



**ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE
Docket No. PF15-6-000**

and



**DOMINION TRANSMISSION, INC.
SUPPLY HEADER PROJECT
Docket No. PF15-5-000**

**Resource Report 10
Alternatives**

Preliminary Draft

Prepared by



December 2014

Summary of Required Federal Energy Regulatory Commission Report Information

Minimum Filing Requirements:	Report Section Reference
1. Address the "no action" alternative. (§ 380.12(l)(1)) <ul style="list-style-type: none"> • Discuss the costs and benefits associated with the alternative. 	Section 10.1
2. For large projects, address the effect of energy conservation or energy alternatives to the project. (§ 380.12(i)(1))	Sections 10.2 and 10.3
3. Identify system alternatives considered during the identification of the project and provide the rationale for rejecting each alternative. (§ 380.12(l)(1)) <ul style="list-style-type: none"> • Discuss the costs and benefits associated with each alternative. 	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. (§ 380.12(l)(2)(ii)) <ul style="list-style-type: none"> • For onshore projects new to offshore areas, be sure to address alternatives using offshore routings. 	Sections 10.5, 10.6, and 10.7
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. (§ 380.12(l)(2)(ii))	Section 10.8

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LIST OF ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
bcf/d	billion cubic feet per day
Columbia	Columbia Gas Transmission, LLC
DTI	Dominion Transmission, Inc.
East Tennessee	East Tennessee Natural Gas, LLC
EIA	U.S. Energy Information Administration
ER	Environmental Report
FERC	Federal Energy Regulatory Commission
FWS	U.S. Fish and Wildlife Service
GDS-NWR	Great Dismal Swamp National Wildlife Refuge
GIS	geographic information system
GWNF	George Washington National Forest
MNF	Monongahela National Forest
Mountain Valley	Mountain Valley, LLC
MP	milepost
mwh/d	megawatt-hours per day
NPS	National Park Service
NRA	National Recreation Area
NRCS	Natural Resources Conservation Service
SHP	Supply Header Project
SNP	Shenandoah National Park
Texas Eastern	Texas Eastern Transmission, LP
TNC	The Nature Conservancy
Transco	Transcontinental Gas Pipe Line Company, LLC
USFS	U.S. Forest Service
VOF	Virginia Outdoors Foundation

**ATLANTIC COAST PIPELINE – Docket No. PF15-6-000 and
SUPPLY HEADER PROJECT – Docket No. PF15-5-000**

10.0 RESOURCE REPORT 10 – ALTERNATIVES

Atlantic Coast Pipeline, LLC (Atlantic) and Dominion Transmission, Inc. (DTI) identified and evaluated a number of alternatives to the proposed Atlantic Coast Pipeline (ACP) and Supply Header Project (SHP), respectively (collectively, the Projects). These include a no-action alternative, alternative energy sources, energy conservation measures, system alternatives, major route alternatives, minor route variations, minor route adjustments, and alternative aboveground facility sites. The review of alternatives included an assessment and comparison of a number of factors, including technical and economic feasibility, constructability, environmental impact, ability to meet the purpose and need of the ACP and SHP, and input from stakeholders, including federal land managing agencies, federal and state resource agencies, and landowners.

As a result of desktop analyses and field surveys, Atlantic and DTI identified several route alternatives and variations along the proposed pipeline routes to avoid or minimize crossings of sensitive environmental features or address engineering or other concerns. These route alternatives and variations were incorporated into the proposed pipeline routes as described in detail below. Additional route alternatives or variations may be considered to address issues identified as a result of ongoing environmental and civil field surveys, engineering design work, agency consultations, landowner communications, or other stakeholder input. Information on additional route alternatives or variations identified and evaluated by Atlantic will be described in the next draft of Resource Report 1.

10.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, neither the ACP nor the SHP would be built and the environmental impacts associated with construction and operation of the proposed facilities would not occur. By not constructing these Projects, however, Atlantic and DTI would be unable to meet existing and projected future demand for natural gas by industrial, commercial, and domestic customers (including power generating facilities) in Virginia and North Carolina. Therefore, the objectives of the ACP and SHP would not be met and the benefits of the Projects would not be realized.

Under the no-action alternative, other natural gas transmission companies could propose to construct new facilities similar to the ACP and SHP to meet the demand for new natural gas transportation service in Virginia and North Carolina. Such actions would likely result in impacts similar to or greater than those described in this Environmental Report (ER) for the ACP and SHP, and might not meet the Projects' objectives within the proposed time frames. Therefore, the no-action alternative is not practical and provides no advantage over the proposed ACP and SHP.

10.2 ALTERNATIVE ENERGY SOURCES

The ACP and SHP are designed to provide for the transportation of natural gas from supply areas in West Virginia to demand areas in Virginia and North Carolina. The use of alternative energy sources is an option to meet some of the short-term and long-term demands for energy in the target market areas. Potential alternative energy sources to natural gas include traditional fuels, such as coal and oil, nuclear energy, and electricity (including electricity generated from oil, coal, and nuclear power); and renewable energy sources, such as wind, solar, hydroelectric, biomass, and tidal and wave. All of these alternative energy sources, depending on the location of the source, would require new infrastructure, including transmission facilities, to connect supply and demand areas.

10.2.1 Traditional Fuel Sources

10.2.1.1 Oil and Coal

Compared to other fossil fuels, natural gas is a relatively clean and efficient fuel. The use of coal-based or petroleum energy instead of natural gas would likely result in increased emissions of pollutants, such as nitrogen oxide, sulfur dioxide, and carbon dioxide. Because natural gas is a cleaner burning fuel than other fossil fuel alternatives, the environmental impacts associated with increased use of coal or petroleum would likely exceed the impacts of the currently proposed Projects. Therefore, these fuel sources provide no environmental advantage over the ACP and SHP.

Another impact of increased use of petroleum and coal relative to natural gas is that volatility in natural gas pricing, particularly during periods of peak demand, could be exacerbated. As of May 2014, natural gas prices in Virginia and North Carolina were higher than the national average due to limited supply and increased demand. Citygate natural gas prices in Virginia and North Carolina, respectively, were 28.9 percent and 16.5 percent higher than the national average (U.S. Energy Information Administration (EIA), 2014a, 2014b). The proposed ACP and SHP would provide a reliable source of domestically produced natural gas, which could help stabilize natural gas prices during periods of peak demand.

The viability of increased use of coal as an alternative to natural gas could be further diminished by a rule recently proposed by the U.S. Environmental Protection Agency aimed at reducing carbon dioxide emissions from power generating facilities.¹ The proposed rule recognizes fossil fuel electric utility generating units as the largest stationary sources of greenhouse gas emissions in the United States, and notes that coal-fired units are the largest emitters (U.S. Environmental Protection Agency, 2014). The proposed rule provides guidelines to help the power sector achieve by 2030 reductions of approximately 30 percent from 2005 carbon dioxide emissions levels. A main component of the proposed rule is to encourage the conversion of aging coal-fired plants to a cleaner fuel source, such as natural gas. If the proposed rule becomes law, states would be required to adopt a plan to meet tailored rate-based

¹ The Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, available online at: <https://www.federalregister.gov/articles/2014/06/18/2014-13726/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating>.

goals in carbon dioxide emissions, which could continue to spur conversions of coal-fired facilities to natural gas.

10.2.1.2 Nuclear Power

The Energy Policy Act of 2005 incorporated a range of measures to support current nuclear plants and provide incentives for building new nuclear facilities. In a projection by the EIA, nuclear power capacity will increase from 769 billion kilowatt-hours in 2012 to 811 billion kilowatt-hours in 2040, accounting for 16 percent of total electric generation. However, nuclear generating capacity will decrease from 102 gigawatts in 2012 to 98 gigawatts in 2020, as new construction and upgrades to existing nuclear facilities are offset by retirements of older facilities (EIA, 2014c).

In addition to the expected decline in generating capacity, nuclear power is a controversial source of energy. There are a number of environmental and regulatory challenges concerning safety, security, and the disposal of toxic materials (spent fuel) at nuclear facilities. Given these issues, as well as the high construction costs for nuclear plants, it is unlikely that a new nuclear power facility and associated electric transmission lines could be sited and developed to provide power to demand areas in Virginia and North Carolina within the time frame proposed for the ACP and SHP. For these reasons, nuclear power is not a viable alternative to the proposed Projects.

10.2.2 Renewable Energy Sources

Renewable energy sources are expected to play an increasingly prominent role in meeting U.S. energy demands in the coming years. Federal, state, and local incentives and continuing research will likely contribute to an increase in the availability and cost effectiveness of renewable sources such as wind, solar, hydroelectric, biomass, and tidal and wave. In a projection by the EIA, total U.S. electricity generation from renewable sources (excluding conventional hydropower) will increase from 12 percent in 2012 to 16 percent in 2040 (EIA, 2014c). Dominion Resources has recently invested in wind, solar, and biomass sources of generation as part of its overall generation portfolio. Nonetheless, significant long-term investment in new facilities would be necessary before renewable energy could potentially offset a substantial portion of the projected energy demand in Virginia and North Carolina.

Several individuals who attended the ACP Open Houses suggested that wind or solar power could be used to meet current and future demand for electricity in Virginia and North Carolina. If used to generate electricity, the 1.5 billion cubic feet per day (bcf/d) of natural gas provided by the ACP and SHP would yield approximately 190,500 megawatt-hours per day (mwh/d) of electricity (EIA, 2014d). Most existing commercial wind facilities in the United States generate less than 1,000 mwh/d, and most commercial solar facilities generate less than 500 mwh/d. To achieve a reasonable economy of scale relative to the ACP and SHP, massive investment in new renewable generating facilities would be required.

The largest commercially available wind turbine from General Electric is a 4.1 megawatt rated turbine (General Electric, 2014). Assuming this model of turbine could operate at maximum capacity for 24 hours per day, 365 days per year (which is an unrealistic assumption), approximately 46,500 turbines would be needed to produce an equivalent amount of energy

which could be supplied by the ACP and SHP (assuming the natural gas is used to generate electricity). According to the National Renewable Energy Laboratory (2009), the average direct impact area (i.e., the area of direct surface disruption due to construction and operation of new facilities) needed to generate one megawatt of wind energy is approximately 2.5 acres. The average total impact area (i.e., the area within the footprint of an operating wind facility) needed to generate one megawatt of wind energy is approximately 84 acres. Using these estimates, approximately 476,000 acres of direct impact area and 16 million acres of total impact area would be required to generate 190,500 mwh/d of wind electricity. By contrast, construction of the ACP and SHP would affect approximately 14,000 acres, of which approximately 4,600 acres would be retained for operation of the proposed facilities.

Commercial scale solar energy generation similarly would require significant investment in land. By way of example, the Ivanpah Solar Electric Generating System in California, which encompasses approximately 3,500 acres of land, generates approximately 392 mwh/d of electricity. Ivanpah claims they have a smaller footprint than traditional photovoltaic solar generation (Ivanpah, 2014), which affects a larger area. Using an equivalent acre to megawatt ratio as the Ivanpah facility, approximately 1.7 million acres of land would need to be dedicated to solar power generation to produce an equivalent amount of energy which could be supplied by the ACP and SHP (assuming the natural gas is used to generate electricity). This would exceed the area of impact for the ACP and SHP by several orders of magnitude.

The area required to generate one megawatt of electricity from hydroelectric facilities varies significantly. More land generally is required to create reservoirs in flatter areas than in areas with hilly terrain. The Union of Concerned Scientists provided estimates of 2,000 acres per megawatt from a large hydroelectric facility in a flat area of Brazil, and 0.25 acre per megawatt for typical, run-of-the-river, hydroelectric facilities built in hilly areas. Using the lower acre to megawatt ratio, approximately 48,000 acres of land would be needed to generate 190,500 mwh/d of electricity at hydroelectric facilities. As with wind and solar power, the land impact of hydroelectric facilities would greatly exceed those of the ACP and SHP.

Depending on the location of the source of new renewable energy facilities, construction of new electric transmission and distribution lines could be required to reach the same markets as the ACP. Construction of these facilities could result in impacts similar or greater in scope to those described in this ER for construction of the ACP and SHP. For these reasons, renewable energy sources are not a reasonable alternative to the proposed Projects.

10.3 ENERGY CONSERVATION

Energy conservation could help alleviate some of the growing demand for energy in the U.S. and in the states to be serviced by the ACP. State and federal energy conservation measures will likely play an important role in slowing the growth of energy demand in the coming decades. However, it is unlikely that these measures will offset the demand for new natural gas sources. The EIA predicts that U.S. energy use per capita will decrease by approximately 8 percent through 2040, as higher efficiency standards for vehicles and appliances take effect. Nevertheless, the EIA indicates that, even with the recently enacted energy efficiency policies and increases in energy prices, total primary energy consumption, including fuels used for electricity generation, will grow by 0.4 percent per year from 2014 to 2040 (EIA, 2014c). To meet this demand, the EIA predicts that total domestic production of natural gas in the United

States will grow from 24.0 trillion cubic feet in 2012 to 37.5 trillion cubic feet by 2040, and that shale gas production will make up 53 percent of total U.S. production in 2040, up from 40 percent in 2012 (EIA, 2014c). The anticipated growth in natural gas demand will be driven primarily by its increased use for electric power generation and industrial applications.

Reduction in the need for additional energy is the preferred option wherever possible. Conservation of energy reduces the demand for limited existing reserves. Although energy conservation measures will be important elements in addressing future energy demands, it is unlikely that they will be able to offset more than a fraction of anticipated demand in the foreseeable future. As a result, energy conservation alone (or in conjunction with other alternatives) is not a viable alternative because it does not preclude the need for natural gas infrastructure projects like the ACP and SHP to meet the growing demand for energy.

10.4 SYSTEM ALTERNATIVES

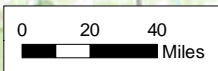
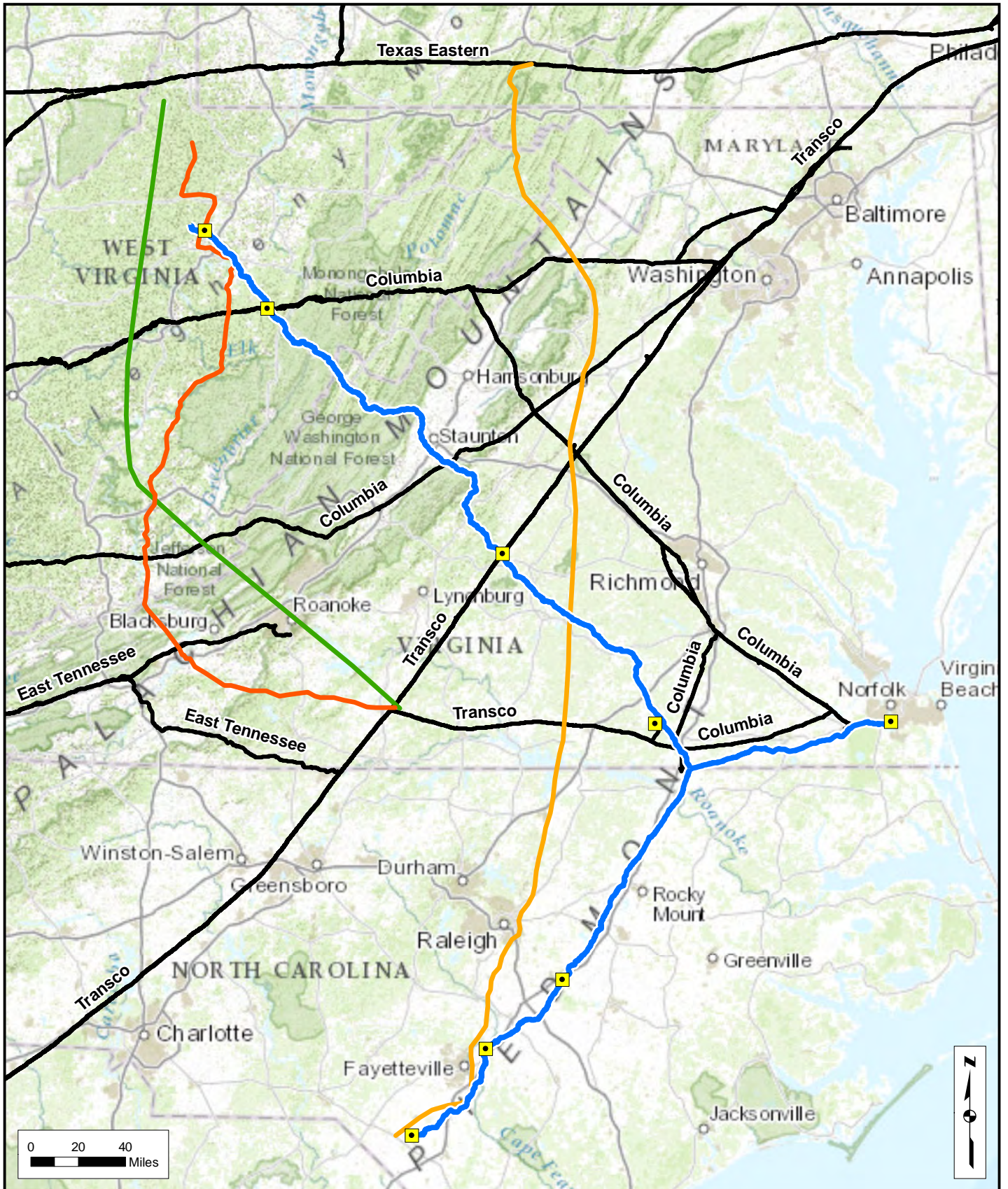
System alternatives would make use of other existing, modified, or proposed pipeline systems to meet the same objectives as the ACP. Use of a system alternative would make it unnecessary to construct all or part of the ACP, though modifications or additions to existing or proposed systems could be required. The modifications or additions would result in environmental impacts that could be less than, similar to, or greater than those associated with the ACP. Because the SHP will involve modifications and additions to existing DTI facilities, no system alternatives were considered.

Several existing, high-pressure, high-volume natural gas pipeline systems provide transportation services to delivery points in the mid-Atlantic and southeast regions. These include Transcontinental Gas Pipe Line Company, LLC (Transco); Columbia Gas Transmission, LLC (Columbia); and East Tennessee Natural Gas, LLC (East Tennessee). Additionally, several new pipeline projects have been proposed to provide natural gas transportation service in the same regions, including Spectra Energy's Carolina Pipeline Project; Mountain Valley, LLC's (Mountain Valley's) Mountain Valley Pipeline Project; and Transco's Western Marcellus Pipeline Project. Significant modifications to each of these systems would be necessary to access the same supply areas and/or provide transportation service to the same customers or at the same delivery points as the ACP. Figure 10.4-1 depicts the locations of these existing and proposed systems relative to the ACP.







10.4.1 Existing Systems

10.4.1.1 Transcontinental Gas Pipe Line Company

Transco operates a 1,800-mile-long, multi-pipeline system that delivers natural gas to major metropolitan areas in the northeast, mid-Atlantic, and southeast regions of the United States. In the vicinity of the ACP, Transco's mainline passes southwest to northeast through North Carolina and Virginia, and includes a lateral pipeline connecting the mainline to points in southeastern Virginia. The system is believed to be capacity constrained for delivery service as demonstrated by several recently proposed projects. These include: the Atlantic Sunrise Project (Docket No. PF14-9-00), an approximately 185-mile-long pipeline expansion in Pennsylvania; and the Virginia Southside Expansion Project (Docket No. CP13-3-000), an approximately 100-mile-long pipeline loop adjacent to the existing lateral.



Atlantic Coast PipelineSM

- | | |
|---|--|
|  Atlantic Coast Pipeline | Proposed Pipeline Systems |
|  Receipt/Delivery Point |  Mountain Valley Pipeline |
|  Existing Pipeline Systems |  Spectra Carolina Pipeline |
| |  Transco Western Marcellus Pipeline |

Atlantic Coast Pipeline
Figure 10.4-1
System Alternatives



Significant upgrade of the existing Transco system would be necessary to access the same source areas, transport the same volume of natural gas, and reach the same delivery points as the ACP. New pipeline construction measuring up to 300 miles in length could be required to connect source areas in West Virginia to the Transco mainline (see the discussion of the proposed Western Marcellus Pipeline Project below). Additional upgrade of the Transco mainline, including new compression and looping, would be necessary to increase capacity and accommodate the volume of gas required for the ACP. Moreover, construction of new mainline or lateral pipelines would be necessary to reach the same delivery points as the ACP in northern Virginia, southeastern Virginia, and North Carolina. Depending on the routes selected, these mainline or lateral pipelines could measure 200 to 300 miles in length.

The environmental impacts associated with the upgrades and new pipeline construction for the Transco system would likely be similar to or greater than those of the ACP. Therefore, the theoretical modifications to the existing system would provide no environmental advantage over the ACP. For this reason, and the fact that the existing system does not meet the ACP's purpose and need, the existing Transco system is not considered a viable system alternative.

10.4.1.2 Columbia Gas Transmission

As currently configured, the existing Columbia system in the mid-Atlantic region provides transportation services from supply areas in the Marcellus basin to demand areas in southern Virginia, including the City of Chesapeake. Because the system is capacity constrained, significant upgrades, including new compression, looping, and mainline or lateral pipelines, would need to be built to transport the same volume of natural gas as the ACP to southern Virginia. Assuming a complete loop of the existing system, up to 400 miles or more of new pipeline could be required to reach the proposed ACP delivery points in southern Virginia. Additional pipeline construction would also be required to reach the proposed delivery points in Brunswick County, Virginia (approximately 10 miles) and in southern North Carolina (approximately 170 miles), much of which could be similar to the proposed AP-2 mainline for the ACP.

While the Columbia system provides access to the same natural gas supply areas in West Virginia, new pipeline facilities would be needed to reach the same delivery points as the ACP in southern Virginia and North Carolina. The environmental impacts associated with construction of these facilities would likely be similar to or greater than those of the ACP, so these theoretical modifications to the existing Columbia system would provide no environmental advantage over the ACP. For this reason, and the fact that the current system does not meet the ACP's purpose and need, the Columbia system is not considered a viable alternative to the ACP.

10.4.1.3 East Tennessee Natural Gas

The East Tennessee pipeline system extends from western Tennessee to central and southern Virginia and northern North Carolina, where it interconnects with Transco. Because the system is believed to be capacity constrained, significant upgrades, including new compression, looping, and mainline or lateral pipelines, would need to be built to transport the same volume of natural gas as the ACP. Additionally, new pipelines would be required to access the same supply area as the ACP (150 to 180 miles), and provide access to the same delivery

points as the ACP in southern Virginia (210 to 230 miles) and North Carolina (190 to 210 miles). Environmental impacts associated with the system upgrades and new pipeline construction would likely be similar to or greater than those of the ACP, so these theoretical modifications to the East Tennessee system would provide no environmental advantage over the ACP. For this reason, and the fact that the current system does not meet the ACP's purpose and need, the existing East Tennessee system is not considered a viable system alternative.

10.4.2 Proposed Systems

10.4.2.1 Carolina Pipeline Project

Spectra Energy recently proposed to construct approximately 430 miles of new pipeline between existing Texas Eastern Transmission, LP (Texas Eastern) facilities in Bedford County, Pennsylvania, and new delivery points in southern Virginia and North Carolina. The project additionally would require unspecified modifications to the existing Texas Eastern system in Pennsylvania and West Virginia. The capacity of the new system, if constructed, would be 1.1 bcf/d (Natural Gas Intelligence Shale Daily, 2014).

Like the ACP, the Carolina Pipeline Project would access gas from the Marcellus basin and provide delivery service to the same areas in southern Virginia and North Carolina. However, additional pipeline construction would be necessary to reach the same or similar delivery points in the City of Chesapeake, Virginia (100 miles or more) and Brunswick County, Virginia (up to 10 miles). Environmental impacts associated with the upgrades to the existing Texas Eastern system and the new pipeline construction would likely be similar to or greater than those of the ACP. Moreover, it is unlikely that the Carolina Pipeline Project could be built in a time frame to meet the ACP's purpose and need because Spectra Energy placed the project on hold in August 2014 (Cumberland Times-News, 2014). For these reasons, the Carolina Pipeline Project is not considered a viable system alternative.

10.4.2.2 Mountain Valley Pipeline Project

Mountain Valley proposes to construct and operate approximately 300 miles of new pipeline from an existing Equitrans transmission system in Wetzel County, West Virginia to an interconnection with the existing Transco system in Pittsylvania County, Virginia. The project also would require the construction of four new turbine compressor stations. The Mountain Valley Pipeline Project is currently under review by the Federal Energy Regulatory Commission (FERC) under Docket number PF15-3-000. If approved and constructed, the project would provide delivery service of 2 bcf/d of natural gas (MarketWatch, 2014; WDBJ7, 2014; Mountain Valley, 2014).

To meet the same purpose and need as the ACP, the proposed Mountain Valley project would need to be expanded to provide sufficient capacity for an additional 1.5 bcf/d of natural gas and to reach the same delivery points in southern Virginia and North Carolina. Similar to the existing Transco system, and depending on the routes selected, the additional pipeline construction could range from 200 to 300 miles in length. Consequently, the environmental impacts associated with system expansion and new pipeline construction would likely be similar to or greater than those of the ACP, and these theoretical project modifications would provide no

environmental advantage over the ACP. For this reason, and the fact that the project as proposed does not meet the ACP's purpose and need, the Mountain Valley Pipeline is not considered a viable system alternative.

10.4.2.3 Western Marcellus Pipeline Project

Transco recently announced plans to develop a new pipeline project between the existing Rockies Express pipeline in Monroe County, Ohio; an existing gas processing facility in Marshall County, West Virginia; and the existing Transco mainline in Pittsylvania County, Virginia. The pipeline is believed to measure approximately 300 miles in length and would operate with a capacity of 1 to 2 bcf/d (Williams Partners, LP, 2014a, 2014b). The project would be similar to (and compete with) Mountain Valley, and would have the same capacity and delivery limitations as that project relative to the ACP.

