166.100.AR VA-PI-173.100.AR VA-PI-173.000	MVP-RR-184-1056	22.8	22.8	0.0	The landowner mentioned that the existing access road goes right behind their house. He asked for the access road not to be used.	This access road reroute is for if the access is needed and to keep it way from house and come in from another location.
NC-AL-138.000 NC-AL-139.000 NC-AL-140.000 NC-AL-141.000 NC-AL-142.000	MVP-RR-186-1407	67.4	67.7	0.3	The LiDAR information suggests that the end of the pond is in the perm. ROW. This adjustment is to stay away from the pond	The LiDAR information suggests that the end of the pond is in the perm. ROW. This adjustment is to stay away from the pond
VA-PI-002.000 VA-PI-001.400.AR VA-PI-003.000 VA-PI-005.000	MVP-RR-187-1006	0.5	1.1	0.6	Landowner feedback from open house meetings	Landowner feedback from open house meetings
NC-RO-101.000 NC-RO-102.000.ABU NC-RO-104.000.ABU NC-RO-105.000 NC-RO-106.000 NC-RO-108.000 NC-RO-109.000 NC-RO-110.000 NC-RO-111.000	MVP-RR-187-1028	40.3	41.5	1.2	Landowner feedback from open house meetings	Landowner feedback from open house meetings
VA-PI-103.000 VA-PI-105.000 VA-PI-106.000	MVP-RR-193-1402	16.0	16.2	0.2	Adjust CL to avoid Wells cemetery	Adjust CL to avoid Wells cemetery
VA-PI-037.000	MVP-RR-194-0932	6.6	6.6	0.0	There are access roads 0.20 north and 0.40 miles south of this one. This is in case those access roads cannot be used.	There are access roads 0.20 north and 0.40 miles south of this one. This is in case those access roads cannot be used.

TABLE 10.6-4

Route Variations Under Evaluation for the MVP Southgate Project Pipeline Route

Tract ID	Reroute No.	Approx. Begin MP	Approx. End MP	Length (miles)	Variation Description	Justification
VA-PI-045.000	MVP-RR-194-0943	8.2	8.2	0.0	This is a possible access road off of Hylton Ln.	This is a possible access road off of Hylton Ln.
VA-PI-101.000	MVP-RR-194-1142	15.6	15.6	0.0	Possible access road	Possible access road
VA-PI-162.000	MVP-RR-194-1154	21.1	21.1	0.0	Access road extension	Access road extension
NC-AL-183.000 NC-AL-182.000 NC-AL-174.130 NC-AL-182.050.ABU NC-AL-182.100.ABU NC-AL-166.000.RR	MVP-RR-194-1245	69.4	69.4	0.0	Possible access road	Possible access road
VA-PI-075.000 VA-PI-076.000	MVP-RR-197-1258	11.0	11.6	0.6	Adjust CL to avoid Prehistoric site. This will also help to avoid crossing the stream twice	Adjust CL to avoid Prehistoric site. This will also help to avoid crossing the stream twice
VA-PI-102.000.ABU VA-PI-103.000	MVP-RA-179-1227	15.8	16.0	0.2	Adjust CL to be next to existing pipeline ROW	Adjust CL to be next to existing pipeline ROW
NC-RO-054.000 NC-RO-056.000 NC-RO-057.000	MVP-RA-193-1030	35.1	35.4	0.3	Adjust CL to avoid multiple stream crossings and side hill construction	Adjust CL to avoid multiple stream crossings and side hill construction
VA-PI-123.000	MVP-RA-193-1417	18.4	18.5	0.1	Adjust CL to avoid A frame power poles	Adjust CL to avoid A frame power poles
NC-RO-092.000 NC-RO-094.000 NC-RO-095.000	MVP-RA-193-1501	39.3	39.7	0.4	Adjust CL to bring the CL up the hill a little bit more and to get the workspace out of the wetland/pond area	Adjust CL to bring the CL up the hill a little bit more and to get the workspace out of the wetland/pond area
NC-RO-111.000 NC-RO-111.000.RC NC-RO-112.000	MVP-RA-193-1511	41.5	41.8	0.3	Adjust CL to straighten out the route and reduce the number of PIs needed	Adjust CL to straighten out the route and reduce the number of PIs needed
NC-RO-156.000	MVP-RA-193-1529	48.1	48.2	0.1	Adjust CL to keep CL on top of hill	Adjust CL to keep CL on top of hill
VA-PI-121.000	MVP-RA-197-1303	18.1	18.1	0.0	Adjust CL of access road TA-PI-046 to avoid cemetery buffer	Adjust CL of access road TA-PI-046 to avoid cemetery buffer
NC-AL-199.000 NC-AL-200.000 NC-AL-201.000	MVP-RA-198-1549	72.0	72.3	0.3	Adjust the CL to avoid the side hill construction	Adjust the CL to avoid the side hill construction