To meet the same purpose and need as the ACP, the Western Marcellus Pipeline Project would need to be expanded to provide sufficient capacity for an additional 1.0 to 1.5 bcf/d of natural gas and reach the same delivery points in southern Virginia and North Carolina. Upgrades to the existing Transco mainline and construction of new pipelines ranging from 200 to 300 miles in length would be required. As a result, the environmental impacts associated with system expansion and new pipeline construction would likely be similar to or greater than those of the ACP, and these theoretical project modifications would provide no environmental advantage over the ACP. For this reason, and the fact that the project as proposed does not meet the ACP's purpose and need, the Western Marcellus Pipeline Project is not considered a viable system alternative.

10.5 MAJOR ROUTE ALTERNATIVES

Atlantic and DTI identified initial or "baseline" routes for the proposed ACP and SHP pipelines based on locations of receipt and delivery points, engineering and constructability criteria, terrain, and existing land use. Atlantic and DTI subsequently evaluated and continue to evaluate environmental and other constraints along each of the routes in an effort to refine the baseline configurations. Route alternatives, variations, and minor adjustments were identified and continue to be identified based on a review of desktop constraint data, discussions with agency staff or other stakeholders, and field review in an effort to optimize the routes. The objective of the process was to identify the shortest possible route between the proposed receipt and delivery points taking into account Project needs, engineering constraints, crossings of public lands, stakeholder concerns, and the potential for impacts on sensitive environmental resources.

For the purposes of this analysis, major route alternatives were defined as alignments that deviate substantially from the baseline route to avoid geographically broad or multiple environmental constraints or other sensitive areas. The major route alternatives measure greater than 5 miles in length and trend several miles away from the baseline route.

The major route alternatives were compared against the corresponding segment of the baseline route and either selected as offering environmental, constructability, or economic advantages, or rejected if no significant advantages were identified. The primary criteria for comparing route alternatives to the baseline route were cumulative impact avoidance relative to the objective of the alternative. If selected, the route alternative was adopted as part of the proposed route, and the corresponding segment of the baseline route was rejected. Minor route variations (1 to 5 miles in length) were also identified as discussed in Section 10.6 below. Sections of the baseline route where no alternatives or variations were considered were adopted as the proposed pipeline route.

In some cases, all or portions of a major route alternative or minor route variation initially selected as preferred relative to the baseline subsequently were compared to newly identified alternative routes. In these cases, the route initially identified as preferred was considered the baseline for comparison to the new route.

Atlantic's and DTI's analysis of route alternatives and variations used a geographic information system (GIS) to characterize crossings of environmental features and other constraints along the routes. A digital centerline for each route alternative and the corresponding segment of the baseline was compared with a variety of datasets and map resources in the GIS. Features and constraints considered in the analysis included: length, public lands crossed, roads crossed, conservation easements crossed, forested lands crossed (based on the National Land Cover Database), wetlands crossed (based on the National Wetlands Inventory), waterbodies crossed (based on the National Hydrography Dataset), and Civil War battlefields crossed.



10.5.1 Atlantic Coast Pipeline

10.5.1.1 Eastern Route Alternative

During the initial planning stages for the ACP, Atlantic identified and evaluated two conceptual route alternatives, an eastern route alternative and a western route alternative. As shown in Figure 10.5.1-1, both routes originate south of Clarksburg in West Virginia and terminate near Lumberton in North Carolina, with laterals extending to Hampton Roads in Virginia and Clayton in North Carolina. Comparative information on each route is provided in Table 10.5.1-1.

The eastern route alternative, including the laterals, measures approximately 538.0 miles in length, of which 22.6 miles is adjacent to existing linear corridor facilities. It crosses approximately 66.4 miles of federal lands, including lands managed by the U.S. Forest Service (USFS), U.S. Fish and Wildlife Service (FWS), U.S. Army, and the National Park Service (NPS). The eastern route crosses both the Blue Ridge Parkway and Appalachian Trail on federal lands. The route crosses 2.8 miles of state lands, 12.2 miles of conservation easements, 328 miles of forested land, 60.6 miles of wetland, and 362 perennial waterbodies. It additionally crosses 13.5 miles of areas identified as historic properties, historic landscapes, or historic landmarks, consisting mostly of Civil War battlefields.



-  Eastern Alternative (Adopted)
-  Western Alternative

Atlantic Coast Pipeline
Figure 10.5.1-1
 Major Route Alternatives
 Eastern Alternative



Features	Unit	Eastern Route ^a	Western Route
Length	miles	538.0	607.2
Primary U.S. or state highway crossed	number	115	103
Adjacent to existing linear corridor facilities	miles	22.6	16.8
Federal lands crossed (total)	miles	66.4	68.4
National Park Service	miles	0.6	0.4
U.S. Forest Service	miles	46.9	44.0
U.S. Fish and Wildlife Service	miles	7.2	7.2
U.S. Army	miles	11.7	14.0
U.S. Army Corps of Engineers	miles	0.0	2.8
Blue Ridge Parkway crossings	number	1	1
Appalachian Trail crossings	number	1	1
State lands crossed (total)	miles	2.8	7.0
West Virginia	miles	0.0	0.0
Virginia	miles	0.2	0.0
North Carolina	miles	2.6	7.0
Conservation easements crossed	miles	12.2	18.3
Forested lands crossed	miles	328.8	414.7
National Wetland Inventory wetlands crossed (total)	miles	60.7	45.7
Forested	miles	55.0	40.1
Emergent	miles	4.7	4.0
Other	miles	1.0	1.6
Intermittent waterbodies crossed	number	342	481
Perennial waterbodies crossed	number	362	425
Historic properties, historic landscapes, and historic landmarks crossed	miles	13.5	10.4

^a The eastern route alternate is similar, but not identical, to the baseline route for the ACP. The eastern route alternative was refined into the baseline route based on customer needs and identification of delivery points for the ACP.

The western route alternative, including the laterals, measures approximately 607.2 miles in length, of which 16.8 miles is adjacent to existing linear corridor facilities. The route crosses 68.4 miles of federal lands, including lands managed by the USFS, FWS, U.S. Army, U.S. Army Corps of Engineers, and NPS. Like the eastern route alternative, it crosses both the Blue Ridge Parkway and the Appalachian Trail on federal lands. It crosses 7.0 miles of state lands, 18.3 miles of conservation easements, 414.7 miles of forested lands, 45.7 miles of wetland, and 425 perennial waterbodies. It also crosses 10.4 miles of areas identified as historic properties, historic landscapes, or historic landmarks, mostly Civil War battlefields.

Relative to the eastern route alternative, the western route alternative is approximately 69.2 miles longer and crosses 2.0 more miles of federal lands, including lands managed by the U.S. Army Corps of Engineers, which the eastern route avoids. Both routes cross the Blue Ridge Parkway and Appalachian Trail on federal lands. The western alternative crosses 4.2 more miles of state land and 6.1 more miles of conservation easements than the eastern alternative. The western alternative crosses 15.0 miles less of wetland and 3.1 miles less of historic places, but 85.9 more miles of forested land and 63 more perennial waterbodies than the eastern route. For these reasons, Atlantic identified the eastern route as the preferred alternative for the ACP. This

route subsequently was refined into the baseline route based on customer needs and the identification of delivery points for the ACP.

10.5.1.2 Monongahela National Forest Major Route Alternatives

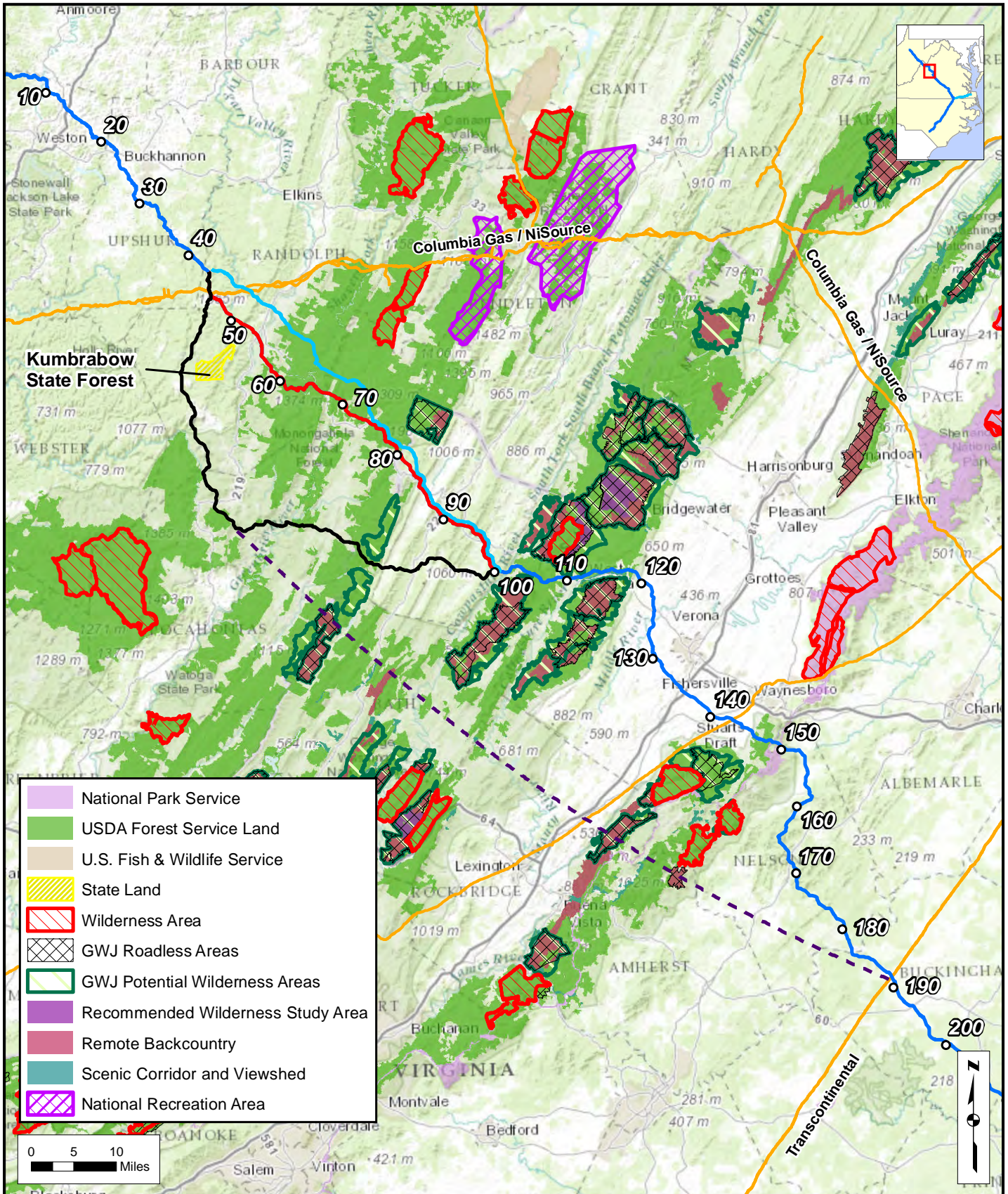
The Monongahela National Forest (MNF) encompasses approximately 919,000 acres of federal lands in the north-central highlands of West Virginia. It is a biologically and geographically diverse area managed by the USFS for a number of uses, including recreation, wilderness, habitat, timber production, mineral extraction, and livestock grazing. The MNF contains eight federally designated wilderness areas as well as backcountry recreation areas, special biological areas, a national recreation area, and visually sensitive areas (USFS, 2014a).

Given the northwest-to-southeast orientation of the proposed AP-1 mainline between central West Virginia and southern Virginia, it is not feasible to avoid crossing the MNF altogether. However, several alternative routes or conceptual corridors were investigated to minimize the crossing of sensitive resources within the forest. These resources include scenic areas, backcountry recreation areas, habitat for sensitive species (e.g., for West Virginia northern flying squirrel and Cheat Mountain salamander), other sensitive habitats (e.g., red spruce forest and botanical areas), and Civil War battlefield sites. Atlantic's initial baseline route across the MNF primarily traversed less sensitive resource areas, such as areas managed for general wildlife habitat, spruce and spruce-hardwood development, and vegetation diversity. The baseline also crossed areas managed for scenic quality and backcountry recreation, habitat for West Virginia northern flying squirrel and Cheat Mountain salamander, and forest areas containing a medium to high percentage of red spruce cover.

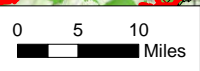
Atlantic considered alternative routes or conceptual corridors extending either north and east or south and east of the baseline as well as variations of the baseline across the MNF. Alternatives were developed in consultation with MNF staff and through review of the *Monongahela National Forest Land and Resource Management Plan* (USFS, 2011a) and GIS data layers provided by USFS staff. Evaluations of the alternatives are provided in the subsections below.

Northern and Eastern Route Alternatives

Conceptually, Atlantic considered heading east and north of its baseline crossing of the MNF in an effort to avoid sensitive resources within the forest. A potential routing opportunity considered was an alternative route parallel and adjacent to the existing Columbia system (see Figure 10.5.1-2A). Several issues were identified, however, which preclude use of this existing corridor as a viable alternative route. Collocation or partial utilization of the existing Columbia corridor does not appear feasible due to space constraints and rugged topography along the corridor. Most of the existing Columbia corridor in this area contains three pipelines of 26- or 36-inch-diameter. Because this corridor crosses very rugged terrain where space for safe and stable pipeline construction is limited, there is insufficient room for a new 42-inch pipeline along or adjacent to the existing corridor. As a result, the AP-1 mainline would need to be routed along a new right-of-way, which would eliminate the benefits of collocation with an existing utility, such as reduced forest clearing.



- National Park Service
- USDA Forest Service Land
- U.S. Fish & Wildlife Service
- State Land
- Wilderness Area
- GWJ Roadless Areas
- GWJ Potential Wilderness Areas
- Recommended Wilderness Study Area
- Remote Backcountry
- Scenic Corridor and Viewshed
- National Recreation Area



Atlantic Coast PipelineSM

- Proposed Route
- Conceptual Southern Route Alternative
- Existing Natural Gas Pipelines
- MNF Baseline
- MNF Alternative 2 (Adopted)
- MNF Alternative

Atlantic Coast Pipeline
Figure 10.5.1-2A
 Major Route Alternatives (Conceptual)
 Monongahela National Forest



Another issue with this alternative is that the existing Columbia corridor crosses or passes near several sensitive management areas, including the Laurel Fork North, Otter Creek, Roaring Plains, and Dolly Sods Wilderness Areas, and the Spruce Knob-Seneca Rocks National Recreation Area (NRA). The Columbia corridor is adjacent to the northern boundary of the Laurel Fork North Wilderness Area for 2.4 miles, and crosses approximately 11.4 miles of the NRA. A new pipeline corridor extending approximately 15 miles north of the Columbia system would be necessary to avoid both the NRA and nearby Wilderness Areas. A route further to the south to avoid these same resources would be located near the baseline and cross many of the same sensitive areas, such as habitat for sensitive species, backcountry recreation areas, and forest areas with a medium to high percentage of red spruce cover.

Finally, an alternative route to the north and east following a similar path as the existing Columbia corridor would eventually have to proceed south to reconnect with Atlantic's proposed route heading southeast. A significant routing constraint that would have to be crossed is the Shenandoah National Park (SNP), which extends from Waynesboro, Virginia northeast to Front Royal, Virginia, a distance of about 70 miles, much of which is designated Wilderness Area. A crossing of the SNP and the Wilderness Area would require an authorization from the U.S. Congress that would be difficult to obtain.

For all the reasons described above, attempts to identify potential route corridors to the north and east of Atlantic's proposed route across the MNF were abandoned.

MNF Baseline Route and Variations

Atlantic identified and evaluated two alternative routes (MNF 1 and MNF 2) in an effort to avoid sensitive resource areas within the MNF along the baseline, including the Gaudineer Scenic Area and a backcountry recreation area. Both routes are south of and generally parallel to the baseline, crossing Cheat and Back Allegheny Mountains south of U.S. Highway 250. MNF 1 was identified first, and then about 20 percent of this route (approximately 9.0 miles) was modified and optimized to create MNF 2, which avoids sensitive habitats identified in GIS data sets provided by USFS staff.

The baseline route measures approximately 56.4 miles in length. Starting at MP 43.1, the route initially heads east/southeast for approximately 11.7 miles, passing south of Nettle Mountain and crossing Rich Mountain and the Tygart Valley. It enters the MNF approximately 2.5 miles southeast of Mill Creek in Pocahontas County, West Virginia, and then continues east/southeast for approximately 23.8 miles, crossing Cheat, Back Allegheny, Burner, and Frank Mountains. The route exits the MNF near the West Virginia/Virginia state line west of Tamarack Ridge. It then continues in a southeasterly direction for approximately 20.9 miles, crossing Bearcamp Knob, Lantz Mountain, Bluegrass Valley, and Jack Mountain. It terminates south of McDowell on Bullpasture Mountain in Highland County, Virginia at approximate MP 99.8.

Beginning at MP 43.1, MNF 1 initially extends to the southeast of the baseline for approximately 16.7 miles, passing south of Huttonsville and entering the MNF at Cheat Mountain. It then heads east/southeast for 13.1 miles, crossing Cheat, Back Allegheny, and Burner Mountains. After crossing the East Fork of the Greenbrier River, the route follows the

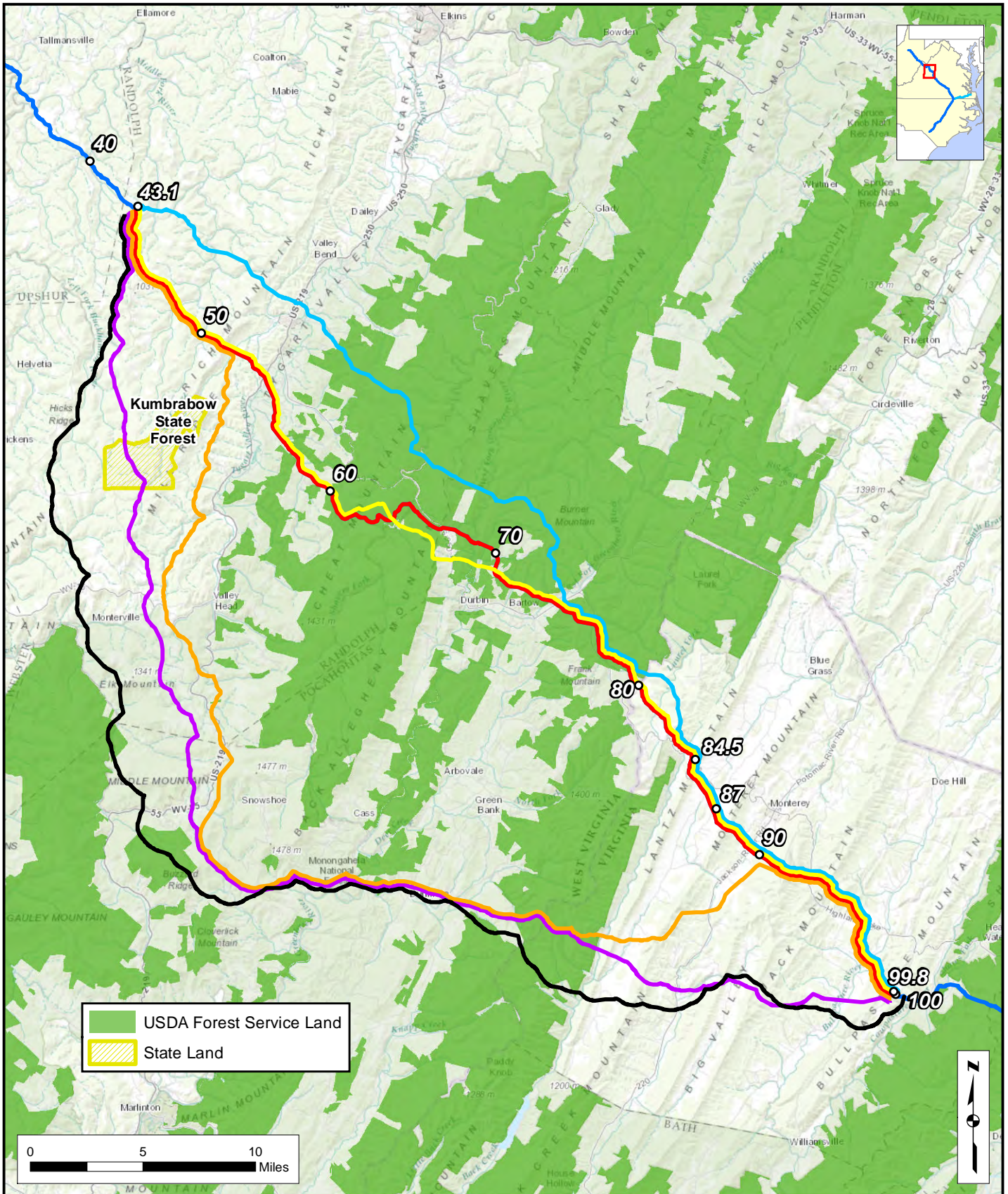
same alignment as the baseline for 5.2 miles across Frank Mountain and Little Spruce Ridge. It then passes south of the baseline for approximately 3.3 miles to avoid a conservation easement at Bearcamp Knob. MNF 1 then follows the same alignment as the baseline to the terminus at approximate MP 99.8.

MNF 2 initially follows the same alignment as MNF 1 for the first 18.8 miles. At Cheat Mountain, it deviates away from MNF 1, following an abandoned strip mine for about 4.7 miles across Cheat and Back Allegheny Mountains. It then parallels U.S. Highway 250 for 1.3 miles, before heading east/southeast for 3.9 miles across Burner Mountain. MNF 2 then follows the same alignment as MNF 1 to the terminus at MP 99.8.

Figure 10.5.1-2B depicts the baseline and alternative routes, and Table 10.5.1-2 provides comparative data on each route. MNF 1 and MNF 2 are approximately the same length as the baseline, but they reduce the crossing length of the MNF by 7.0 and 5.1 miles, respectively. This primarily is due to the routes following a mix of cleared agricultural and forested lands between approximate MPs 53.5 and 58.5 across the Tygart Valley and along Becky Creek before entering federal lands in the MNF. Both alternatives cross 1.7 miles of state-owned lands, compared to 0.4 mile for the baseline. The alternatives avoid crossings of conservation easements on private lands, whereas the baseline crosses 2.3 miles of conservation easement at Bearcamp Knob. Except as discussed below, crossings of other resource types are similar for the three routes, though MNF 1 and MNF 2 both cross 3.6 fewer miles of forested land than the baseline.

The major optimization of MNF 1 to MNF 2 was accomplished by adjusting the route to follow a bench along the side of Cheat Mountain that was used during the mid- to late-twentieth century for strip mining of coal. The bench consists of a stabilized and previously graded, relatively flat, side-cut area measuring about 150 feet wide. It follows along the south side of an east-west trending ridgeline north of Lambert Run between Cheat and Back Allegheny Mountains at about the 4,000-foot contour. The bench is relatively flat, rocky, and covered by grass or shrubs, but portions of it are in the process of being replanted with red spruce seedlings by the USFS and private stakeholder groups.

Starting at about MP 60.3, MNF 2 follows the bench for a distance of approximately 4.7 miles through areas mapped by the MNF as red spruce forest and potential habitat for West Virginia northern flying squirrel. Relative to the baseline and MNF 1, MNF 2 optimizes existing, cleared (or very recently replanted) corridors within the forest. Atlantic's engineers have reviewed aerial photography and topographic maps of this area. Based on this desktop review, MNF 2 appears to be a constructible route that would avoid significant tree clearing as well as areas of steep slope along Cheat and Back Allegheny Mountains. Based upon review of aerial photography, MNF 2 crosses approximately 3.8 miles less of forested land than MNF 1 in the area where it follows the abandoned strip mine. Additionally, MNF 2 runs immediately adjacent to a 1.3-mile-long section of U.S. Route 250 on the northeast side of Back Allegheny Mountain and the south side of Blister Run, to maximize collocation with an existing corridor.



Atlantic Coast Pipeline SM

- Proposed Route
- MNF Baseline Route
- MNF Alternative 1
- MNF Alternative 2 (Adopted)
- MNF Alternative 3
- MNF Alternative 4
- MNF Alternative 5

Atlantic Coast Pipeline
Figure 10.5.1-2B
 Major Route Alternatives
 Monongahela National Forest



Features	Unit	Baseline					
		Route	MNF 1	MNF 2	MNF 3	MNF 4	MNF 5
Length (total)	miles	56.4	55.7	56.8	74.3	67.6	73.0
Land crossed with slope greater than 35 percent	miles	8.9	8.9	9.6	19.0	13.1	14.6
Primary U.S. or State Highway	number	10	11	11	10	9	9
Other state or local roads	number	18	18	21	18	27	19
Adjacent to existing linear corridor facilities (total)	miles	0.0	0.0	1.0	3.8	1.7	0.7
Federal lands crossed (total)	miles	23.0	16.0	17.9	5.2	5.3	8.0
U.S. Forest Service (total)	miles	23.0	16.0	17.9	5.2	5.3	8.0
Monongahela National Forest	miles	23.0	16.0	17.9	2.2	2.2	4.8
George Washington National Forest	miles	0.0	0.0	0.0	3.0	3.1	3.2
State lands crossed (total)	miles	0.4	1.7	1.7	0.5	4.8	1.6
West Virginia	miles	0.0	1.3	1.3	0.1	3.5	0.1
Virginia	miles	0.4	0.4	0.4	0.4	1.3	1.5
Private lands crossed	miles	33.0	38.0	37.2	68.6	57.5	63.4
Conservation easements crossed	miles	2.3	0.0	0.0	2.1	0.0	0.0
U.S. Forest Service management prescription units crossed							
Vegetation diversity	miles	11.6	5.7	7.1	0.0	0.0	1.7
Spruce and spruce-hardwood ecosystems management	miles	5.4	6.4	6.9	0.0	0.0	0.0
Wildlife habitat emphasis	miles	4.8	3.7	3.7	2.2	2.2	2.6
Backcountry recreation	miles	1.0	0.0	0.0	0.0	0.0	0.5
Special areas - scenic areas	miles	0.3	0.0	0.0	0.0	0.0	0.0
Mosaics of wildlife habitat (George Washington National Forest)	miles	0.0	0.0	0.0	3.0	3.1	3.2
Big-eared bat habitat	miles	4.6	4.8	4.5	0.0	0.0	0.0
Indiana bat habitat	miles	0.9	1.9	2.5	0.6	0.6	2.4
Northern flying squirrel habitat	miles	5.6	4.7	5.2	0.0	0.0	0.0
Cheat Mountain salamander habitat	miles	2.4	2.2	0.2	0.0	0.0	0.0
Red spruce crossing percent cover							
Greater than 50 percent cover	miles	0.8	0.9	0.0	0.0	0.0	0.0
10 to 50 percent cover	miles	3.5	1.4	1.1	0.0	0.8	0.5
10 percent cover	miles	5.1	6.2	5.5	1.1	1.6	2.0
No spruce present	miles	16.9	16.3	19.4	12.8	28.8	16.9
Land use types crossed							
Agricultural	miles	5.1	7.9	8.9	7.8	8.6	4.8
Developed	miles	0.5	0.5	0.6	0.7	0.8	0.7
Forested	miles	50.8	47.2	47.2	65.9	58.1	66.6
Open water	miles	0.0	0.1	0.1	0.0	0.0	0.1
Mine	miles	0.0	0.0	0.0	0.0	0.0	0.9
Recreational trails crossed	number	21	16	36	21	20	18
Wetlands crossed – forested	miles	0.0	0.1	0.1	<0.1	<0.1	0.1
Wetlands crossed – emergent	miles	<0.1	0.0	0.0	0.0	0.0	<0.1
Wetlands crossed – other	miles	0.1	0.1	0.1	<0.1	<0.1	<0.1
Intermediate waterbodies crossed	number	25	29	27	48	35	22
Perennial waterbodies crossed	number	20	27	30	30	19	25
Battlefield areas (total)	miles	0.7	1.7	3.4	1.0	0.0	0.0
McDowell	miles	0.7	0.7	0.7	0.7	0.0	0.0
Cheat Mountain	miles	0.0	0.9	2.6	0.3	0.0	0.0

Several digital environmental resource data layers provided by USFS staff were reviewed to evaluate the alternative routes across the Cheat/Back Allegheny Mountain area of the MNF. These include suitable and high probability habitat for the West Virginia northern flying squirrel, habitat for Cheat Mountain salamander, a special botanical area (Blister Run Swamp), a spruce restoration area (Lambert Spruce Restoration Area), a potential wild and scenic river crossing, and red spruce cover. Salient points relative to these data layers include the following:

Suitable and High Probability Habitat for the West Virginia Northern Flying Squirrel

Both MNF 1 and MNF 2 cross areas mapped as suitable or high potential habitat for the West Virginia northern flying squirrel. Unlike the baseline route and MNF 1, MNF 2 mostly crosses these areas within or adjacent to existing, previously cleared corridors. These include the abandoned strip mine areas along the east-west trending ridgeline north of Lambert Run and the area adjacent to U.S. Route 250 (which itself is separated from the main forested habitat area on Back Allegheny Mountain by an adjacent, cleared power line corridor). The abandoned strip mine areas are mostly cleared of trees, and based on this fact, do not appear to provide suitable habitat for northern flying squirrel. Much of this area occurs at elevations of 4,000 feet or less, on the south facing slope of the ridgeline, and/or areas mapped as containing no or less than 10 percent red spruce cover. Atlantic understands that suitable habitat for northern flying squirrel generally occurs at elevations greater than 3,000 feet, on north facing slopes, in red spruce and mixed red spruce/northern hardwood forest, and adjacent areas with these characteristics.

Habitat for Cheat Mountain Salamander

Both the baseline and MNF 1 routes cross areas mapped by the USFS as habitat for Cheat Mountain salamander along Back Allegheny Mountain. MNF 2 avoids these mapped habitat areas on Cheat Mountain, but crosses 0.2 mile of mapped habitat area on Grassy Knob off Little Spruce Ridge.

Blister Run Swamp Botanical Area

The baseline, MNF 1, and MNF 2 avoid the Blister Run Swamp Botanical Area, though MNF 2 is adjacent to this area where the route parallels U.S. Highway 250.

Lambert Spruce Restoration Area

Both MNF 1 and MNF 2 cross the Lambert Spruce Restoration Area along the east-west trending ridgeline north of Lambert Run. Unlike MNF 1, MNF 2 mostly crosses this area within previously cleared abandoned strip mines. Atlantic understands that the USFS, in collaboration with different stakeholders, has begun a process to reclaim these areas. Although MNF 2 crosses some areas that have been reclaimed, Atlantic would restore these areas with additional red spruce plantings following construction.

Potential Wild and Scenic Rivers

The baseline, MNF 1, and MNF 2 each cross an area mapped as a potential wild and scenic river along Shavers Fork. Atlantic believes that impacts on Shavers Fork could be mitigated through implementation of best management practices during construction (including

implementation of the Commission's Wetland and Waterbody Construction and Mitigation Procedures, which are USFS-approved) as well as by restoration of the right-of-way.

Red Spruce Cover

The baseline route crosses large areas mapped as containing medium (10-50 percent) and high (>50 percent) red spruce cover on Back Allegheny Mountain. MNF 1 and MNF 2 mostly cross areas mapped as containing no or low red spruce cover on Back Allegheny Mountain. MNF 2 crosses the least amount of high and medium red spruce cover across Back Allegheny Mountain because it follows the abandoned strip mine, which is mapped as having no red spruce cover present. MNF 2 additionally avoids areas mapped as containing medium or high spruce cover on Cheat Mountain.

Based on review of digital desktop data and discussions with USFS staff, Atlantic believes that MNF 2 has the potential to avoid or minimize impacts on sensitive resources within the MNF. Atlantic has applied for and is currently awaiting approval of a temporary use permit from the MNF to access MNF lands for the purposes of conducting environmental field surveys, including surveys for sensitive habitats and species. Field surveys are planned for this route in the spring 2015 to verify constructability of the route and collect data on known and unrecorded resources along the route.

Battlefield Areas

Compared to the baseline route, MNF 1 and MNF 2 cross an additional 0.9 or 2.6 miles in battlefield areas. However, Atlantic understands that a good portion of these areas have been previously disturbed through mining or other activities, and are not intact. Atlantic will perform cultural resources testing of any designated battlefield areas, and will study and curate any that would be identified prior to construction.

Southern Route Alternatives

After consultation with staff at the MNF, the West Virginia Field Office of the FWS, and the West Virginia Department of Natural Resources, three routes to the south of Atlantic's baseline (MNF 3, MNF 4, and MNF 5) were identified and evaluated. The intent of these route alternatives was to reduce the crossing length of the MNF and avoid sensitive resources in the Cheat/Back Allegheny Mountain area, particularly habitat for West Virginia northern flying squirrel and Cheat Mountain salamander. Figure 10.5.1-2B depicts the baseline and alternative routes, and Table 10.5.1-2 provides comparative data on the three alternatives.

The alternative routes leave the baseline at MP 43.1 following the same path as MNF 2 until reaching MP 46.0 (MNF 3 and MNF 4) or 52.0 (MNF 5). The southern alternative routes then proceed due south for between 27.0 and 34.0 miles, turning east just south of the Snowshoe Ski Area at Thorny Flat, West Virginia. The routes then proceed east past Dunmore, West Virginia for about 15.8 miles, crossing the West Virginia/Virginia state border east of Dunmore, West Virginia. From here, MNF 3 proceeds to the northwest for 10.3 miles, then follows the same path as the baseline to approximate MP 99.8, while MNF 4 and 5 continue east for approximately 15.0 miles to the terminus of the routes. MNF 3, 4, and 5 are longer than the

corresponding segments of the baseline and its variant routes, adding between 11.2 and 17.9 miles of route relative to the baseline.

MNF 3, 4, and 5 cross 2.2 miles, 2.2 miles, and 4.8 miles, respectively, of the MNF, compared with 23.0 miles for the baseline and 16.0 miles and 17.9 miles, respectively, for MNF 1 and MNF 2. MNF 3, 4, and 5 cross between 3.0 and 3.2 miles of the George Washington National Forest (GWNF) in areas managed for wildlife habitat. MNF 3 and 4, however, are in areas identified in the *George Washington National Forest Draft Revised Land and Resource Management Plan* (USFS, 2011b) as potential wilderness areas.

In addition to adding substantial mileage to the Project, there are several other significant disadvantages associated with MNF 3, 4, and 5. First and foremost is the difficulty of the terrain crossed by these routes, particularly between the Snowshoe/Thorny Flats area and the points where these routes reconnect to the proposed pipeline. Where the corresponding section of the baseline route crosses slopes exceeding 35 percent for a distance of about 8.9 miles, MNF 3, 4, and 5 cross slopes exceeding 35 percent for 19.0 miles, 13.1 miles, and 14.6 miles, respectively. As discussed in Resource Report 1, special construction methods, including use of winched tractors and other vehicles, is necessary in areas where the slope exceeds 35 percent.

Of great significance is the jumbled arrangement of ridgetops south and east of Thorny Flat. The mountain ridges in this area generally run in a north/south direction (the AP-1 mainline trends northwest to southeast) or have no primary orientation and consist of a jumbled mass of peaks and ridge tops. Trying to cross this terrain with a 42-inch pipeline results in a combination of steep side slope traverses and up and down approaches to ridgetops, requiring heavy equipment winching on both sides of the ridge from a narrow staging area on top.

Because of the narrowness and remoteness of the ridgetops, most of these areas require the construction of a graded winching platform on top of the ridge, and a construction access road built along the ridge to access the winch platform for delivery of construction equipment and pipe sections. Construction access in these remote areas would be difficult due to the lack of existing nearby roadway infrastructure, which would likely result in the construction of longer, new access roads into the remote areas. Slope restoration and stabilization would also be difficult to achieve in many of the steep areas crossed by the southern alternative routes. Based on desktop review, Atlantic's engineers concluded that MNF 5 would be the least difficult to construct and re-stabilize of the three southern alternative routes, although it would be more difficult than either MNF 1 or MNF 2. MNF 5 additionally avoids the portion of the GWNF identified in the *George Washington National Forest Draft Revised Land and Resource Management Plan* (USFS, 2011b) as potential wilderness area. However, even with the avoidance of this land the aggregation of the terrain and accessibility on MNF 5 makes this route just as difficult from a construction standpoint as MNF 3 and MNF 4.

In addition to construction, access, and restoration/stabilization issues, the greater length required for the three southern alternative routes would result in significant additional land disturbance and forest clearing. For example, in addition to MNF 5 adding 16.6 miles to the Project, it also crosses 15.8 more miles of forested lands than the corresponding segment of the baseline and 19.4 more miles of forested land than MNF 2. Assuming a construction right-of-

way width of 125 feet, this would result in the clearing and grading of an additional 238.5 acres of forested land than the baseline or an additional 293.9 acres of forested land than MNF 2.

In addition to MNF 3, 4, and 5, Atlantic conceptually investigated the possibility of a southern alternative corridor that would start at or near MP 43.1 on the currently proposed route that initially would follow the same alignment as MNF 5 to the Snowshoe Ski area near Thorny Flats. Rather than continuing to the east/northeast and rejoining the current route near the northern boundaries of the GWNF as MNF 3, 4, and 5 do, Atlantic investigated a conceptual route extending in a southeast direction, crossing the Blue Ridge Parkway and Appalachian Trail somewhere near Raphine, Virginia, and rejoining the current route in the vicinity of Norwood, Virginia (see the route labeled “Conceptual Southern Route Alternative” on Figure 10.5.1-2A).

From an operations perspective, as long as the conceptual alternative route could rejoin the currently proposed route upstream of Compressor Station 2, it would be compatible with Atlantic’s proposed operations and natural gas deliveries. If possible to find a corridor preferable to MNF 3, 4 and 5 from an environmental and constructability perspective, it would avoid backtracking sharply to the east to connect back to the currently proposed route north of Staunton, Virginia and could also reduce the overall length of the MNF alternative routes.

While many of the same constructability and construction access issues posed by MNF 3, 4, and 5 would also apply to the Conceptual Southern Route Alternative, environmental routing constraints associated with crossing the George Washington and Jefferson National Forests south of the current proposed route appear to be insurmountable. These routing constraints include large sections of special management areas such as designated Wilderness Areas, potential wilderness areas, designated roadless areas, remote backcountry areas, and designated scenic areas. Atlantic’s assessment of potential route corridors in the general vicinity of the Conceptual Southern Route Alternative as shown on Figure 10.5.1-2A determined that there is not a feasible across the Blue Ridge Mountains in this area.

MNF Route Selection

Atlantic’s review of potential alternative routes north and east of the baseline across the MNF indicates that for reasons of steep, rugged topography and existing sensitive management areas (e.g., the Laurel Fork North Wilderness Area and the Spruce Knob-Seneca Rocks NRA), it is not possible to collocate the AP-1 mainline with the existing Columbia pipeline infrastructure heading north and east of the proposed ACP route. Moreover, any route to the north and east of the proposed route would eventually have to go south to reconnect to the proposed pipeline, and in doing so, would cross the SNP, which would require an authorization from the U.S. Congress. Therefore, Atlantic determined that potential alternatives to the north and east are not feasible.

Atlantic looked at five major alternative routes south of the baseline route: two alternatives (MNF 1 and MNF 2) which optimize the baseline, and three alternatives (MNF 3, MNF 4, and MNF 5) which trend farther to the south. MNF 1 and MNF 2 range from 0.7 mile shorter to 0.4 mile longer than the baseline, while MNF 3, MNF 4, and MNF 5 add between 11.2 and 17.9 miles to the AP-1 mainline relative to the baseline. Of the five alternative routes, Atlantic believes that based on desktop studies to date, that construction along MNF 2 appears to result in the least environmental impact by following existing cleared corridors through potential

habitat for protected species, or by avoiding these habitat areas entirely. Construction of this route along previously disturbed and in some cases previously graded areas, would avoid the most rugged terrain of all the alternatives, have the best existing access through the area (primarily via U.S. Highway 250) and, due to its comparably shorter length, would appear to result in the least impact to previously undisturbed lands. However, field surveys in spring of 2015 are needed to confirm that sensitive habitats would be avoided to the extent possible and that the route is constructible within the previously disturbed strip mine areas and in other terrain along this route. Consequently, Atlantic will continue to refine and study alternative routes to the south, as well as the MNF Alternative 2.

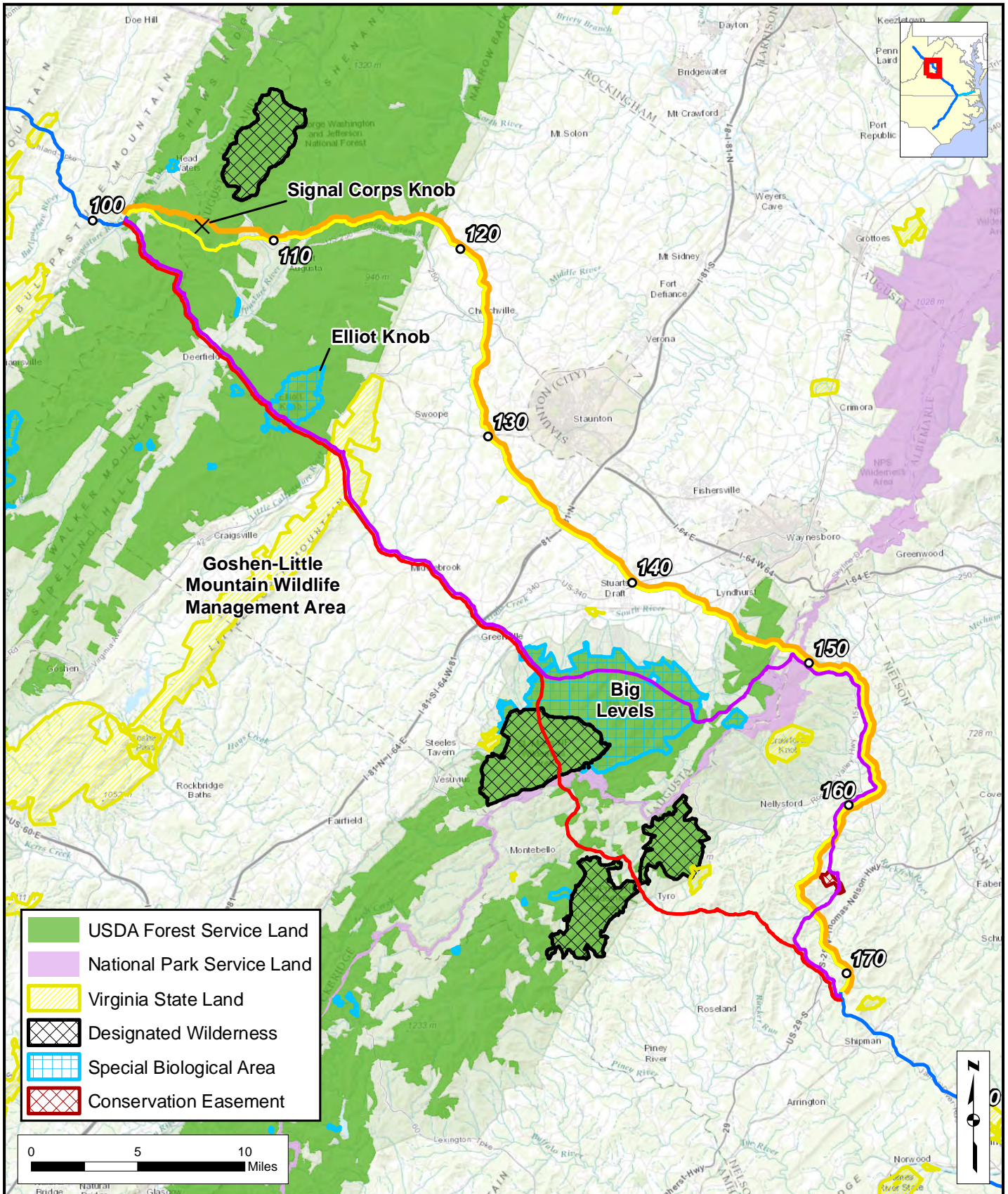
10.5.1.3 George Washington National Forest Major Route Alternatives

The GWNF encompasses approximately 1 million acres of federal lands along the Appalachian Mountain chain in Virginia, West Virginia, and Kentucky. It contains portions of the Appalachian Trail and Blue Ridge Parkway as well as eight federally designated wilderness areas and a number of backcountry recreation, special biological, and visually sensitive areas. Portions of the GWNF are managed for timber production and wood products (USFS, 2014b).

Given the northwest-to-southeast orientation of the proposed AP-1 mainline between central West Virginia and southern Virginia, it is not feasible to avoid crossing the GWNF altogether. However, DTI identified and evaluated several route alternatives based on review of the *George Washington National Forest Draft Revised Land and Resource Management Plan* (USFS, 2011b) and input from USFS staff in an effort to minimize the crossing length and avoid sensitive areas within the forest. In addition to the baseline, Atlantic identified three alternative routes (GWNF 1, GWNF 2, and GWNF 3) between approximate mileposts (MP) 101.9 and 171.0 in Highland, Augusta, and Nelson Counties, Virginia. The baseline route and each alternative are depicted on Figure 10.5.1-3, and comparative information on each route is provided in Table 10.5.1-3.

At 58.8 miles in length, the baseline route is the shortest of the four alternatives. Beginning at MP 101.9, the baseline initially heads southeast for approximately 33.0 miles, passing between Deerfield and West Augusta and east of Staunton, Stuarts Draft, and Waynesboro. At a point east of Greenville, the route turns south for approximately 15.0 miles, passing east of Montebello and north of Nash. It crosses the Blue Ridge Parkway approximately 7 miles south of Greenville, and the Appalachian Trail approximately 6 miles east of Montebello. At a point near Tyro, the route heads southeast for approximately 11.0 miles, terminating west of Lovingston at MP 171.0.

The baseline route crosses approximately 23.9 miles of the GWNF, including 3.0 miles in the St. Mary's Wilderness Area and 0.5 mile in the Three Ridges Wilderness Area. Crossings of wilderness areas require an authorization from the U.S. Congress that would be difficult to obtain. The baseline route additionally crosses management prescription units in the forest designated as special biological areas, scenic corridors and viewsheds, remote backcountry, and roadless areas. Staff from the GWNF advised Atlantic that utility corridors generally are prohibited in these areas.



	<ul style="list-style-type: none"> Proposed Route GWNF Baseline Route GWNF 1 GWNF 2 GWNF 3 	<h3>Atlantic Coast Pipeline</h3> <h4>Figure 10.5.1-3</h4> <h4>Major Route Alternatives</h4> <h4>George Washington National Forest</h4>
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Features	Unit	Baseline Route	GWNF 1 Route Alternative	GWNF 2 Route Alternative	GWNF Route Alternative (proposed)
Length	miles	58.8	68.4	68.7	69.1
Primary U.S. or state highway crossed	number	9	10	14	14
Other state or local roads crossed	number	54	64	75	79
Adjacent to existing linear corridor facilities	miles	0.0	0.0	0.0	0.0
Federal lands crossed (total)	miles	24.5	26.7	12.8	13.0
National Park Service (total)	miles	0.6	0.7	0.5	0.5
Blue Ridge Parkway	miles	0.6	0.2	0.2	0.2
Appalachian Trail corridor	miles	0.0	0.5	0.3	0.3
U.S. Forest Service (total)	miles	23.9	26.0	12.3	12.5
State lands crossed	miles	3.5	3.5	0.0	0.0
Private lands crossed	miles	30.8	38.2	55.9	56.1
Conservation easements crossed	miles	2.5	2.6	0.0	0.0
U.S. Forest Service management prescription units crossed (total)	miles	23.9	26.0	12.3	12.5
Blue Ridge Parkway corridor	miles	0.1	0.1	0.0	0.0
Designated wilderness	miles	3.5	0.0	0.0	0.0
Dispersed recreation	miles	0.0	1.2	0.0	0.0
Eligible recreation river corridor	miles	0.2	0.0	0.0	0.0
Mosaics of wildlife habitat	miles	10.3	10.7	12.3	12.5
Pastoral landscapes and rangelands	miles	0.0	0.5	0.0	0.0
Remote backcountry	miles	3.0	2.5	0.0	0.0
Scenic corridor and viewshed	miles	1.6	0.3	0.0	0.0
Special biological area	miles	5.2	10.7	0.0	0.0
Utility corridor	miles	0.1	0.1	0.0	0.0
U.S. Forest Service roadless areas	miles	2.5	3.5	0.0	0.0
Forested lands crossed	miles	46.8	54.3	41.6	42.1
Wetlands crossed – freshwater emergent	miles	<0.1	<0.1	0.1	0.1
Wetlands crossed – freshwater forested/shrub	miles	<0.1	0.3	0.4	0.4
Intermittent waterbodies crossed	number	23	52	68	69
Perennial waterbodies crossed	number	24	41	39	38
McDowell Battlefield study area crossed	miles	0.0	0.0	0.6	0.3

Outside the GWNF, the baseline route crosses 0.6 mile of NPS lands, including the Blue Ridge Parkway and Appalachian Trail; approximately 3.5 miles of state lands in the Goshen-Little Mountain State Wildlife Area; and approximately 2.5 miles of private lands subject to conservation easements held by the Virginia Outdoors Foundation (VOF). The baseline route crosses the fewest amount of wetlands and waterbodies, but the second most miles of forested land.

GWNF 1 is approximately 68.4 miles long, which is 9.6 miles longer than the baseline. It follows the same alignment as the baseline for approximately 32.0 miles, then heads east-

northeast for approximately 17.0 miles to avoid crossing the St. Mary's and Three Ridges Wilderness Areas. The route crosses the Blue Ridge Parkway and Appalachian Trail approximately 3.0 miles south of Interstate 64 at Afton Mountain. In Rockfish Valley, the route turns south and continues for approximately 32.0 miles, where it intersects the baseline near Woods Mountain in Nelson County. It then follows the same alignment as the baseline to the terminus at approximate MP 171.0, west of Lovingston.

GWNF 1 crosses approximately 26.0 miles of GWNF lands, including areas designated as remote backcountry, scenic corridors and viewsheds, special biological areas, and roadless areas. One of the special biological areas, Elliott Knob, provides habitat for several sensitive species, including the cow knob salamander, which is protected under a special conservation agreement between the USFS and the FWS. Another special biological area, Big Levels, contains unique groundwater features, vernal pools, dense concentrations of prehistoric archaeological sites, and habitat for several sensitive species. Staff from the GWNF recommended avoiding these areas.

Outside the national forest, GWNF 1 crosses approximately 0.7 mile of NPS land at the Blue Ridge Parkway and Appalachian Trail; 3.5 miles of state land in the Goshen-Little Mountain State Wildlife Area; and 2.6 miles of private land subject to conservation easements held by the VOF and Virginia Department of Forestry. It crosses more wetlands and waterbodies than the baseline route, but less than the other alternatives. It also crosses the most forested land.

GWNF 2 is approximately 68.7 miles long, which is 9.9 miles longer than the baseline. Starting at MP 101.9, the route initially heads east for approximately 16.0 miles, passing north of West Augusta. It then heads south-southeast for approximately 34.0 miles, passing north of Stuarts Draft and south of Staunton and Waynesboro. Like GWNF 1, it crosses the Blue Ridge Parkway approximately 3.0 miles south of Interstate 64 at Afton Mountain. After crossing Rockfish Valley Road, the route heads south for another 19 miles, passing east of Wellsford and Lovingston, terminating at MP 171.0.