TABLE 10.6-4

Route Variations Under Evaluation for the MVP Southgate Project Pipeline Route

Tract ID	Reroute No.	Approx. Begin MP	Approx. End MP	Length (miles)	Variation Description	Justification
VA-PI-103.000 VA-PI-104.000.ABU VA-PI-106.000	MVP-RA-199-1127	16.0	16.2	0.2	This is an alternate route for avoiding the Wells cemetery	This is an alternate route for avoiding the Wells cemetery
VA-PI-180.000	MVP-RA-199-1511	25.2	25.5	0.3	Adjust the CL to avoid large washout.	Adjust the CL to avoid large washout.

TABLE 10.6-5

Route Variations Eliminated from Further Consideration for the MVP Southgate Project Pipeline Route

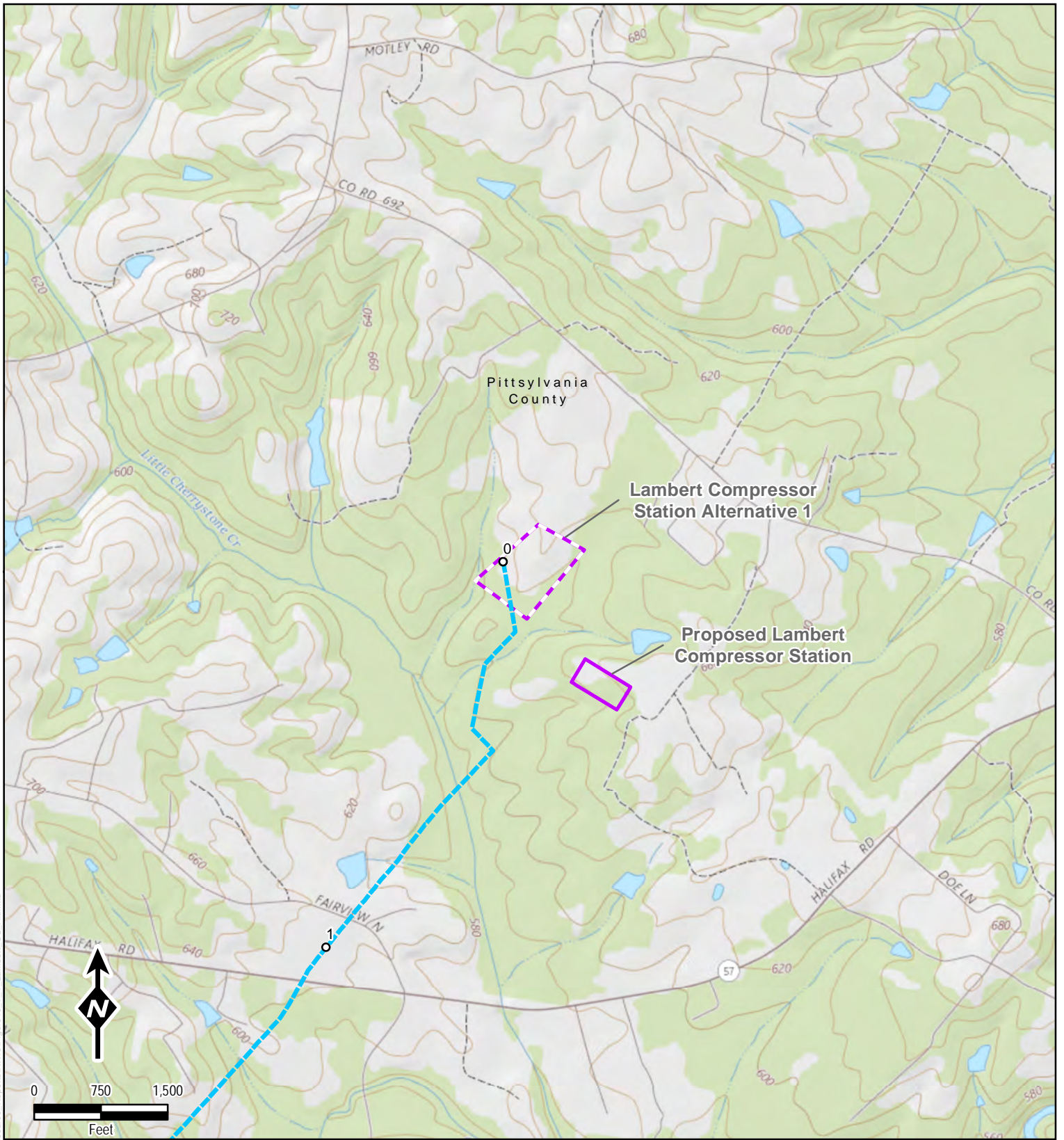
Tract ID	Reroute No.	Approx. Begin MP	Approx. End MP	Length (miles)	Variation Description	Justification
VA-PI-150.000 VA-PI-151.000 VA-PI-152.000	MVP-RA-153-1141	19.9	20.1	0.2	The existing Transco pipeline is approximately 40 feet from the edge of pavement of an auto auction parking lot which would put MVP-Southgate's CL under the pavement. On the south side of Hwy 58 MVP Southgate line would be crossing under all of Transco's lines with limited space. Also, on the north side of Hwy 58 and east side of Transco's lines there wouldn't be side hill construction. We propose to cross under Transco's lines north of Hwy 58 then cross the Hwy leaving more room for a bore or receiving pit. Also, if more space is needed field is a nice place for ATWS	An alternative in this same area. Approving the other alternative.
---	MVP-RR-149-1647	3.9	4.2	0.3	Landowner Alternative	Landowner survey permission granted
---	MVP-RR-149-1652	69.2	70.2	1.0	Town Of Haw River- Alternative	Survey permission granted by Town of Haw River
NC-RO-006.000	MVP-RR-149-1653	28.4	28.4	0.0	Additional Compressor Station MP29	Proposed compressor station site
---	MVP-RR-163-1404	3.9	5.3	1.4	Landowner Tract Avoidance	Landowner Tract Avoidance
---	MVP-RR-163-1438	49.9	51.1	1.2	Landowner Tract Avoidance	v Tract Avoidance