GWNF 2 crosses approximately 12.3 miles of USFS lands, all within the mosaic of wildlife habitat management prescription unit. Based on discussions with USFS staff, lands within this management prescription unit would be considered suitable for a utility crossing of the national forest. Relative to GWNF 1, the route avoids the Elliott Knob and Big Level special biological areas and designated roadless areas, but crosses approximately 0.6 mile of the study area for the McDowell Battlefield site. It additionally crosses Signal Corps Knob, which USFS staff identified as an important site used as a signal station by both the Union and Confederate Armies during the Civil War.

Outside the national forest, GWNF 2 crosses approximately 0.5 mile of NPS land at the Blue Ridge Parkway and Appalachian Trail, but avoids the Goshen-Little Mountain State Wildlife Area as well as crossings of conservation easements. It crosses the same amount of wetlands and waterbodies as GWNF 3, but more than the baseline and GWNF 1 route alternatives. It also crosses the least amount of forested land of all four routes.

GWNF 3 has a total length of 69.1 miles, which is 10.3 miles longer than the baseline route. It follows the same alignment as GWNF 2, with the exception of a short segment between MPs 103.1 and 109.3, where it passes approximately a mile to the south in the vicinity of Signal Corps Knob. GWNF 3 crosses 12.5 miles of USFS lands, all within the mosaic of wildlife habitat management prescription unit. Like GWNF 2, the route avoids the Elliot Knob and Big Level special biological areas and designated roadless areas. It also avoids the Civil War site on Signal Corp Knob and crosses 0.3 mile less of the McDowell Battlefield site.

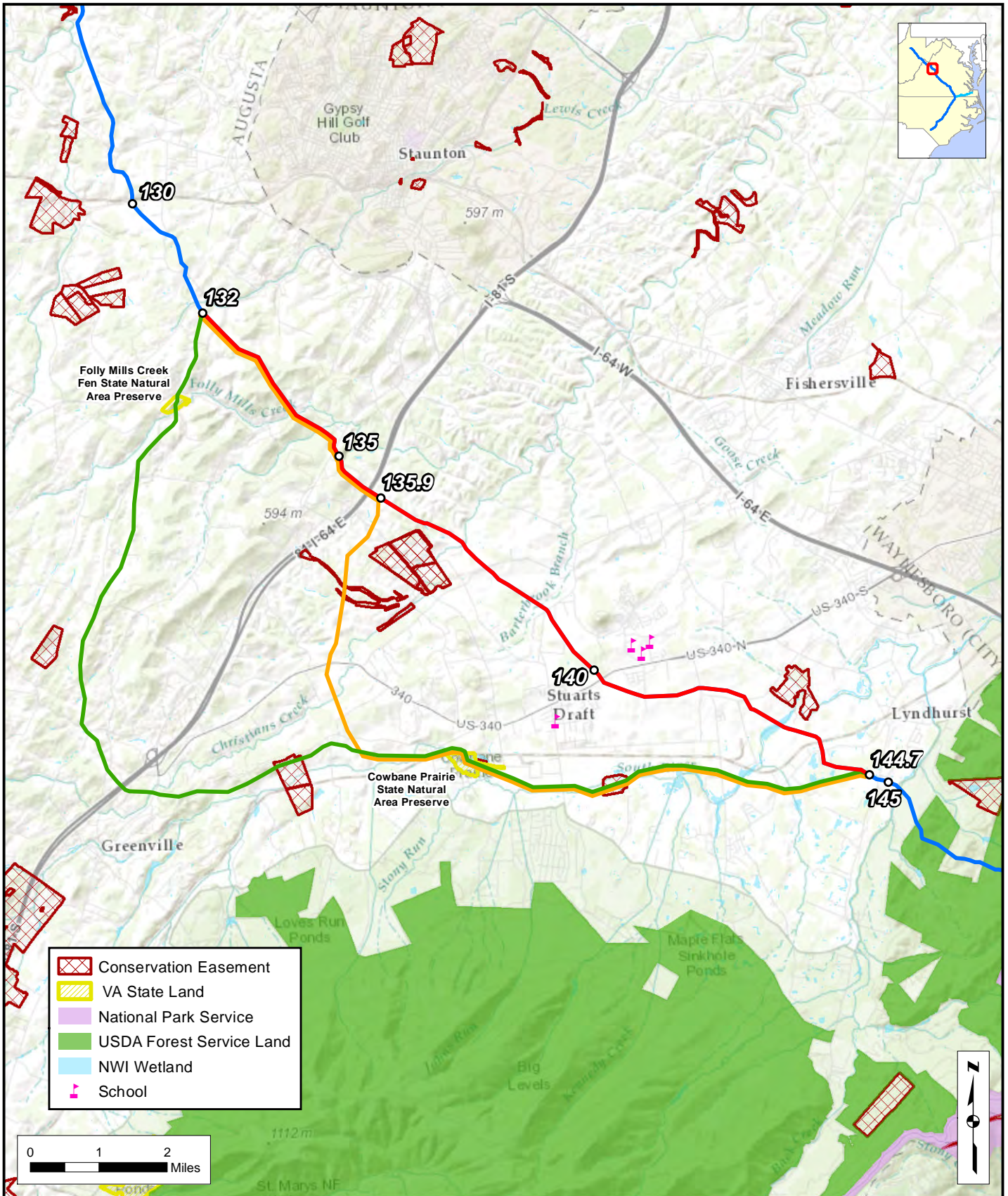
Outside the national forest, GWNF 3 crosses 0.5 mile of NPS lands at the Blue Ridge Parkway and Appalachian Trail, but avoids the Goshen-Little Mountain State Wildlife Area and all conservation easements. It crosses the same amount of wetlands and waterbodies as GWNF 2 and just 0.5 more mile of forested land.

Although it is the longest of the four alternatives, Atlantic identified GWNF 3 as the preferred alternative. This route minimizes impacts on sensitive resources in the GWNF, including areas with special management designations, designated roadless areas, and Civil War sites. It reduces the crossing of NPS lands at the Blue Ridge Parkway and Appalachian Trail, and avoids state lands and conservation easements. It crosses more wetlands and waterbodies than the baseline and GWNF 1 alternatives, primarily due to the increased length of the route, and the same amount of these features as GWNF 2. It also crosses the second fewest miles of forested lands. For all these reasons, Atlantic incorporated GWNF 3 into the proposed route.

10.5.1.4 Stuarts Draft Major Route Alternatives

Atlantic identified and evaluated two alternative routes (Stuarts Draft 1 and Stuarts Draft 2) in Augusta County, Virginia at the request of the county Board of Supervisors in an effort to increase the distance between the current route (a segment of GWNF 3) and a three-school complex in Stuarts Draft, Virginia. The county also requested that Atlantic work to avoid water protection areas. The current route for the AP-1 mainline passes to the northeast of Stuarts Draft where it crosses U.S. Highway 340 at MP 142.2. The alternatives originate at MP 132.0, pass west and south of Stuarts Draft, and terminate along the current route at approximate MP 144.7. Stuarts Draft 1 initially heads south for 8 miles, crosses Interstate 64/81 north of Greenville, and then heads east for 11 miles, where it rejoins the current route southwest of Lyndhurst. Stuarts Draft 2 follows the same alignment as the current route for 4 miles, heads south for 4 miles on the east side of the interstate, then follows the same path as Stuarts Draft 1 to the terminus at MP 144.7. The current route and both alternatives are depicted on Figure 10.5.1-4, and comparative data on each route is provided in Table 10.5.1-4.

At 19.1 miles, Stuarts Draft 1 is 6.4 miles longer than the corresponding segment of the current route. It increases the distance between the proposed pipeline and the three-school complex from 0.5 to 1.6 miles, but passes within 0.9 mile of another school in Stuarts Draft. The alternative route crosses 0.8 mile of conservation easements, compared to none for the current route, and 0.4 mile of state lands in the Cowbane Prairie State Natural Prairie area, which the current route avoids. Stuarts Draft 1 additionally crosses 0.5 mile more of forested land, 0.2 mile more of wetland, and 6 more perennial waterbodies than the current route.



Atlantic Coast Pipeline SM

- Proposed Route
- Stuarts Draft Baseline
- Stuarts Draft Alternative 1
- Stuarts Draft Alternative 2

Atlantic Coast Pipeline
Figure 10.5.1-4
 Major Route Alternatives
 Staunton Draft



Features	Unit	Current Route (GWNF 3)	Stuarts Draft 1 Route Alternative	Stuarts Draft 2 Route Alternative
Length	miles	12.7	19.1	15.7
Primary U.S. or state highway crossed	number	5	4	5
Other state or local roads crossed	number	14	30	20
Adjacent to existing linear corridor facilities	miles	0.0	0.0	0.0
Federal lands crossed	miles	0.0	0.0	0.0
State lands crossed	miles	0.0	0.4	0.2
Private lands crossed	miles	12.7	18.7	15.5
Conservation easements crossed	miles	0.0	0.8	0.4
Forested lands crossed	miles	4.4	4.9	3.8
Wetlands crossed – freshwater emergent	miles	0.0	0.1	0.1
Wetlands crossed – freshwater forested/shrub	miles	0.1	0.2	0.2
Intermittent waterbodies crossed	number	11	6	12
Perennial waterbodies crossed	number	6	12	11

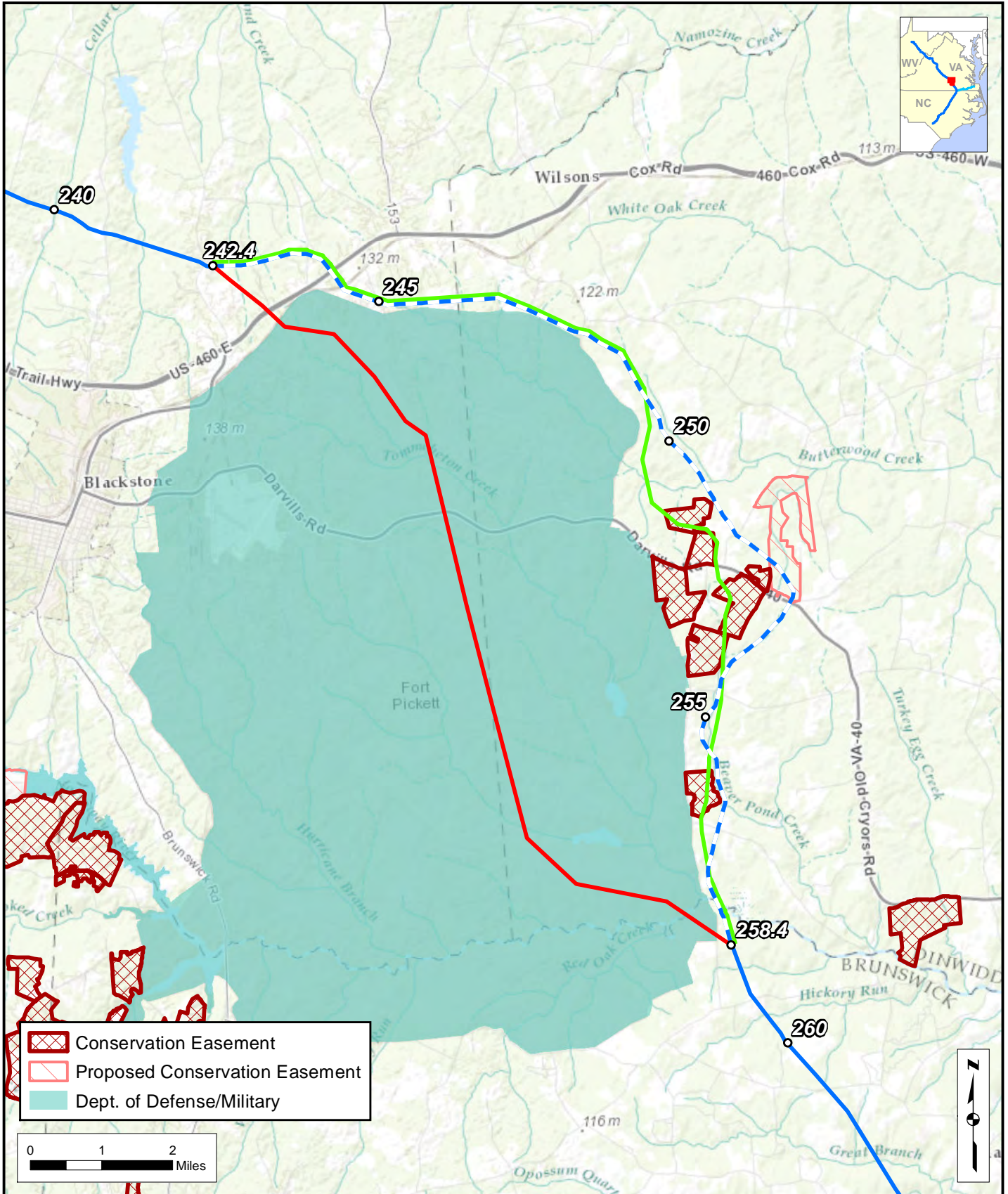
Stuarts Draft 2 is 3.4 miles shorter than Stuarts Draft 1, but 3.0 miles longer than the current route. Like Stuarts Draft 1, it increases the distance between the proposed pipeline and the three-school complex from 0.5 to 1.6 miles, but introduces a new route component that passes within 0.9 mile of another school in Stuarts Draft. Stuarts Draft 2 crosses less state land and conservation easements than Stuarts Draft 1, but approximately 0.2 and 0.4 mile more, respectively, than the current route. Stuarts Draft 2 crosses 0.6 mile less forested land than the current route, but 0.2 mile more of wetland and 5 more perennial waterbodies.

Each of these alternatives would require substantial additional acreage to be disturbed. Both Stuarts Draft 1 and Stuarts Draft 2 present additional exposure to designated conservation easements, and increase the Project's impact on perennial waterbodies and water protection areas. Therefore, Atlantic recommends retention of the baseline route in the Stuarts Draft area.

10.5.1.5 Fort Pickett Major Route Alternatives

The Fort Pickett Military Reservation is an Army National Guard training facility located near Blackstone, Virginia. It encompasses approximately 42,000 acres owned by the U.S. Department of Defense, but is managed and operated by the Virginia National Guard. The fort has been used as a maneuver training facility since World War II (Virginia National Guard, 2014).

The baseline route for the proposed AP-1 mainline crosses Fort Pickett in Nottoway, Dinwiddie, and Brunswick Counties, Virginia. Because this area is an active military training facility, Atlantic identified and evaluated two major route alternatives (Fort Pickett 1 and Fort Pickett 2) to avoid crossing the site. Both alternative routes begin north of the Colonial Trail Highway at approximate MP 242.4 in Nottoway County, and end north of Miry Run at approximate MP 258.4 in Brunswick County. Fort Pickett 1 generally runs parallel to, but outside of, the northern and western boundaries of the military reservation. Fort Pickett 2 is similar to Fort Pickett 1, but passes further east at the crossing of Virginia State 40 to avoid conservation easements. The baseline and Fort Pickett route alternatives are depicted on Figure 10.5.1-5, and comparative information on each route is provided in Table 10.5.1-5.



	<ul style="list-style-type: none"> — Proposed Route — Fort Pickett Baseline — Fort Pickett 1 — Fort Pickett 2 (Adopted) 	<p>Atlantic Coast Pipeline Figure 10.5.1-5 Major Route Alternatives Fort Pickett</p>
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Features	Unit	Baseline Route	Fort Pickett 1 Route Alternative	Fort Pickett 2 Route Alternative (Proposed)
Length	miles	13.1	15.6	16.0
Primary U.S. or state highway crossed	number	4	2	2
Other state or local roads crossed	number	19	9	9
Adjacent to existing linear corridor facilities	miles	0.0	0.0	0.0
Federal lands crossed (Fort Pickett)	miles	11.7	0.0	0.0
State lands crossed	miles	0.0	0.0	0.0
Private lands crossed	miles	1.4	15.6	16.0
Conservation easements crossed	miles	0.0	2.4	0.0
Proposed conservation easements crossed	miles	0.0	0.0	0.7
Forested lands crossed	miles	9.8	10.3	11.7
Wetlands crossed – freshwater emergent	miles	0.2	0.2	0.1
Wetlands crossed – freshwater forested/shrub	miles	0.4	0.6	0.8
Intermittent waterbodies crossed	number	10	24	23
Perennial waterbodies crossed	number	9	11	9

Fort Pickett 1 is 2.5 miles longer than the baseline route but avoids the military reservation. It crosses 2 fewer highways and 10 fewer county/local roads, but 0.5 more mile of forested land, 14 more intermittent waterbodies, and 2 more perennial waterbodies. Both routes cross 0.2 mile of emergent wetland, but Fort Pickett 1 crosses 0.2 mile more of forested/shrub wetland. The route alternative also crosses five conservation easements with a combined crossing length of 2.4 miles. One easement is held by the Virginia Department of Forestry and the others are held by the VOF.

The Fort Pickett 2 route alternative is 2.9 miles longer than the baseline route, but avoids the military reservation. It crosses 2 fewer highways and 10 fewer county/local roads, but 1.9 more miles of forested land and 13 more intermittent waterbodies than the baseline route. The alternative route crosses 0.1 mile less of emergent wetland, but 0.6 more mile of forested/shrub wetland. Like the baseline route, Fort Pickett 2 avoids designated conservation easements, but crosses 0.7 mile of an area proposed to be listed as a conservation easement with the VOF. The VOF confirmed with Atlantic that the proposed conservation easement will be adopted; however, the easement agreement will include language which will allow the pipeline to cross, and the landowner is in favor of the ACP. Therefore, the proposed easement was not considered a constraint in this analysis.

Although it is the longest of the three alternatives, and crosses the most forested land and wetlands, Fort Pickett 2 was identified as the preferred alternative and incorporated into the proposed route. This route would have the least impact by avoiding the military reservation and designated conservation easements, and minimize crossings of highways and other roads.

10.5.1.6 Johnston County, North Carolina Major Route Alternative

Atlantic identified and evaluated an alternative route for the AP-2 mainline at the request of the Johnston County, North Carolina Economic Development Authority in an effort to move the pipeline closer to a proposed industrial park near the town of Four Oaks. The baseline route for the AP-2 mainline crosses Johnston County east of the towns of Smithfield and Four Oaks.

Beginning at MP 385.8 near Smithfield, the alternative route follows an existing electric transmission line southwest of the baseline for approximately 7 miles to a point just south of Four Oaks. The route then heads to the south-southwest for approximately 14 miles, where it rejoins the baseline west of Jumping Run Swamp at MP 407.3. The baseline and Johnston County route alternative are depicted on Figure 10.5.1-6, and comparative information on each route is provided in Table 10.5.1-6.

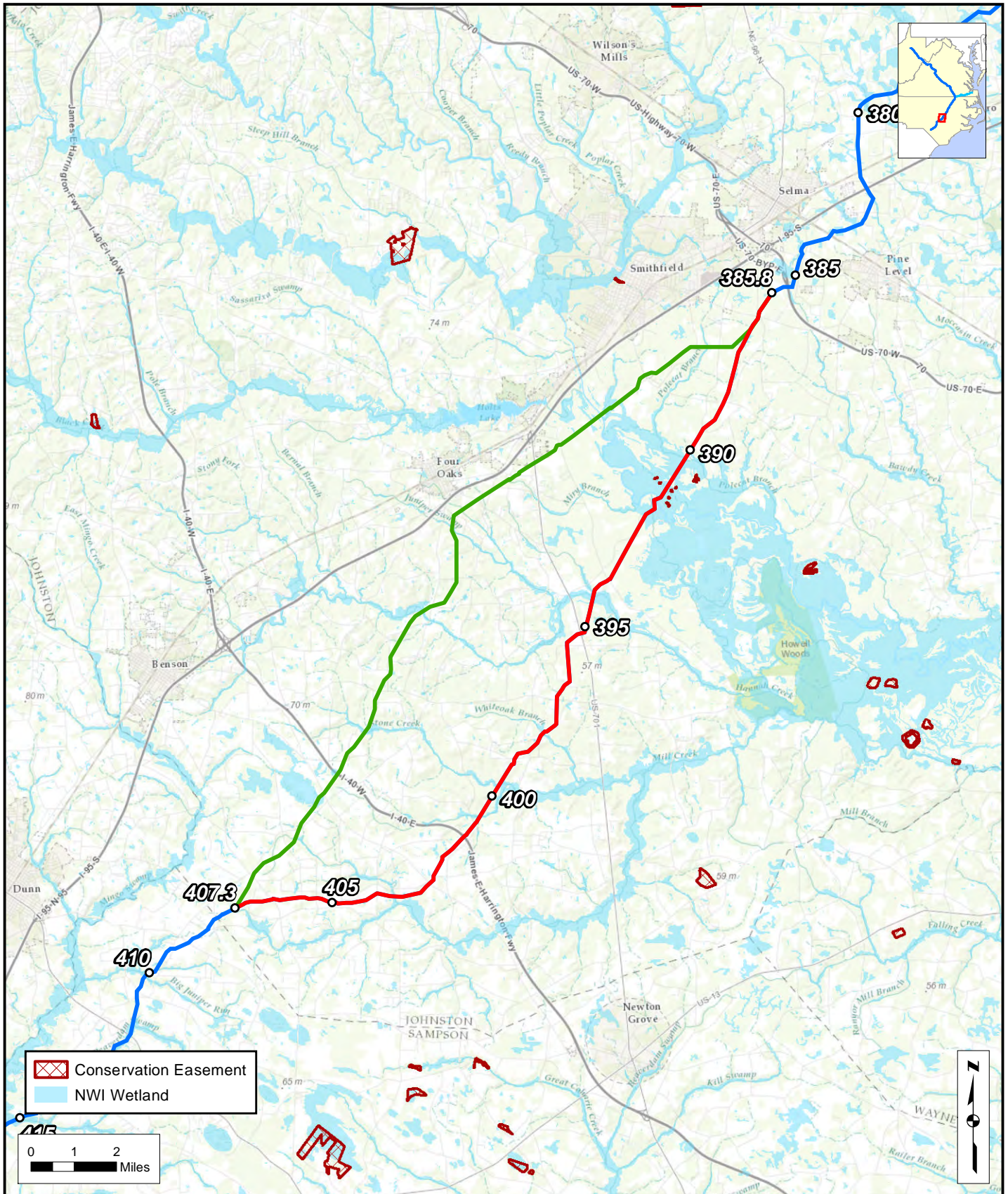
Features	Unit	Baseline (Existing) Route	Johnston County Route Alternative
Length (total)	miles	21.5	20.7
Primary U.S. or state highways crossed	number	7	7
Other state or local roads crossed	number	23	22
Adjacent to existing linear corridor facilities	miles	0.0	6.1
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	8.0	5.4
Wetlands crossed - forested/shrub	miles	2.5	0.7
Intermittent waterbodies crossed	number	33	28
Perennial waterbodies crossed	number	8	8
Bentonville Battlefield (total)	miles	0.1	0.2

The Johnston County route alternative is approximately 4.0 miles closer to the town of Four Oaks than the baseline. Consistent with this proximity, the proposed alternative route crosses 239 parcels of property, compared to the baseline route which affects 163 parcels.

The alternative route is 0.8 mile shorter and crosses 2.6 fewer miles of forested lands and 1.8 fewer miles of forested wetland than the baseline. Of particular note, the alternative route minimizes the crossing of a forested wetland complex adjacent to the Neuse River. Both routes cross a portion of the Bentonville Battlefield area, though the alternative crosses 0.1 mile more than the baseline. Both routes cross similar numbers of roads and waterbodies; however, the proposed alternative route involved more difficult construction with regard to crossing existing utilities.

As noted above, the alternative route is adjacent to an existing electric transmission line for approximately 6.1 miles. The towers for the power line are anchored by guy wires, which could require shifting the pipeline further away from the electric transmission line. This could reduce the benefits of collocation such as use of previously cleared areas for workspace or spoil storage during construction.

Balancing the various considerations presented, and the uncertainty of the location of the proposed industrial park, Atlantic does not adopt the Johnston County Major Route Alternative.



Atlantic Coast Pipeline SM

- ↘ Proposed Route
- ↘ Johnston County Baseline
- ↘ Johnston County Alternative

Atlantic Coast Pipeline
Figure 10.5.1-6
 Major Route Alternatives
 Johnston County



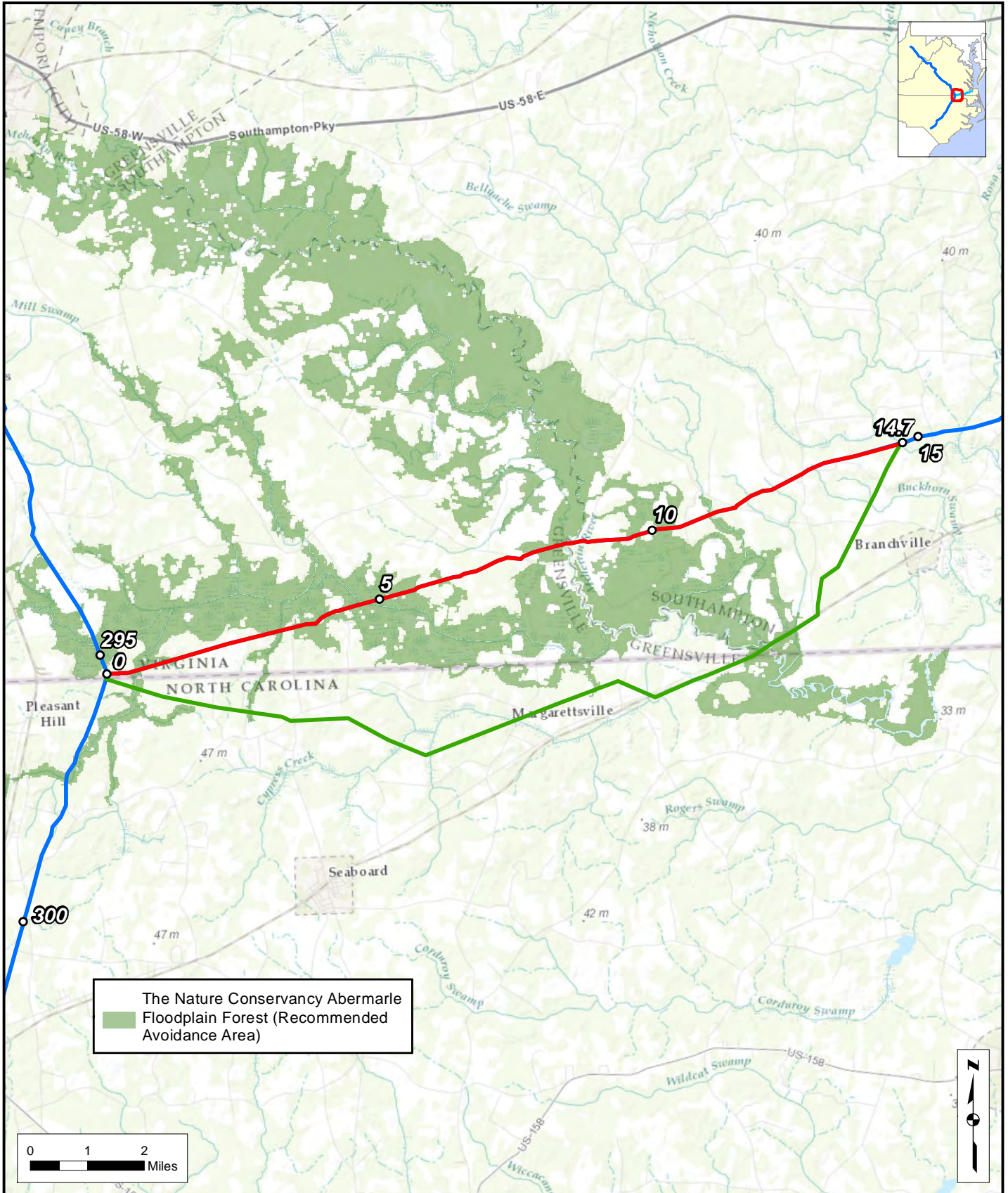
10.5.1.7 Meherrin River Major Route Alternative

In a letter dated September 8, 2014, and in a meeting on November 12, 2014, The Nature Conservancy (TNC) asked Atlantic to consider an alternative route for the proposed AP-3 lateral to avoid or minimize crossings of the Meherrin River and Fountains Creek watersheds in southeastern Virginia. These watersheds are part of TNC’s Albemarle Sound Whole System project area, which encompasses approximately 6 million acres of freshwater dominated estuarine habitat in southeastern Virginia and northeastern North Carolina. TNC states that the Albemarle Sound System contains “areas of large intact wetland forest that support high levels of use by migratory and breeding birds and buffer some of the best migratory fish spawning and nursery habitats on the East Coast.” TNC has worked with public agencies, corporations, landowners, and communities to protect and restore public and private lands in this area.




The current route for the AP-3 lateral crosses floodplain forest in the Meherrin River and Fountains Creek watersheds between MPs 0.0 and 12.0, including areas which TNC has recommended for avoidance. Atlantic identified and evaluated a route alternative which avoids Fountains Creek altogether and minimizes crossings of floodplain forest in areas recommended by TNC for avoidance. The baseline route and Meherrin River Route Alternative are depicted on Figure 10.5.1-7, and comparative information on each route is provided in Table 10.5.1-7.

Features	Unit	Baseline Route (Proposed)	Meherrin River Route Alternative
Length	miles	14.7	16.8
Primary U.S. or state highway crossed	number	1	2
Other state or local roads crossed	number	20	19
Adjacent to existing linear corridor facilities	miles	0.0	6.8
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	14.7	16.8
Conservation easements crossed	miles	0.0	0.0
Forested lands crossed	miles	3.6	3.5
Wetlands crossed – freshwater emergent	miles	0.0	0.3
Wetlands crossed – freshwater forested/shrub	miles	6.5	6.2
Wetlands crossed – other	miles	0.0	0.1
Intermittent waterbodies crossed	number	9	7
Perennial waterbodies crossed	number	13	14
TNC floodplain forest recommended for avoidance	miles	4.1	1.4

The baseline route for the AP-3 lateral trends southwest to northeast across Greenville and Southampton Counties, Virginia, crossing Fountains Creek at approximate MP 4.7 and the Meherrin River just north of Haley’s Bridge at approximate MP 8.4. Starting at MP 0.0, the Meherrin River Route Alternative initially extends to the east-southeast for approximately 5.8 miles across Southampton County, North Carolina, passing south of the Fountains Creek watershed. It then heads to the northeast for approximately 7.6 miles, mostly adjacent to existing power lines, roads, or railroads. It crosses the Meherrin River along the Virginia/North Carolina State line adjacent to an existing railroad. The alternative route then heads north-northeast for approximately 3.4 miles, where it intersects the baseline route at approximate MP 14.7 in Southampton County, Virginia.



Atlantic Coast PipelineSM

-  Proposed Route
-  Meherrin River Baseline
-  Meherrin River Route Alternative

Atlantic Coast Pipeline
Figure 10.5.1-7
Major Route Alternatives
Meherrin River



The Meherrin River Route Alternative is 2.1 miles longer than the baseline, but avoids Fountains Creek and crosses 2.7 miles less of floodplain forest areas recommended for avoidance by TNC. About 70 percent (1.0 mile) of the floodplain forest along the alternative route occurs at the Meherrin River crossing, which is adjacent to an existing railroad. This will minimize impacts in the watershed due to forest fragmentation. The alternative route additionally is adjacent to existing linear corridor facilities (power lines and roads) for approximately 6.8 miles (40 percent) compared to 0.0 miles for the baseline. Crossings of forested lands, wetlands, and waterbodies are similar for both routes.

Based on the feasibility of collocation with other utility corridors in this area, and the relative similarity of the impact on other major resource considerations, Atlantic adopts the Meherrin River Route Alternative.

10.5.1.8 Great Dismal Swamp Major Route Alternatives

The Great Dismal Swamp National Wildlife Refuge (GDS-NWR) is an approximately 112,000-acre preserve in southeastern Virginia and northeastern North Carolina managed by the FWS. The refuge encompasses a remnant of a larger swamp forest ecosystem that used to cover much of the surrounding area (FWS, 2014).

To meet its commitments in precedent agreements for the ACP, Atlantic is proposing to provide transportation service to various shippers at a new delivery point in the City of Chesapeake, Virginia via the AP-3 lateral. Options for routing a new pipeline into this area are limited due to urbanization in and around the Cities of Suffolk and Chesapeake, which have built out to the northern boundary of the GDS-NWR. Atlantic identified an initial baseline route that avoids developed areas in the cities and minimizes impacts on the GDS-NWR by routing along the northern interior boundary of the refuge in an area containing existing electric transmission and pipeline facilities on the south side of U.S. Highway 13 (Portsmouth Boulevard).

Atlantic met with staff from the GDS-NWR on June 30 and August 21, 2014 to review the proposed baseline route across the refuge. The meeting on June 30, 2014 included a field visit to various points along the baseline route both within the refuge and in the City of Suffolk, Virginia. Based on feedback from GDS-NWR staff, specifically that the route should minimize crossings of federal lands and be adjacent to existing utilities, Atlantic identified and evaluated an alternative route (GDS 1) across the refuge. The route alternative incorporated specific recommendations from GDS-NWR staff regarding the configuration of the route along White Marsh Road in the City of Suffolk, Virginia.

In subsequent communications, GDS-NWR staff asked Atlantic to identify and evaluate an alternative route which avoids the refuge altogether. In response to this request, Atlantic identified an alternative route (GDS 2) which avoids the refuge by passing north of the City of Suffolk. Atlantic additionally identified two alternative routes (GDS 3 and GDS 4) which reduce the crossing length of the refuge by passing north of U.S. Highway 13 between the communities of Magnolia and Bowers Hill. Atlantic looked at the feasibility of a route going south of the refuge, but this was rejected and not studied in great detail due to a significant increase in the length of the pipeline (greater than 20 miles), which would result in a much larger environmental impact. Therefore, this alternative is not discussed in any detail in this analysis.

Each of the GDS alternative routes identified by Atlantic originates at approximate MP 46.5 in Suffolk County and terminates at approximate MP 70.3 in the City of Chesapeake. The

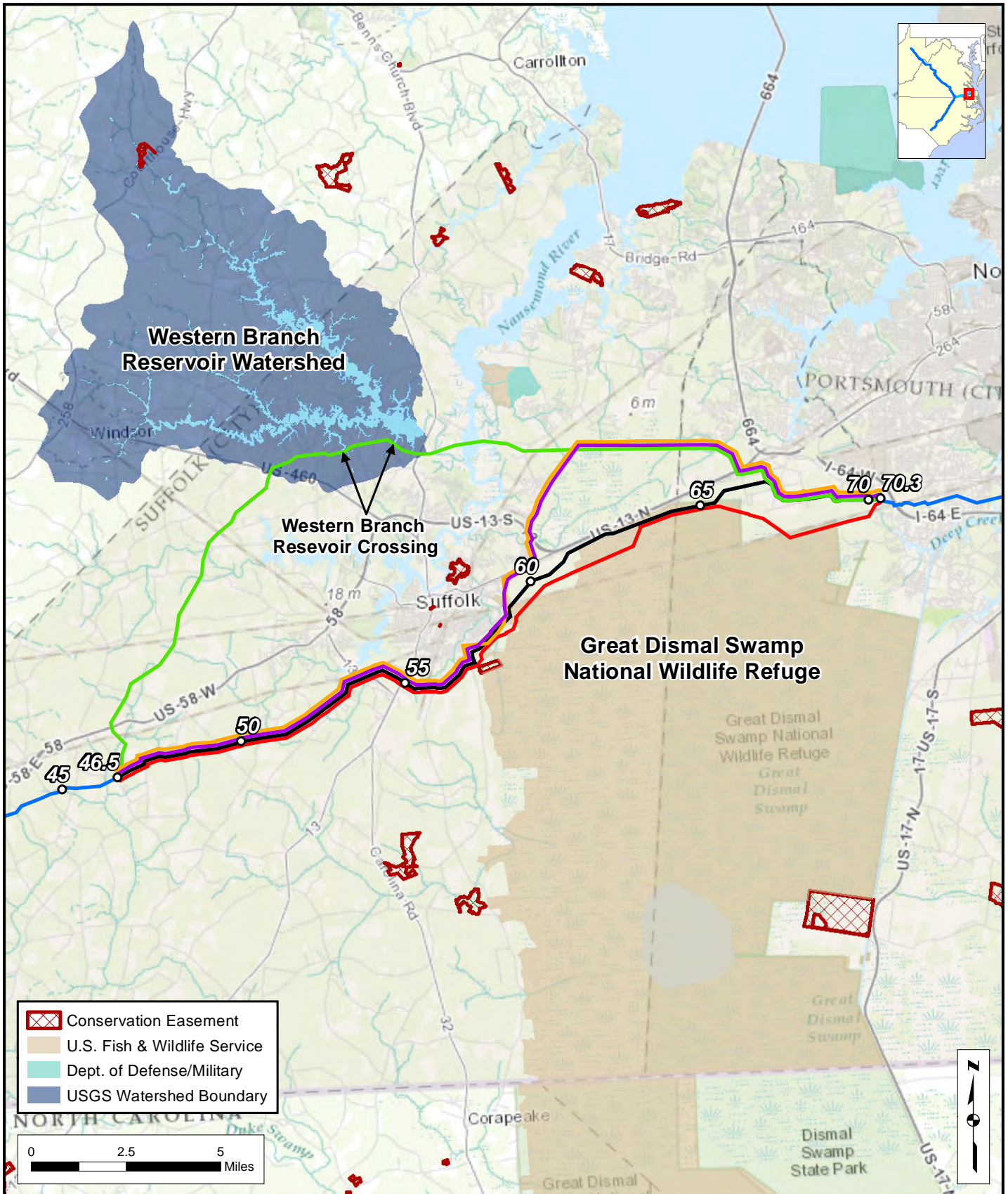
baseline and alternative routes are depicted on Figure 10.5.1-8, and comparative information on each route is provided in Table 10.5.1-8.

Features	Unit	Baseline	GDS 1	GDS 2	GDS 3	GDS 4
Length	miles	23.5	23.8	27.2	26.5	26.7
Primary U.S. or state highway crossed	number	3	3	9	10	10
Other state or local roads crossed	number	11	19	19	22	21
Adjacent to existing linear corridor facilities	miles	5.2	9.1	1.8	4.0	2.6
Federal lands crossed (GDS-NWR)	miles	7.2	4.8	0.0	1.1	0.6
State lands crossed	miles	0.0	0.0	0.0	0.0	0.0
Private lands crossed	miles	16.3	18.6	26.8	25.1	25.7
Conservation easements crossed	miles	0.0	0.0	0.0	0.0	0.0
Forested lands crossed	miles	16.6	15.3	14.8	18.5	18.5
Wetlands crossed – freshwater emergent	miles	0.7	0.1	0.3	0.2	0.2
Wetlands crossed – freshwater forested/shrub	miles	12.1	8.9	6.1	9.5	10.8
Wetlands crossed – Estuarine and Marine	miles	0.0	0.0	1.0	0.0	0.0
Intermittent waterbodies crossed	number	1	1	9	4	4
Perennial waterbodies crossed	number	6	7	11	15	14
Canal/Ditch/Artificial Path crossed	number	26	30	33	27	28
Source Water Watershed – Western Branch Reservoir	miles	0.0	0.0	4.5	0.0	0.0
Navigable Waters	number	0	0	2	0	0

At 23.5 miles, the baseline is the shortest of the five alternative routes. Starting at MP 46.5, the route extends to the east-northeast for approximately 7.8 miles to a point east of Lake Kilby. It then continues to the east-northeast for another 4.5 miles, passing south and east of Suffolk and entering the GDS-NWR east of White Marsh Road. The route then extends east for 6.3 miles crossing the refuge on the south side of U.S. Highway 13 and exiting the refuge at a point just east of the Suffolk/Chesapeake municipal line. The route then continues east for approximately 4.9 miles, where it reaches approximate MP 70.3 about 0.3 mile west of Interstate 64.

The baseline route crosses approximately 7.2 miles of federal lands in the GDS-NWR, including 2.4 miles adjacent to existing electric transmission or pipeline facilities. In total, approximately 5.2 miles (22 percent) of the baseline is collocated with existing linear corridor facilities, which is the second highest percentage of the five routes considered. The baseline crosses the most miles of wetlands (by 1.8 miles) and second most miles of forested land, but the fewest number of waterbodies and roads. It avoids crossings of conservation easements and navigable waters.

GDS 1 measures approximately 23.8 miles in length, which is 0.3 mile longer than the baseline. It is similar to the baseline route, but reduces the crossing length and maximizes collocation opportunities on the refuge. The route initially follows the same alignment as the baseline for approximately 10.6 miles. After crossing White Marsh Road, it turns north for 0.3 mile, then east for 0.2 mile, providing an alternate crossing of Jericho Ditch Lane relative to the baseline. The route then follows the same alignment as the baseline for 0.5 mile before turning northeast for 3.1 miles to parallel an existing electric transmission line. It then heads to the east-northeast for approximately 9.1 miles, crossing both private and refuge lands on the south side of U.S. Highway 13.



GDS 1 crosses approximately 4.8 miles of federal land in the GDS-NWR, which is 2.4 miles less than the baseline. Approximately 9.1 miles of the route (38 percent) is adjacent to existing electric transmission or pipeline facilities, including 3.8 miles within the refuge. The route crosses the second fewest miles of wetlands and forested lands and the second fewest numbers of waterbodies and roads. Like the baseline, GDS 1 avoids conservation easements and navigable waters.

GDS 2 measures approximately 27.2 miles in length, which is 3.7 miles longer than the baseline. Starting at MP 46.5, the route heads north-northeast for approximately 9.9 miles to a point just north of Pruden Boulevard in Suffolk. It then heads east for approximately 12.0 miles, passing north of Suffolk and crossing two short segments of the Western Branch Reservoir, which is a water supply for the City of Norfolk. After passing north of the Hampton Roads Airport, GDS 2 turns south-southeast for approximately 2.0 miles, crossing U.S. Highway 13. It then follows the same alignment as GDS 1 for 3.2 miles east to approximate MP 70.3.

GDS 2 avoids the refuge, but is the longest of the five alternative routes by between 0.5 and 3.7 miles. It is adjacent to existing electric transmission or pipeline facilities for 1.8 miles (7 percent), which is less than the other routes. GDS 2 crosses the fewest miles of wetlands, but is the only route to cross wetlands characterized as estuarine/marine. GDS crosses the most waterbodies, including two (Nansemond River and Western Branch) which are classified as navigable waters, and two which are finger lakes to the Western Branch Reservoir. The route additionally is within the watershed of the reservoir for 4.5 miles. It is not possible to avoid the reservoir or its watershed in this area due to competing land use constraints, primarily houses. GDS 2 crosses the fewest miles of forested land and the second fewest roads. Like the other routes, it avoids conservation easements.

GDS 3 measures approximately 26.5 miles in length, which is 3.0 miles longer than the baseline. It combines portions of GDS 1 and GDS 2 to reduce the crossing length of the refuge relative to the baseline and GDS 1. It follows the same alignment as GDS 1 for approximately 12.7 miles to a point in the refuge just south of the Norfolk Southern Railroad. It then heads north for approximately 5.1 miles, crossing U.S. Highway 13 east of Magnolia and intersecting GDS 2 south of Robin Hood Trail. It then follows the same alignment as GDS 2 to the terminus of the route alternative at MP 70.3.

GDS 3 crosses approximately 1.1 miles of the GDS-NWR, which is 6.1 miles and 3.7 miles less than the baseline and GDS 1, respectively. It is adjacent to existing electric transmission or pipeline facilities for approximately 4.0 miles (15 percent), including 0.6 mile within the refuge. GDS 3 crosses the third fewest miles of wetlands, but the second most number of waterbodies. It crosses the most miles of forested land and most number of roads, including primary highways. Like the baseline and GDS 1, it avoids conservation easements and navigable waters.

At 26.7 miles in length, GDS 4 is 3.2 miles longer than the baseline. It is similar to GDS 3 but reduces the crossing length of the refuge by paralleling a short segment of Jericho Ditch Lane and crossing a parcel of state owned land within the boundaries of the refuge. GDS 4 initially follows the same alignment as GDS 3 for approximately 10.9 miles to an intersection with Jericho Ditch Lane. It then parallels the north side of the lane for 0.5 mile, before heading

north for 2.5 miles to a point south of East Washington Street in Suffolk. It then follows the same alignment as GDS 3 for 12.8 miles to the terminus of the route alternative at MP 70.3.

GDS 4 crosses approximately 0.6 mile of the GDS-NWR, which is 0.5 mile less than GDS 3, as well as approximately 0.9 mile of state owned land. It is adjacent to existing linear corridor facilities for approximately 2.6 miles (10 percent), none of which is in the refuge. It crosses the most miles of wetland and forested land and the third most number of waterbodies, though none are classified as navigable. The route crosses the second most number of roads, including 10 primary highways. Like the other routes, it avoids conservation easements.

These route alternatives are under evaluation by Atlantic.

10.5.1.9 Appalachian Trail Scenic Corridor

The current proposed route for the AP-1 mainline crosses the Appalachian Trail Scenic Corridor on NPS lands in Nelson County, Virginia. As an alternative to the current Appalachian Trail crossing, on NPS lands, Atlantic is investigating the potential routing options and alternative crossing locations within the same general area that would avoid crossing the trail on NPS lands. Atlantic concurrently is investigating construction issues and methods, visual impacts, and land uses associated with the current route and with potential alternative crossing locations. Atlantic will provide information on the results of these investigations in the next draft of Resource Reports 1 and 10.

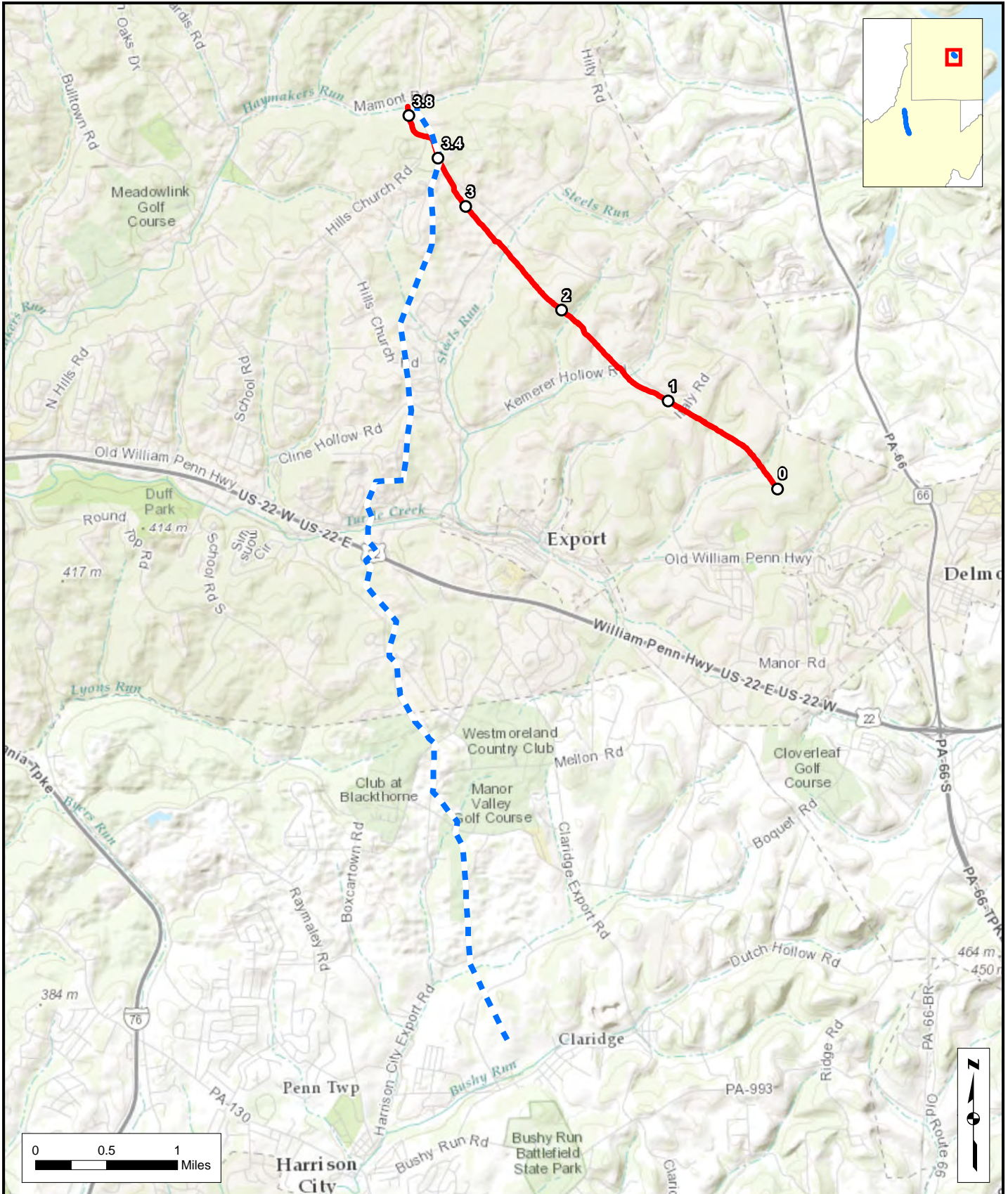
10.5.2 Supply Header Project

10.5.2.1 JB Tonkin Major Route Alternatives

The proposed SHP facilities in Pennsylvania include a pipeline loop (TL-636) along DTI's existing LN-25 transmission pipeline. The baseline route for the loop extends southeast from DTI's existing JB Tonkin Compressor Station, adjacent to the existing LN-25 right-of-way, for about 3.8 miles where it connects with DTI's existing TL-591 pipeline northwest of Delmont, Pennsylvania.

In addition to the baseline route, DTI evaluated a potential alternative that extends south from the existing JB Tonkin Compressor Station, adjacent to its existing TL-342 pipeline right-of-way, for about 7.3 miles where it connects with DTI's existing TL-591 pipeline northeast of Harrison City, Pennsylvania.

The baseline and alternative JB Tonkin routes are depicted on Figure 10.5.2-1 and comparative information on each route is provided in Table 10.5.2-1. Although it crosses 9 fewer waterbodies than the baseline route, the alternative is 3.5 miles longer, includes approximately 2.0 miles of greenfield routing, and crosses 2.1 more miles of forested land. Additionally, the alternative route passes within 100 feet of developed residential areas in several locations, while the baseline route does not. For these reasons, the alternative route was rejected as the proposed route for the SHP loop in Pennsylvania.