MVP Southgate Project

Docket No. PF18-4-000

Draft Resource Report 10

Appendix 10-C
Compressor Station Site Alternatives Figures

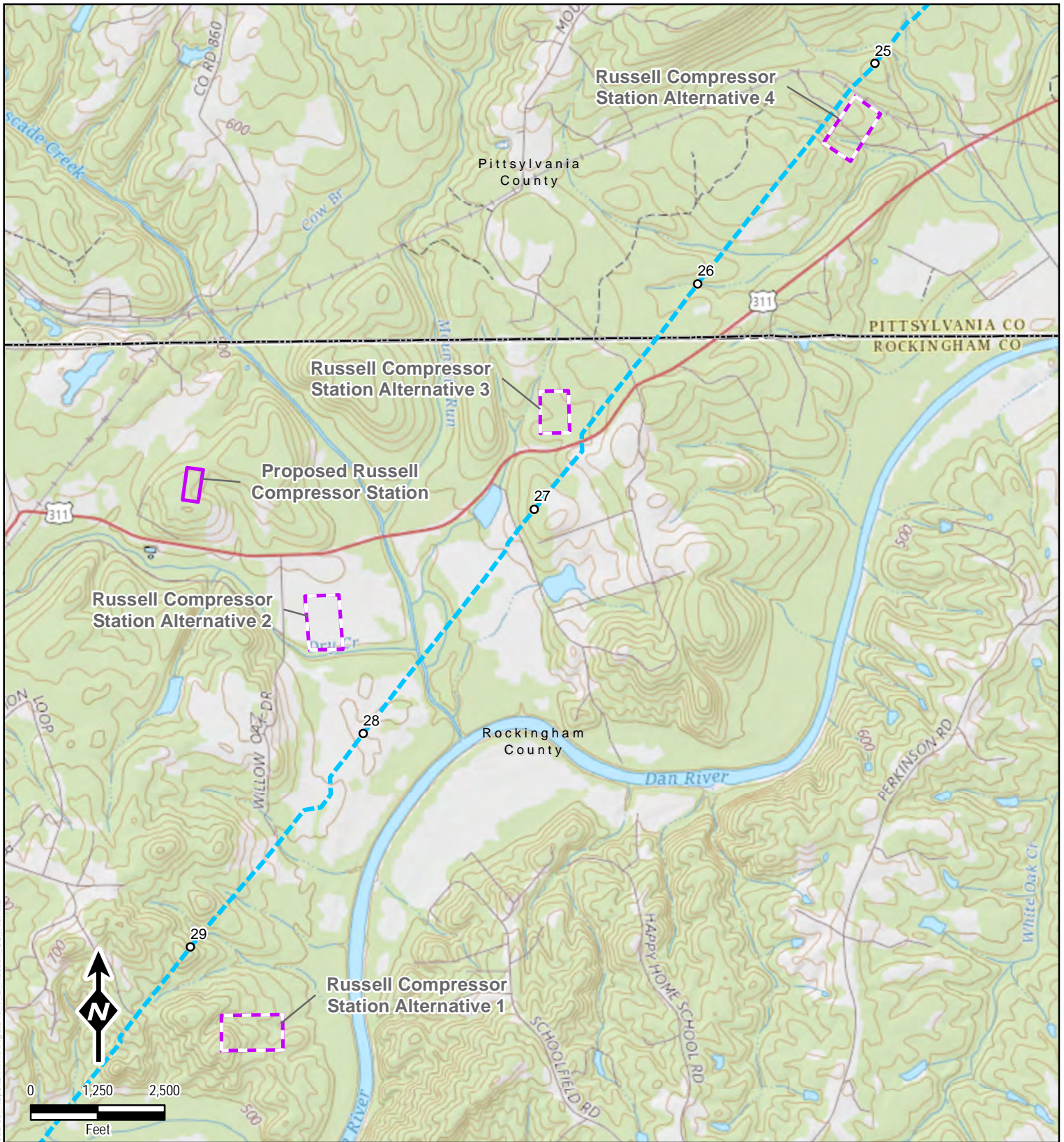


S:\4-PROJECTS\NEXTEPA\300423_MVP_South\Map6\MXD\Bresource_Reports\RR10\Figure10_7_1_Lambert_CS_Alt.mxd



Legend	
	Mileposts
	Proposed Pipeline Route
	Proposed Compressor Station Location
	Lambert Compressor Station Alternative
	State Boundary
	County Boundary
Data Sources: ESRI, USGS, TRC, EQT	
1 inch = 1,500 feet When Printed 8.5x11	

Figure 10.7-1	
Lambert Compressor Station Alternative	
	600 Willowbrook Ln West Chester, PA 19382



S:\4 PROJECTS\NEXT\EPBA\300423 MVP_South\Map\6\XXDI\Resource_Reports\RR10\Figure10.7.2_Russell_CS_Alt.mxd



Legend

- Mileposts
- Proposed Pipeline Route
- Proposed Russell Compressor Station Location
- Russell Compressor Station Alternatives
- State Boundary
- County Boundary

Data Sources: ESRI, USGS, TRC, EQT

1 inch = 2,500 feet
When Printed 8.5x11

Mountain Valley
PIPELINE LLC

Figure 10.7-2

Russell Compressor Station Alternatives

TRC
Results you can rely on

600 Willowbrook Ln
West Chester, PA 19382