- ▬▬▬ JB Tonkin Major Route Alternative
- ▬▬▬ Baseline Route (Adopted)

Supply Header Pipeline
Figure 10.5.2-1
 Major Route Alternatives
 JB Tonkin

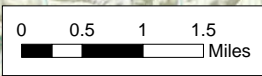
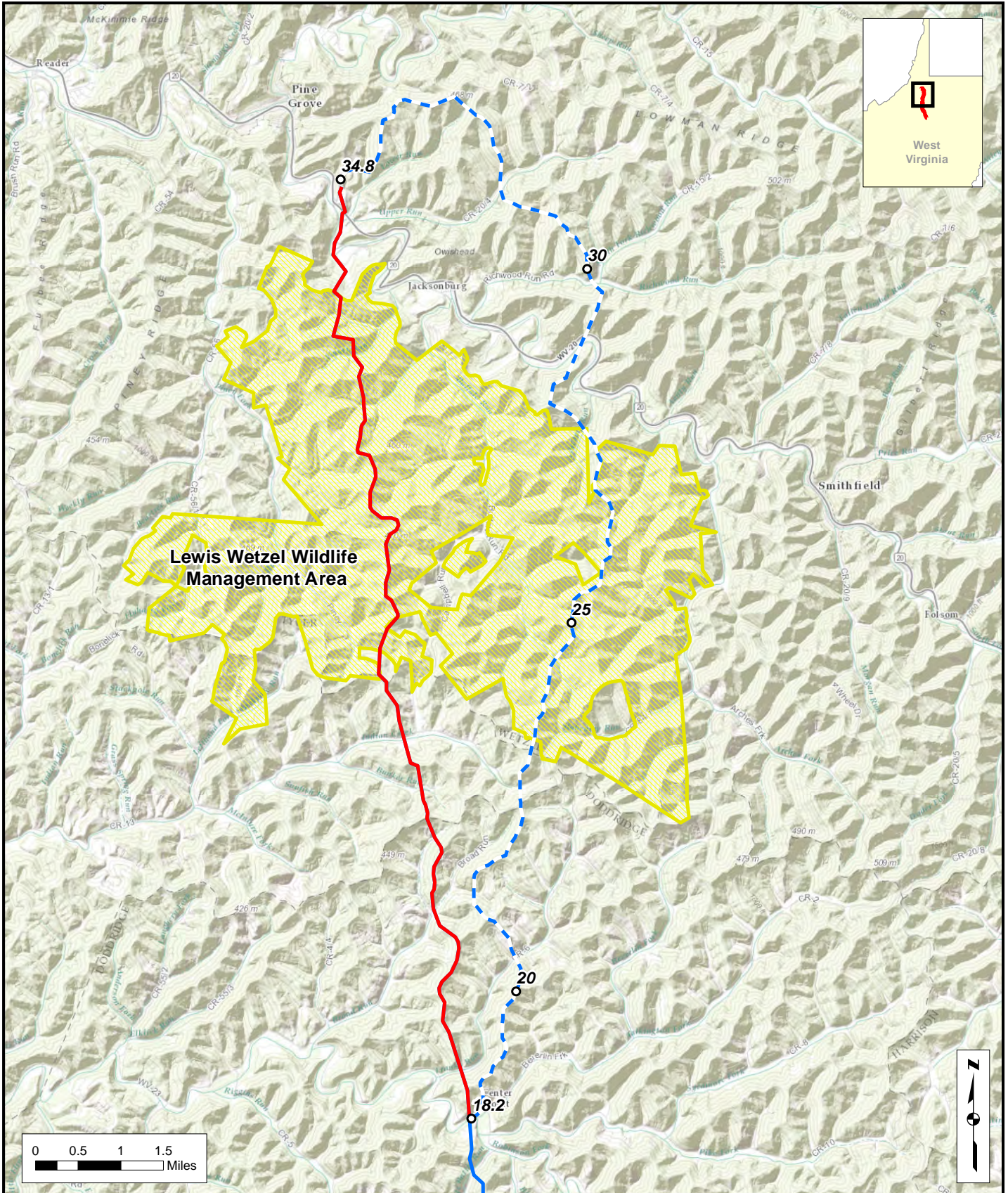
Features	Unit	Baseline Route (Proposed)	JB Tonkin Route Alternative
Length	miles	3.8	7.3
Primary U.S. or state highway crossed	number	0	1
Other state or local roads crossed	number	8	18
Adjacent to existing linear corridor facilities	miles	3.8	5.3
Federal lands crossed (Fort Pickett)	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	3.8	7.3
Conservation easements crossed	miles	0.0	0.0
Forested lands crossed	miles	1.7	3.8
Wetlands crossed – freshwater emergent	miles	0.0	0.0
Wetlands crossed – freshwater forested/shrub	miles	0.0	0.0
Intermittent waterbodies crossed	number	8	4
Perennial waterbodies crossed	number	7	2




10.5.2.2 Mockingbird Hill Major Route Alternatives

The proposed SHP facilities in West Virginia include a pipeline loop (TL-635) along DTI's existing TL-360 transmission pipeline. The baseline route for the loop extends south from DTI's existing Mockingbird Hill Compressor Station for about 12.4 miles, of which about 10.5 miles are collocated with the existing TL-360 right-of-way. DTI identified and evaluated the Mockingbird Hill Major Route Alternative, to provide an alternative approach to the Mockingbird Hill Compressor Station and reduce engineering and safety concerns associated with construction occurring alongside slope in areas of collocation.

The Mockingbird Hill alternative heads northeast from the existing Mockingbird Hill Compressor Station, following a ridgeline that turns to the south. The alternative then heads south, running along several ridgelines, until it reconnects with the baseline route at MP 18.2. The baseline route and the Mockingbird Hill alternative are depicted on Figure 10.5.2-2, and comparative information is provided in Table 10.5.2-2.

The alternative route is 4.2 miles longer than the baseline route and crosses 5.4 additional miles of forested land, but slightly reduces the length of wetlands crossed and crosses 1.4 miles less of the Lewis Wetzel Wildlife Management Area. Due to the steep topography in the area, the collocation of the baseline route with the existing TL-360 pipeline on top of a ridgeline is not possible in most areas. Therefore, collocation with the existing pipeline in these areas would require the construction workspace, and the pipeline in some areas, to be almost entirely located along side slopes. For this reason, the Mockingbird Hill Major Route Alternative was adopted as the proposed route.



-  Proposed Route
-  Baseline
-  Route Alternative (Adopted)

Supply Header Pipeline
Figure 10.5.2-2
 Major Route Alternative
 Mockingbird Hill



Features	Unit	Baseline Route	Mockingbird Hill Route Alternative (Proposed)
Length	miles	12.4	16.6
Primary U.S. or state highway crossed	number	2	2
Other state or local roads crossed	number	15	11
Adjacent to existing linear corridor facilities	miles	10.5	1.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	5.1	3.7
Private lands crossed	miles	7.3	13.0
Conservation easements crossed	miles	0.0	0.0
Forested lands crossed	miles	10.4	15.8
Wetlands crossed – freshwater emergent	miles	0.02	0.0
Wetlands crossed – freshwater forested/shrub	miles	0.0	0.0
Wetland crossed – other	miles	0.02	0.01
Intermittent waterbodies crossed	number	8	8
Perennial waterbodies crossed	number	6	6

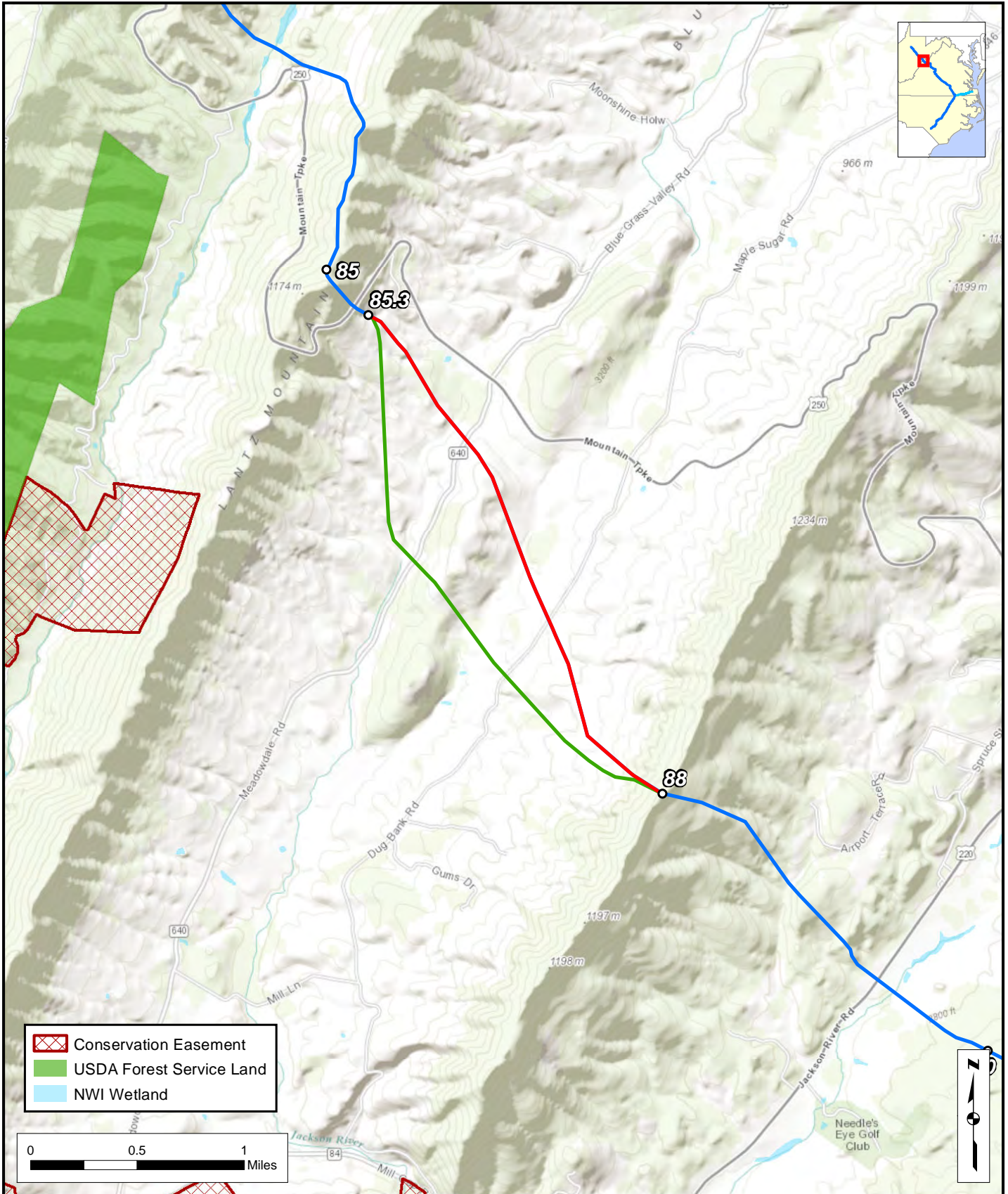
10.6 ROUTE VARIATIONS

Atlantic and DTI identified and continues to identify and evaluate a number of route variations designed to avoid or minimize impacts on geographically distinct and localized resources, such as conservation easements, cultural resource sites, or wetlands. Route variations were also considered to resolve engineering or constructability issues or address stakeholder concerns, where feasible. The route variations measured between approximately 1 and 5 miles in length and passed within a couple miles of the baseline route. The primary criterion for comparing route variations to the baseline route was cumulative impact avoidance relative to the objective of the route variation. Similar to the major route alternatives described above, if a route variation was adopted, it became part of the proposed route and the corresponding segment of the baseline route was rejected. Descriptions of each route variation to date are provided in the subsections below.

10.6.1 Atlantic Coast Pipeline

10.6.1.1 Dividing Waters Farm Route Variation

Atlantic identified and evaluated a minor route variation between MPs 85.3 and 88.0 in Highland County, Virginia in an effort to avoid the Dividing Waters Farm (see Figure 10.6.1-1 and Table 10.6.1-1). Interested parties have advocated that this farm be purchased by the state and turned into a new state park; these parties recommend that Atlantic avoid crossing this property.



- Proposed Route
- Dividing Waters Farm Baseline
- Dividing Waters Farm Route Variation

Atlantic Coast Pipeline
Figure 10.6.1-1
 Dividing Waters Farm
 Route Variation

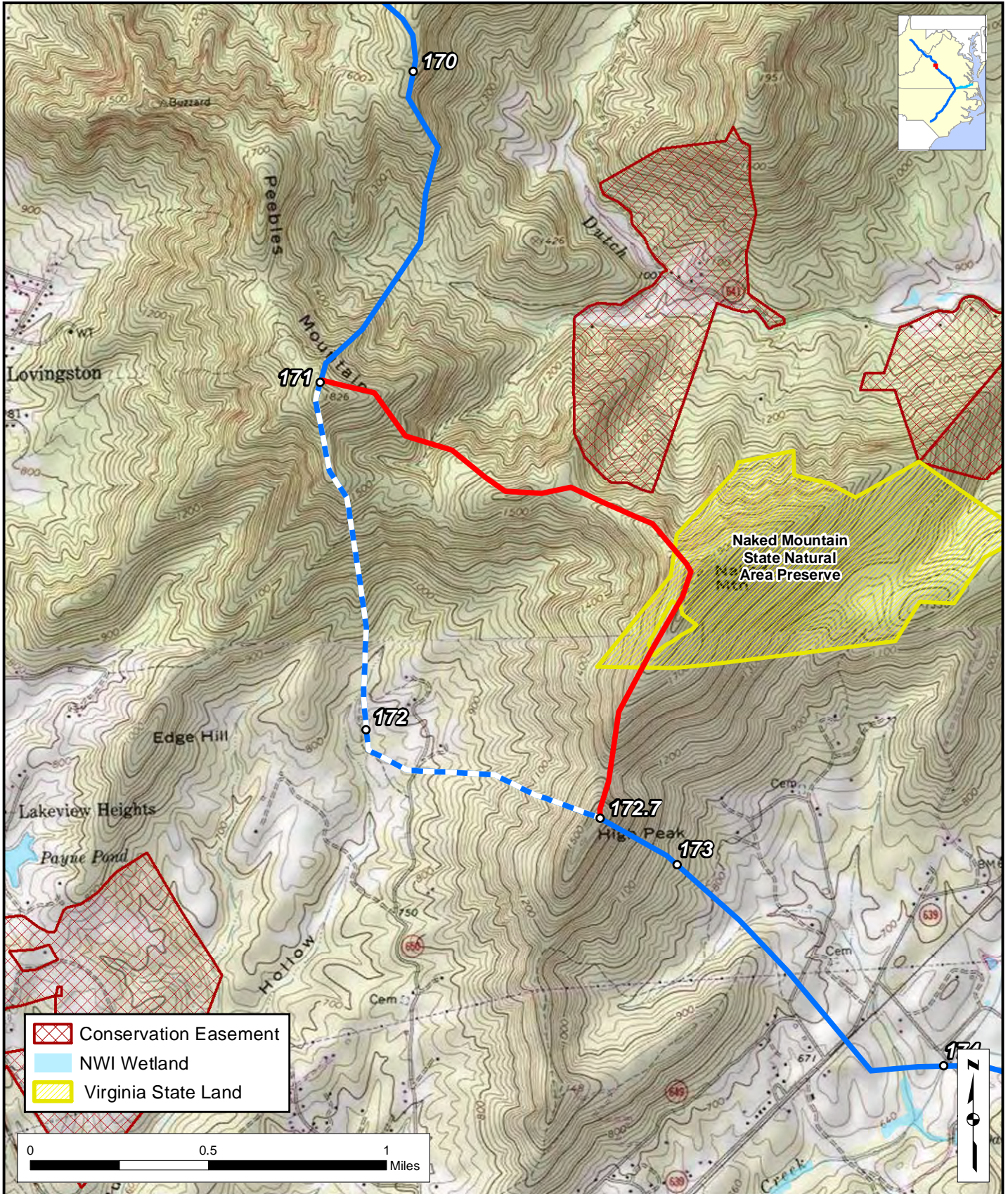
Features	Unit	Baseline Route	Dividing Waters Farm Route Variation
Length	miles	2.6	2.8
Roads crossed	number	2	2
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	2.6	2.8
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	0.5	0.5
Wetlands crossed	miles	0.0	0.0
Intermittent waterbodies crossed	number	6	8
Perennial waterbodies crossed	number	0	0
Potential future state park crossed	miles	1.3	0.3

Starting just south of Lantz Mountain, the route variation initially extends south for approximately 1.2 miles to an intersection with Meadowdale Road. It then heads to the southeast for 1.6 miles, crossing Doug Bank Road and rejoining the baseline route on Monterey Mountain. It is not possible to avoid the Dividing Waters Farm altogether due to difficult terrain where the proposed route crosses Lantz Mountain; however, the route variation reduces the crossing length of the property by approximately 1.0 mile. Otherwise, the route variation is 0.2 mile longer than the baseline and crosses 2 more intermittent waterbodies.




To support Virginia Governor Terry McAuliffe's goal of conserving 400,000 acres of open space, Atlantic is investigating the compatibility of route variations in this area with the future development of a state park, taking into consideration the potential impact of variations on other features. Atlantic will reflect the results of its investigation in the next draft of Resource Reports 1 and 10.

10.6.1.2 Naked Mountain Route Variation

Atlantic identified and evaluated a minor route variation between MPs 171.0 and 172.7 of the AP-1 mainline in Nelson County, Virginia to avoid state land in the Naked Mountain State Natural Area Preserve (see Figure 10.6.1-2 and Table 10.6.1-2). Relative to the baseline route, the Naked Mountain Route Variation extends south from Pebbles Mountain for approximately 1.1 miles, then east-southeast for approximately 0.6 mile, rejoining the baseline route at High Peak. Although it crosses approximately 1.3 more miles of forested land, the route variation is 0.2 mile shorter than the baseline route and avoids the nature preserve. As shown in Table 10.6.1-2, crossings of other resources along the two routes are similar. Therefore, Atlantic incorporated the Naked Mountain Route Variation into the proposed route.



Atlantic Coast PipelineSM

-  Proposed Route
-  Naked Mountain Route Variation (Adopted)
-  Baseline Route

Atlantic Coast Pipeline
Figure 10.6.1-2
 Naked Mountain Route Variation

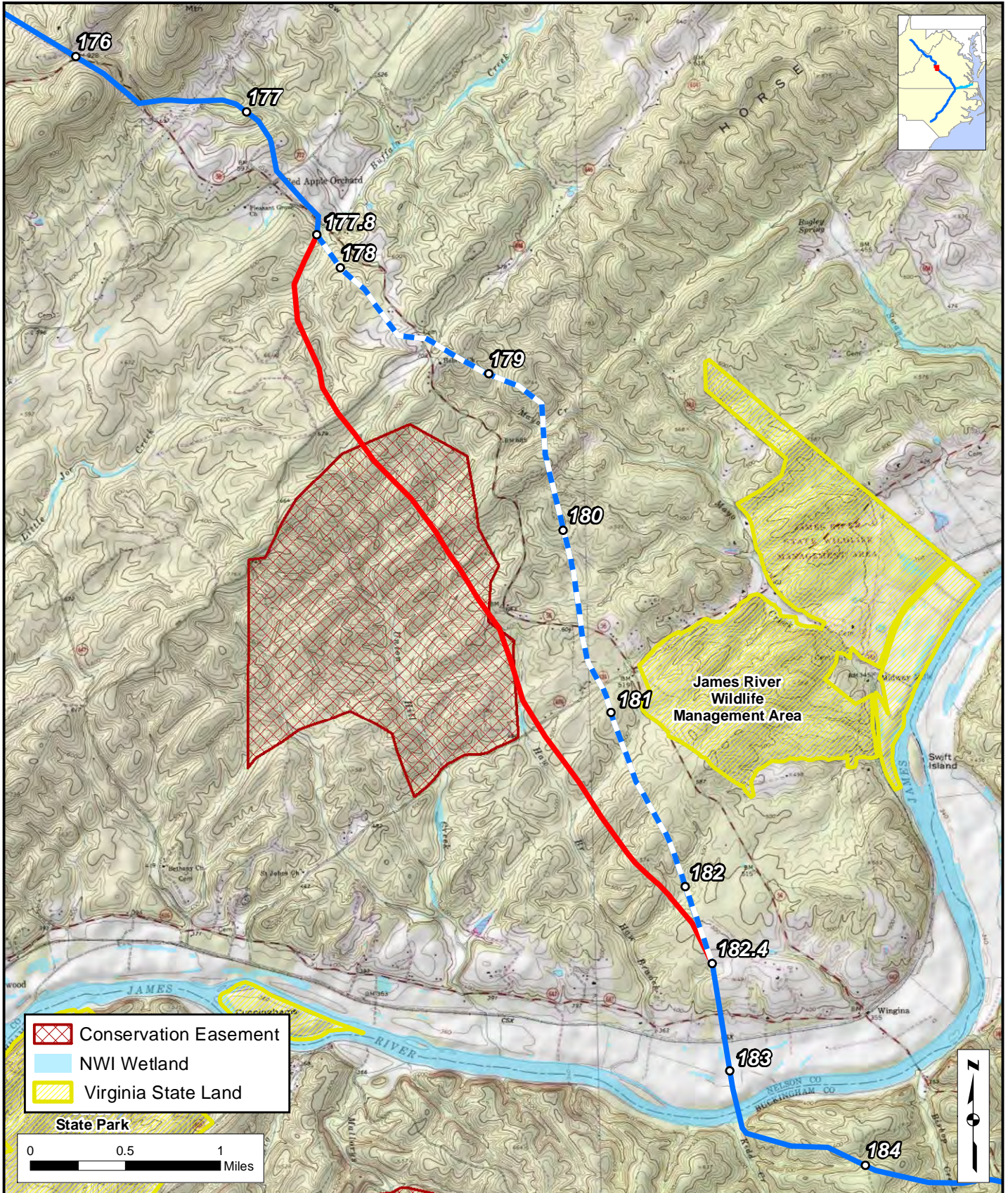


Features	Unit	Baseline Route	Naked Mountain Route Variation (Proposed)
Length	miles	2.0	1.8
Roads crossed	number	1	2
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.2	0.0
Private lands crossed	miles	1.8	1.8
Conservation easements crossed	miles	0.0	0.0
Forested lands crossed	miles	0.0	1.3
Wetlands crossed	miles	0.0	0.0
Intermittent waterbodies crossed	number	1	1
Perennial waterbodies crossed	number	0	0




10.6.1.3 Norwood Route Variation

Atlantic identified and evaluated a route variation between MPs 177.8 and 182.4 of the AP-1 mainline in Nelson County, Virginia to avoid crossing a conservation easement held by the VOF (see Figure 10.6.1-3 and Table 10.6.1-3). Starting just south of James River Road, the route variation initially extends approximately 1.5 miles east-southeast of the baseline route to Horse Mountain. It then turns south-southeast and continues for another 3.1 miles, rejoining the baseline route approximately 0.5 mile north of the James River crossing. Although it is 0.2 mile longer than the baseline, the route variation avoids the conservation easement and crosses 0.8 mile less of forested land and two fewer intermittent waterbodies. For these reasons, Atlantic incorporated the Norwood Route Variation into the proposed route.

Features	Unit	Baseline Route	Norwood Route Variation (Proposed)
Length	miles	4.6	4.8
Roads crossed	number	2	5
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.2	0.0
Private lands crossed	miles	4.6	4.6
Conservation easements crossed	miles	1.3	0.0
Forested lands crossed	miles	3.6	2.8
Wetlands crossed	miles	0.0	0.0
Intermittent waterbodies crossed	number	8	6
Perennial waterbodies crossed	number	0	0



Atlantic Coast Pipeline SM

-  Proposed Route
-  Norwood Route Variation (Adopted)
-  Baseline Route

Atlantic Coast Pipeline
Figure 10.6.1-3
 Norwood Route Variation



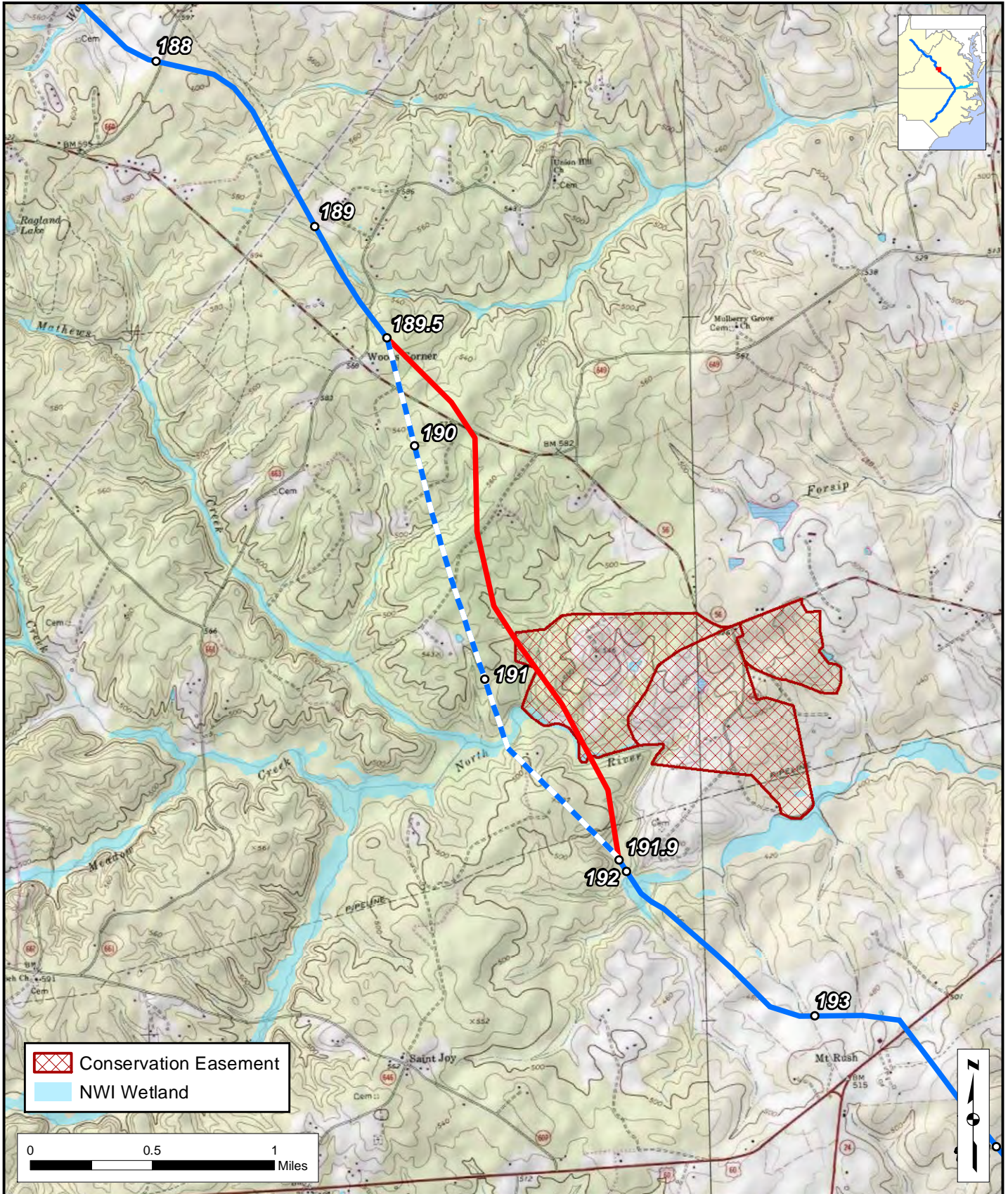
10.6.1.4 Perry Hill Route Variation



Atlantic identified a route variation between MPs 189.5 and 191.9 of the AP-1 mainline in Buckingham County, Virginia to avoid a VOF conservation easement (see Figure 10.6.1-4 and Table 10.6.1-4). Beginning just north of the James River Highway, the route variation heads south for approximately 1.8 miles to a point near Matthews Creek. It then continues south-southeast for 0.6 mile where it intersects the baseline route near Willow Lake Road. Both routes measure approximately 2.8 miles in length and cross less than 0.1 mile of wetland. The route variation crosses 0.8 mile more forested land and one additional perennial waterbody, but it avoids the conservation easement and crosses one fewer intermittent waterbody. Atlantic incorporated the route variation into the proposed route because it avoids the conservation easement.

Features	Unit	Baseline Route	Perry Hill Route Variation (Proposed)
Length	miles	2.4	2.4
Roads crossed	number	1	1
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	2.4	2.4
Conservation easements crossed	miles	0.6	0.0
Forested land crossed	miles	0.9	1.7
Wetlands crossed – freshwater forested/shrub	miles	<0.1	<0.1
Intermittent waterbodies crossed	number	0	1
Perennial waterbodies crossed	number	2	1

10.6.1.5 Cumberland Church Battlefield Route Variation




Atlantic identified and evaluated a route variation between MPs 210.8 and 213.6 of the AP-1 mainline in Cumberland County, Virginia to reduce the crossing length of the Cumberland Church Battlefield (see Figure 10.6.1-5 and Table 10.6.1-5). Starting south of Raines Tavern Road, the route variation trends generally east for approximately 2.9 miles, crossing Dry Creek and Atkins and Cumberland Roads. It rejoins the baseline route just west of Green Creek. The route variation is 0.1 mile shorter than the baseline route and reduces the crossing length of the battlefield study area by 0.4 mile. Additionally, the route variation crosses the battlefield study area along the northern periphery of the site, approximately 0.5 mile north of the battlefield core area. In contrast, the baseline route crosses the north-central portion of the battlefield study area and passes within 150 feet of the core area of the site. The route variation additionally crosses two fewer intermittent waterbodies than the baseline route. Crossings of other resources are similar for the two routes. For these reasons, Atlantic incorporated the Cumberland Church Battlefield Route Variation into the proposed route.



 Conservation Easement
 NWI Wetland

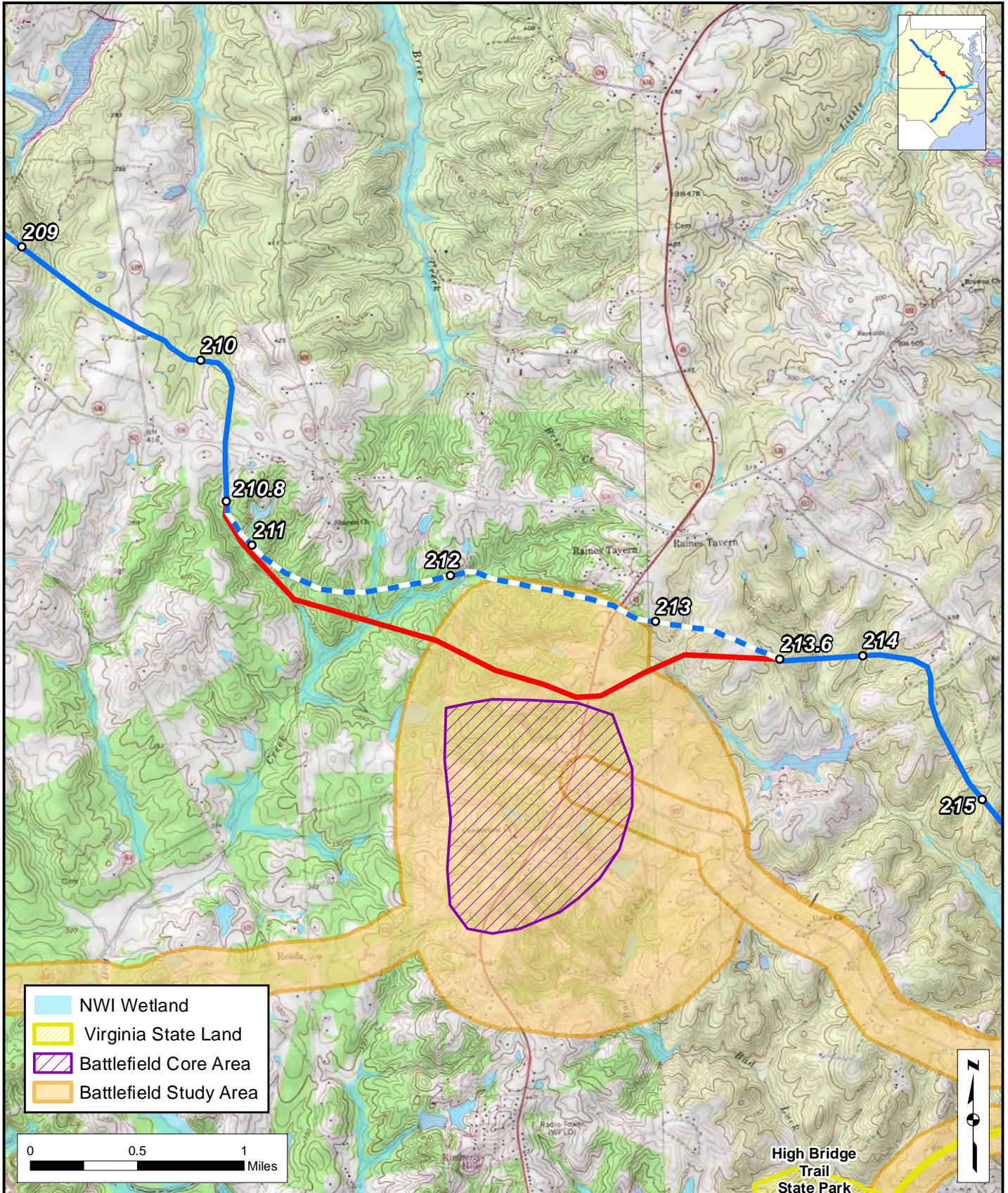
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Atlantic Coast PipelineSM




-  Proposed Route
-  Perry Hill Route Variation (Adopted)
-  Baseline Route

Atlantic Coast Pipeline
Figure 10.6.1-4
 Perry Hill Route Variation





Atlantic Coast PipelineSM

-  Proposed Route
-  Cumberland Church Battlefield Route Variation (Adopted)
-  Baseline Route

Atlantic Coast Pipeline
Figure 10.6.1-5
 Cumberland Church Battlefield
 Route Variation

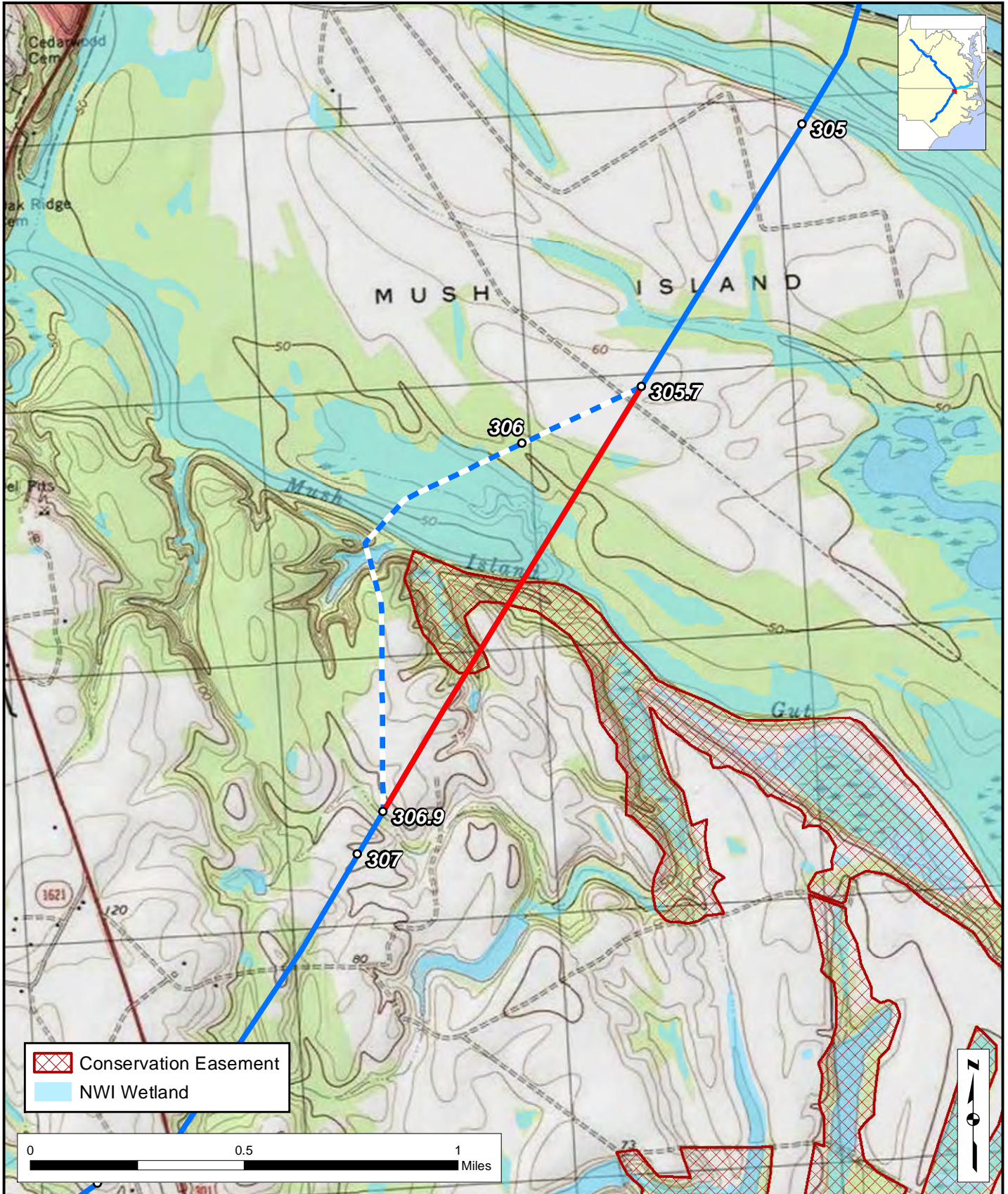


Features	Unit	Baseline Route	Cumberland Church Battlefield Route Variation (Proposed)
Length	miles	3.0	2.9
Roads crossed	number	3	2
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	3.0	2.9
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	2.3	2.3
Wetlands crossed – freshwater forested/shrub	miles	<0.1	<0.1
Intermittent waterbodies crossed	number	7	5
Perennial waterbodies crossed	number	2	2
Cumberland Church Battlefield study area	miles	1.1	0.7




10.6.1.6 Mush Island Route Variation

Atlantic identified a route variation between MPs 305.7 and 306.9 of the AP-2 mainline in Halifax County, North Carolina to avoid a conservation easement enrolled in the Natural Resources Conservation Service's (NRCS) Wetland Reserve Program (see Figure 10.6.1-6 and Table 10.6.1-6). Relative to the baseline route, the Mush Island Route Variation initially extends to the southwest of the baseline route for approximately 0.7 mile, and then turns due south for another 0.7 mile back to baseline. The route variation is approximately 0.2 mile longer than the baseline route, but it avoids the conservation easement. The route variation additionally crosses approximately 0.1 more mile of forested land, 0.1 more mile of wetland, and one more intermittent waterbody. Because it avoids the conservation easement, however, Atlantic incorporated the Mush Island Route Variation into the proposed route.

Features	Unit	Baseline Route	Mush Island Variation (Proposed)
Length	miles	1.2	1.4
Roads crossed	number	1	1
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	1.2	1.4
Conservation easements crossed	miles	0.1	0.0
Forested land crossed	miles	0.7	0.8
Wetlands crossed – freshwater forested/shrub	miles	0.2	0.3
Intermittent waterbodies crossed	miles	0.0	<0.1
Perennial waterbodies crossed	number	1	2
Cumberland Church Battlefield study area	number	1	1



Atlantic Coast PipelineSM

-  Proposed Route
-  Mush Island Route Variation (Adopted)
-  Baseline Route

Atlantic Coast Pipeline
Figure 10.6.1-6
 Mush Island Route Variation



10.6.1.7 Breeches Swamp Route Variation

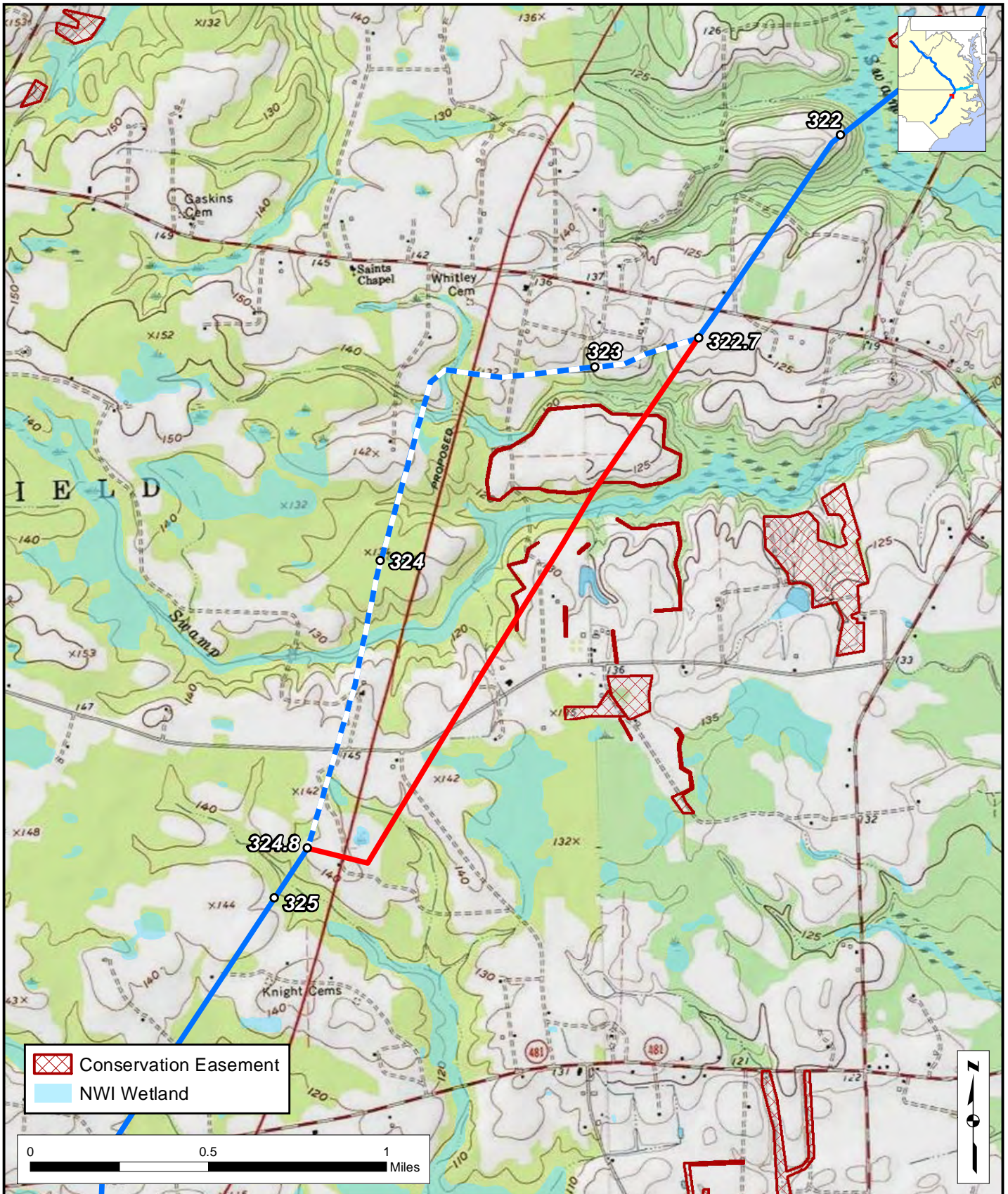
Atlantic identified a route variation between MPs 322.7 and 324.8 of the AP-2 mainline in Halifax County, North Carolina to avoid two conservation easements enrolled in the NRCS's Conservation Reserve Program (see Figure 10.6.1-7 and Table 10.6.1-7). Starting at a point just south of Ringwood Road, the Breeches Swamp Route Variation extends west of the baseline route for approximately 0.7 mile, crossing Interstate 95. It then heads due south for approximately 1.4 miles parallel to and west of Interstate 95, rejoining the baseline route approximately 0.3 mile south of Sneed Road. The route variation is approximately 0.2 mile longer than the baseline route and crosses approximately 0.1 more mile of wetland, but it avoids the conservation easement, crosses 0.1 mile less of forested land, and crosses one less intermittent waterbody. For these reasons, Atlantic incorporated the Breeches Swamp Route Variation into the proposed route.

Features	Unit	Baseline Route	Breeches Swamp Route Variation (Proposed)
Length	miles	1.9	2.1
Roads crossed	number	4	6
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	1.9	2.1
Conservation easements crossed	miles	0.1	0.0
Forested land crossed	miles	0.4	0.3
Wetlands crossed – freshwater forested/shrub	miles	0.1	0.2
Intermittent waterbodies crossed	number	3	2
Perennial waterbodies crossed	number	1	1




10.6.1.8 Red Oak Route Variation

Atlantic identified a route variation between MPs 337.0 and 339.1 of the AP-2 mainline in Nash County, North Carolina, to avoid a historic landfill (see Figure 10.6.1-8 and Table 10.6.1-8). Starting north of the town of Red Oak, the route variation initially heads southeast for approximately 1.0 mile, then turns south for approximately 1.5 miles, passing east of an existing subdivision along Flat Rock Road and Red Oak Battleboro Drive. The route then heads west for approximately 0.6 mile, rejoining the baseline at a point just north of Big Jim Road. The route variation avoids an approximately 0.1 mile long crossing of the Red Oak Landfill, which operated from 1969 to 1977. Two unique disposal events were noted by North Carolina Department of Environmental and Natural Resources at the landfill: a one-time disposal of 135 pounds of pesticides and a three-year weekly disposal of waste rags contaminated with the solvent methyl isobutyl ketone. The route variation is approximately 1.1 mile longer than the baseline, but avoids the historic landfill.

Crossings of other features are similar or identical for the two routes. In light of the avoidance of contaminated land, and the similar impact on other major resource considerations, Atlantic adopts the Red Oak Route Variation.

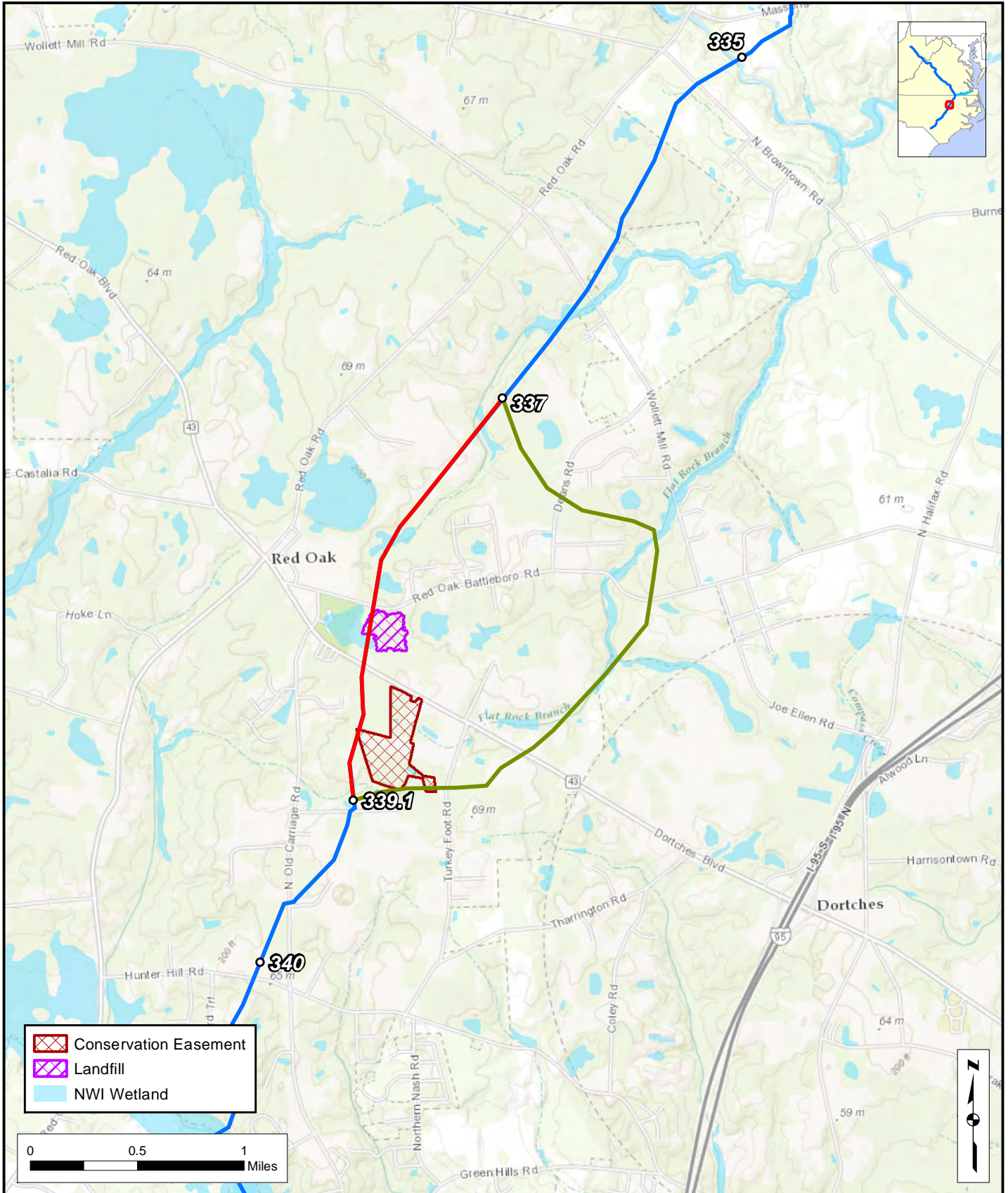


Atlantic Coast PipelineSM

-  Proposed Route
-  Breeches Swamp Route Variation (Adopted)
-  Baseline Route

Atlantic Coast Pipeline
Figure 10.6.1-7
 Breeches Swamp Route Variation





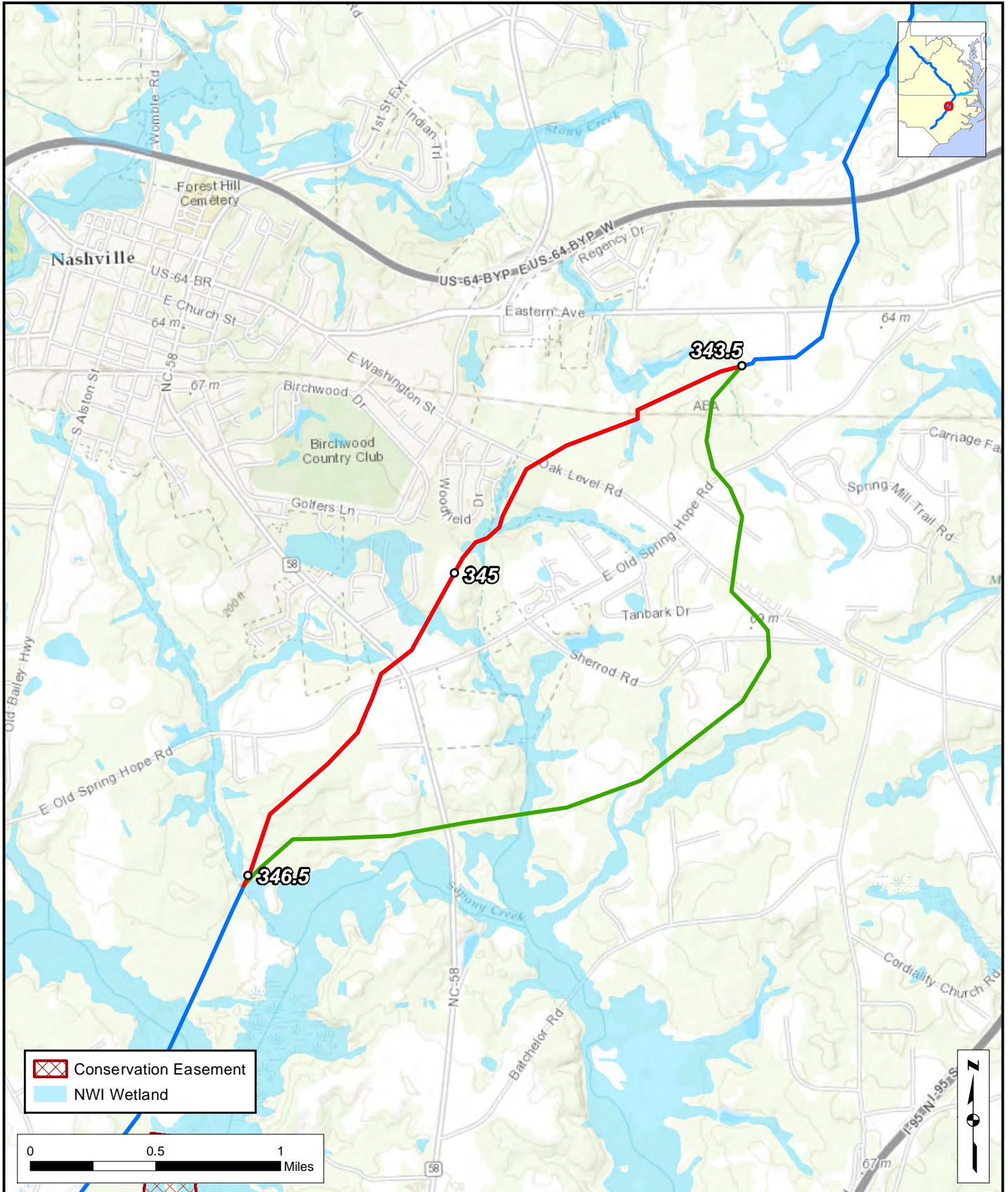
	<ul style="list-style-type: none"> Proposed Route Red Oak Baseline Red Oak Route Variation 	<p>Atlantic Coast Pipeline Figure 10.6.1-8 Red Oak Route Variation</p>	
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Features	Unit	Baseline Route	Red Oak Route Variation
Length	miles	2.1	3.2
Roads crossed	number	2	4
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	2.1	3.2
Conservation easements crossed	miles	<0.1	<0.1
Forested land crossed	miles	1.0	1.2
Wetlands crossed – forested/shrub	miles	0.2	0.2
Intermittent waterbodies crossed	number	3	4
Perennial waterbodies crossed	number	1	3
Historic landfill area	miles	0.1	0.0

10.6.1.9 City of Nashville Route Variation

Atlantic identified and evaluated a route variation for the AP-2 mainline at the request of the City of Nashville, in an effort to avoid the proposed route between two existing subdivisions on the south side of Oak Level Road (see Figure 10.6.1-9 and Table 10.6.1-9). Starting at MP 343.5, the route variation initially heads south for approximately 1.5 miles, passing east of these subdivisions and crossing East Old Springs Hope and Oak Level Roads. It then heads southwest for 2.2 miles, crossing North Carolina State Road 58, and intersecting the baseline at MP 346.5. The City of Nashville Route Variation is approximately 0.7 mile longer than the baseline. It crosses 0.8 mile more of forested land, but 0.2 mile less of forested wetland. While the route variation avoids the subdivisions west of East Old Spring Hope Roads, it crosses between other subdivisions along Oak Level Road and Sherrod Road. For these reasons, Atlantic does not adopt the City of Nashville Route Variation.

Features	Unit	Baseline Route	City of Nashville Route Variation
Length	miles	3.0	3.7
Roads crossed	number	4	5
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	3.0	3.7
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	0.5	1.3
Wetlands crossed – freshwater forested/shrub	miles	0.3	0.1
Intermittent waterbodies crossed	number	2	1
Perennial waterbodies crossed	number	0	1



Atlantic Coast PipelineSM

- Proposed Route
- City of Nashville Baseline
- City of Nashville Route Variation

Atlantic Coast Pipeline
Figure 10.6.1-9
 City of Nashville
 Route Variation



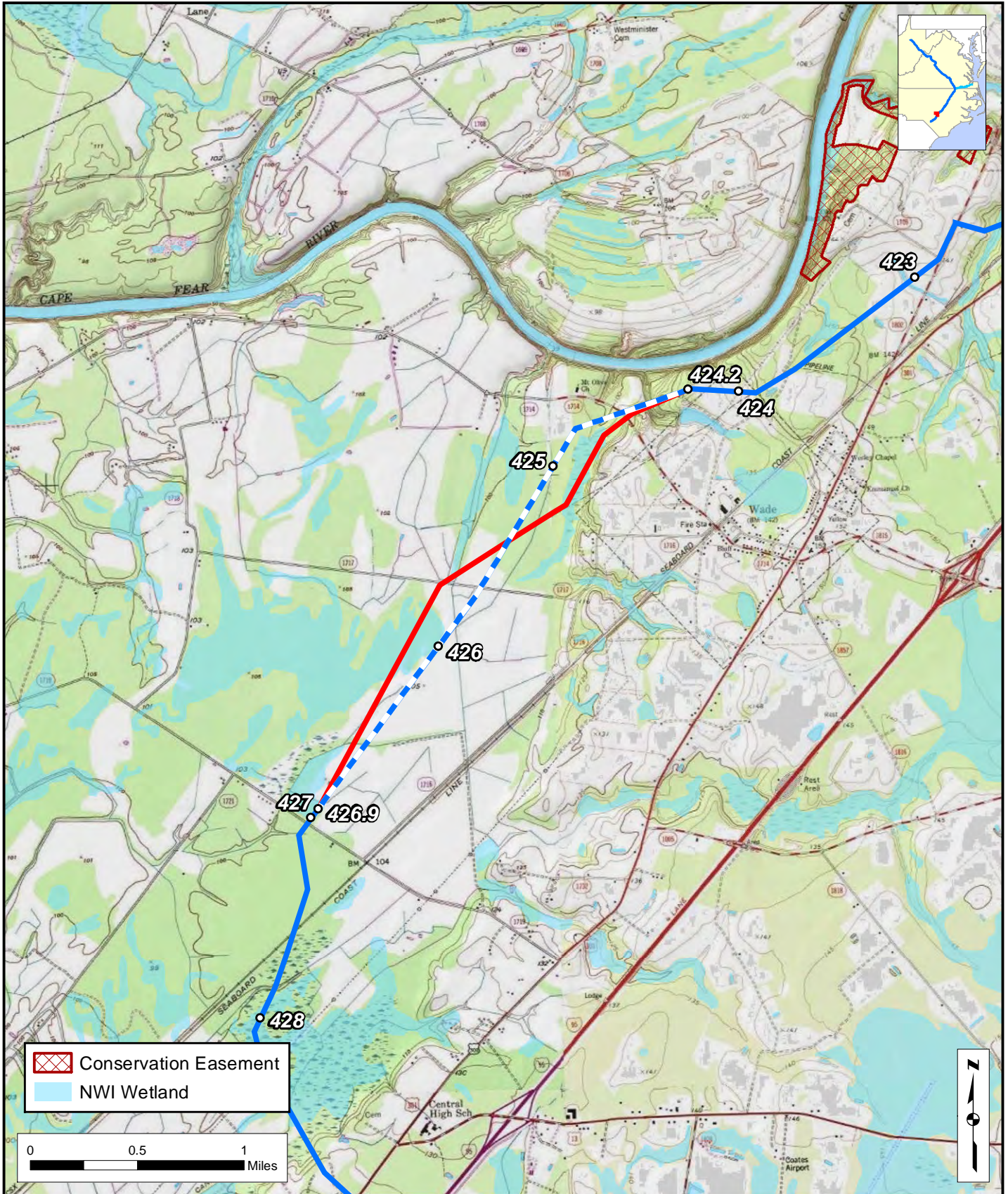
10.6.1.10 Swamp Road Route Variation



Atlantic identified a route variation between MPs 422.2 and 427.0 of the AP-2 mainline in Cumberland County, North Carolina to minimize crossings of forested wetland (see Figure 10.6.1-10 and Table 10.6.1-10). The Swamp Road Route Variation generally parallels the initial baseline route beginning at a point just north of River Road and extending 2.7 miles south-southwest to Rick Walker Road. The route variation passes east of a forested wetland near MP 425.0 and west of a forested wetland near MP 426.0. It crosses 0.8 mile less of forested wetland, 0.6 mile less of forested land, and three fewer perennial waterbodies than the initial baseline route. As a result, Atlantic incorporated the Swamp Road Route Variation into the proposed route.

Features	Unit	Baseline Route	Swamp Road Route Variation (Proposed)
Length	miles	2.7	2.7
Roads crossed	number	3	2
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	2.7	2.7
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	1.4	0.8
Wetlands crossed – freshwater forested/shrub	miles	0.9	0.1
Intermittent waterbodies crossed	number	2	2
Perennial waterbodies crossed	number	4	1

10.6.1.11 Cape Fear Route Variation




Atlantic identified and evaluated a route variation between MPs 439.6 and 444.9 in Cumberland County, North Carolina to avoid a conservation easement enrolled in the NRCS's Wetland Reserve Program (see Figure 10.6.1-11 and Table 10.6.1-11). From a point near Cedar Creek Road, the Cape Fear Route Variation heads approximately 1.5 miles to the southwest of the baseline route to Evans Dairy Road. It then continues to the south-southwest for approximately 3.8 miles, crossing the Cape Fear River and rejoining the baseline route near Tyson Road. The route variation is approximately 0.2 mile longer than the baseline route, crosses 0.2 mile more of forested land, and crosses two more perennial waterbodies than the baseline route. However, it avoids the conservation easement and reduces crossings of forested wetlands by 0.1 mile. For these reasons, Atlantic adopted the Cape Fear Route Variation into the proposed route.



 Conservation Easement
 NWI Wetland

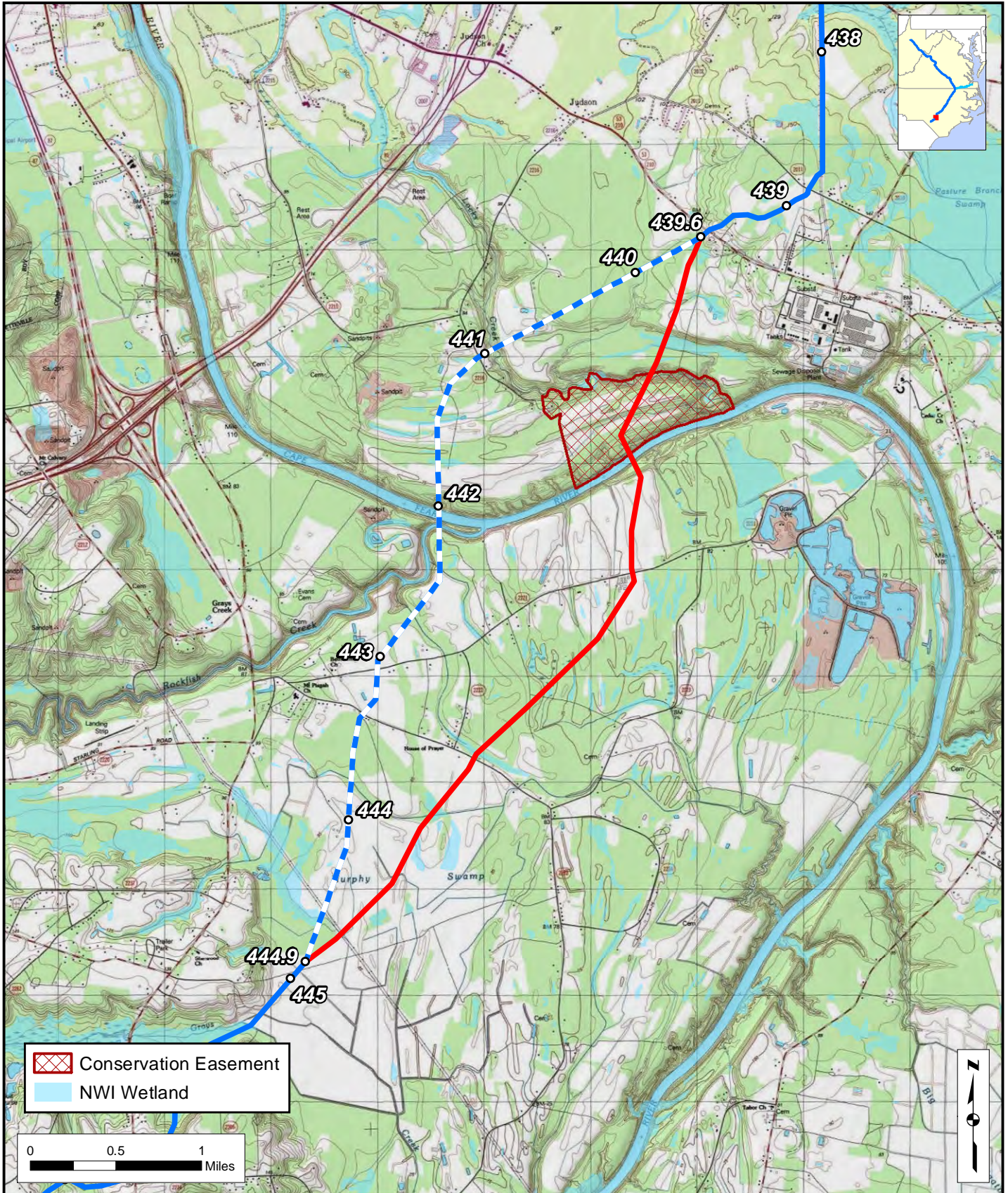
0 0.5 1 Miles

Atlantic Coast Pipeline SM




-  Proposed Route
-  Swamp Road Route Variation (Adopted)
-  Baseline Route

Atlantic Coast Pipeline
Figure 10.6.1-10
 Swamp Road Route Variation





**Atlantic
Coast
Pipeline** SM

-  Proposed Route
-  Cape Fear Route Variation (Adopted)
-  Baseline Route

Atlantic Coast Pipeline
Figure 10.6.1-11
 Cape Fear Route Variation



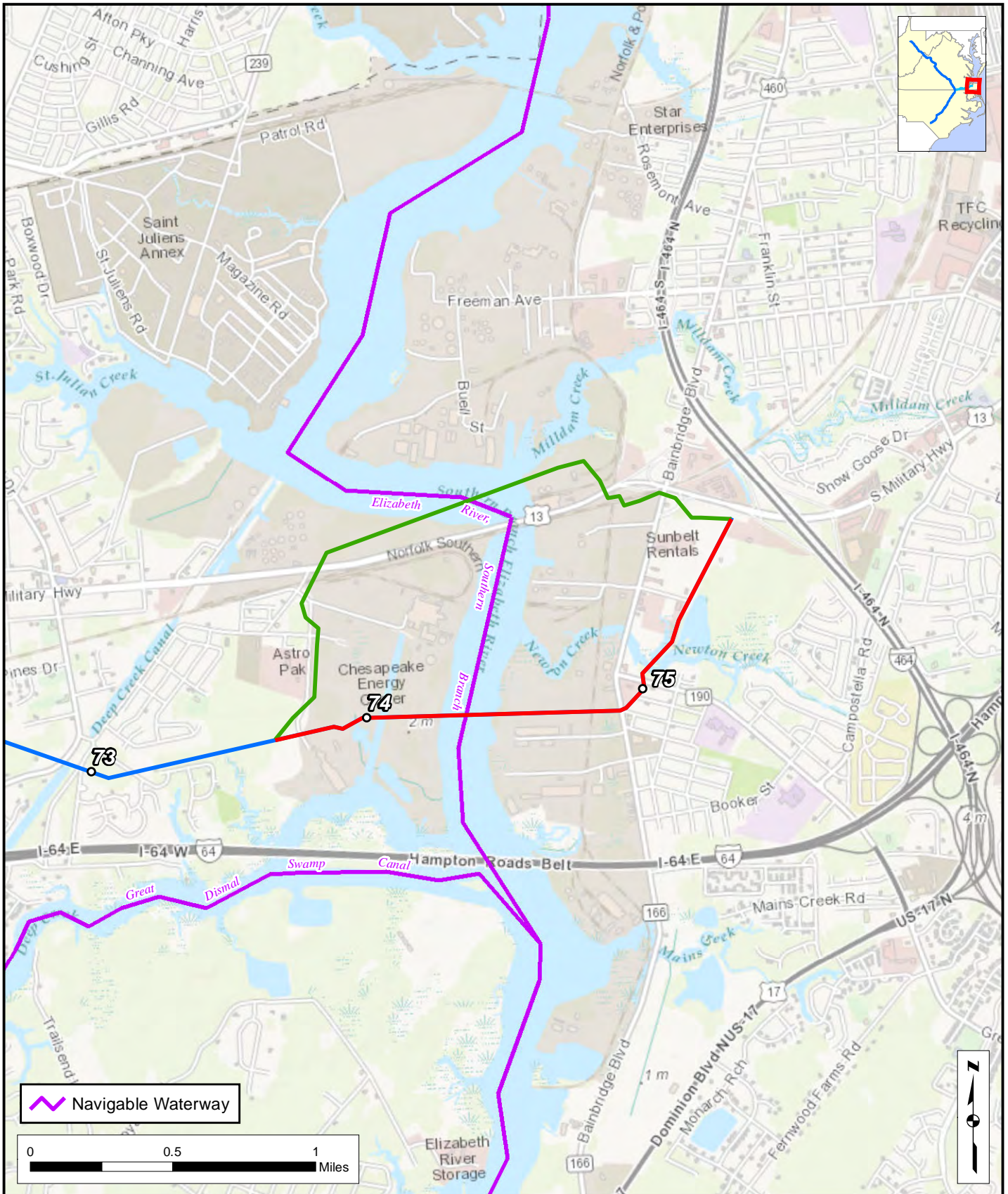
Features	Unit	Baseline Route	Cape Fear Route Variation (Proposed)
Length	miles	5.1	5.3
Roads crossed	number	2	5
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	5.1	5.3
Conservation easements crossed	miles	0.5	0.0
Forested land crossed	miles	1.7	1.9
Wetlands crossed – freshwater forested/shrub	miles	0.3	0.2
Intermittent waterbodies crossed	number	4	3
Perennial waterbodies crossed	number	2	4

10.6.1.12 Chesapeake Energy Route Variation

Atlantic identified and evaluated a route variation between MPs 73.6 and the terminus of the AP-3 lateral in Chesapeake, Virginia, to avoid a Chesapeake Energy Center coal ash storage area along the Southern Branch of the Elizabeth River (see Figure 10.6.1-12 and Table 10.6.1-12). The route variation initially heads north of the baseline for 0.8 mile along Steel Street; then heads east for 0.9 mile crossing the Elizabeth River and paralleling the north side of South Military Highway; then heads east/south east for 0.7 mile to the terminus of the route. The Chesapeake Energy Route Variation is 0.4 mile longer than the baseline and crosses 0.2 miles more of forested lands. Crossings of other features along the two routes are similar.

This route alternative is under evaluation by Atlantic.

Features	Unit	Baseline Route	Chesapeake Energy Route Variation
Length	miles	2.0	2.4
Roads crossed	number	4	12
Adjacent to existing linear corridor facilities	miles	2.0	0.4
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	2.0	2.4
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	0.5	0.7
Wetlands crossed – freshwater forested/shrub	miles	0.1	0.1
Wetlands crossed – freshwater emergent	miles	0.1	0.1
Wetlands crossed – marine	miles	0.4	0.4
Intermittent waterbodies crossed	number	0	0
Perennial waterbodies crossed	number	3	2



Atlantic Coast Pipeline SM

- Proposed Route
- Chesapeake Energy Baseline Route
- Chesapeake Energy Route Variation

Atlantic Coast Pipeline
Figure 10.6.1-12
Chesapeake Energy
Route Variation



10.6.2 Supply Header Project

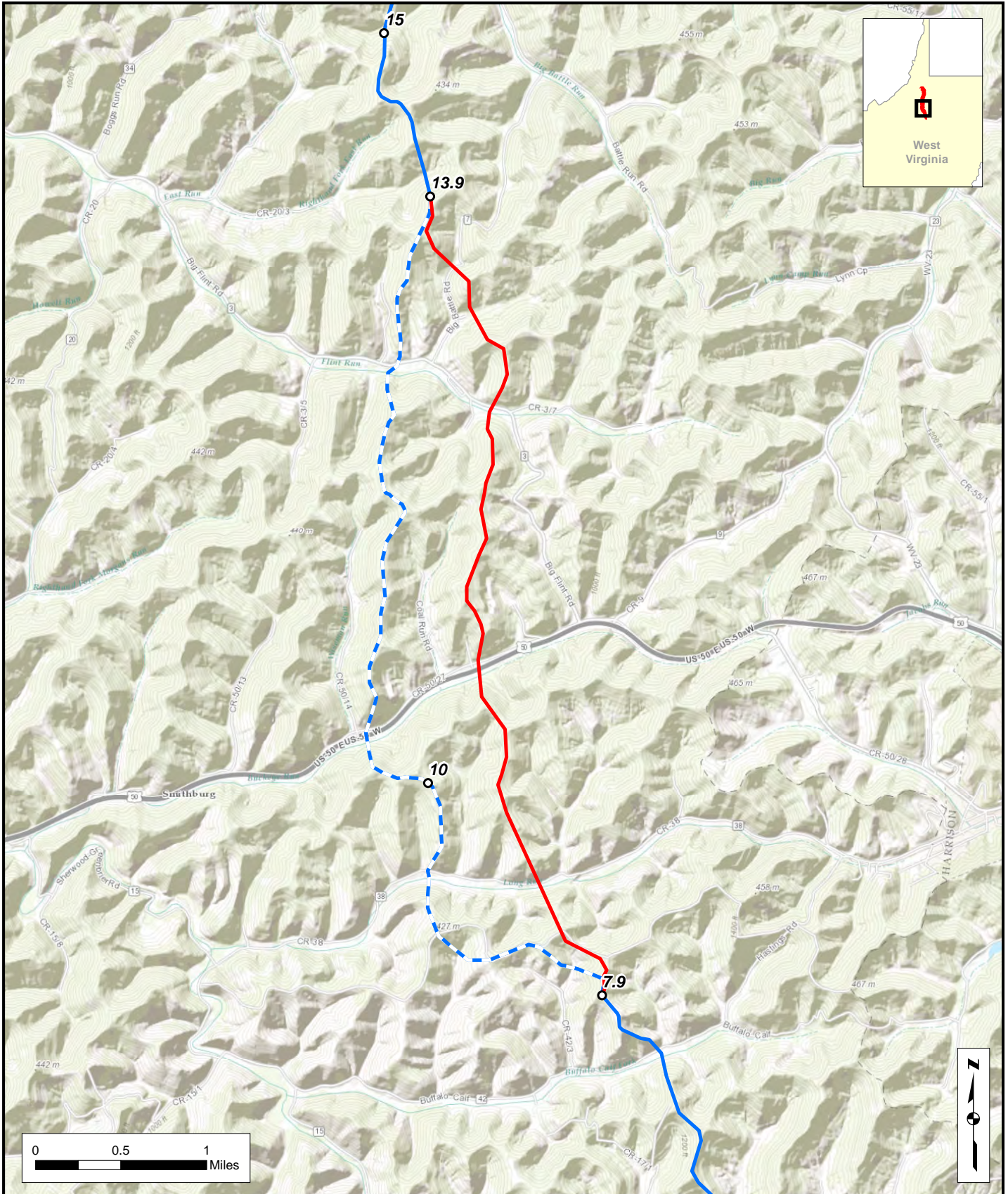
10.6.2.1 Buckeye Run Route Variation




DTI identified and evaluated a route variation between MPs 7.9 and 13.9 due to engineering constraints along the baseline route (see Figure 10.6.2-1 and Table 10.6.2-1). The Buckeye Run Route Variation follows a ridgeline to the west of the ridgeline followed by the baseline route. The route variation is about 0.8 miles longer than the baseline route but crosses fewer roads, wetlands, and waterbodies. The baseline route is collocated with an additional 1.9 miles of existing pipeline corridor. However, collocation in these areas would require the construction workspace to be almost entirely located along side slopes due to limited space at the top of the ridgeline. Based on the engineering and safety concerns associated with construction along the baseline route, the Buckeye Run Route Variation was adopted as the proposed route.

Features	Unit	Baseline Route	Buckeye Run Route Variation (Proposed)
Length	miles	5.2	6.0
Roads crossed	number	6	4
Adjacent to existing linear corridor facilities	miles	2.2	0.3
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	5.2	6.0
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	4.9	5.7
Wetlands crossed – freshwater forested/shrub	miles	0.0	0.0
Wetlands crossed – freshwater emergent	miles	0.01	0.0
Intermittent waterbodies crossed	number	2	1
Perennial waterbodies crossed	number	3	3
Recreational trails crossed	number	3	3

10.7 ROUTE ADJUSTMENTS

Atlantic and DTI made and continue to make a number of minor route adjustments to optimize the baseline routes as a result of ongoing routing, biological, cultural resources, and civil field surveys. The route adjustments generally measure less than 2 miles in length, pass within a quarter mile or less of the baseline routes, and do not significantly affect the total length of the routes. The route adjustments were adopted without a formal alternatives analysis, but the need for the adjustment was intuitive and practical (e.g., a slight shift in the centerline to avoid a wetland). Individually, the refinements to the routes are small, but collectively they reduce the impact of the Project on environmental resources. Table 10.7-1 lists the route adjustments to date that have been incorporated into the proposed ACP pipeline routes and the rationale for each adjustment. No adjustments to the SHP routes have been identified to date.



-  Proposed Route
-  Baseline
-  Route Variation (Adopted)

Supply Header Pipeline
Figure 10.6.2-1
 Buckeye Run Route Variation



Route Variation	Approximate Mileposts	State	Rationale
AP-1 Mainline			
Hollick Run	7.1 to 8.1	WV	Adjustment to decrease the length of the pipeline and provide better alignment for a river crossing
Life's Run	12.7 to 14.6	WV	Adjustment to reduce crossings of a known mussel stream
Left Fork of French Creek Road	28.9 to 29.9	WV	Adjustment to reduce tree clearing
Queens Road	37.0 to 37.8	WV	Adjustment to avoid a wetland
Laurel Fork	78.3 to 80.8	VA	Adjustment to avoid a waterbody crossing
Little Willis River 1	206.0 to 206.3	VA	Adjustment to avoid two waterbody crossings
Little Willis River 2	206.9 to 207.1	VA	Adjustment to avoid two waterbody crossings
Raines Tavern Road	209.8 to 210.7	VA	Adjustment to avoid two waterbody crossings
Little Creek	227.4 to 228.1	VA	Adjustment to avoid a waterbody crossing
Deep Creek	233.0 to 234.1	VA	Adjustment to minimize a wetland crossing
Weedy Creek	236.7 to 238.6	VA	Adjustment to minimize a wetland crossing
Taylors Mill Road	292.0 to 292.8	VA	Adjustment to minimize a wetland crossing
AP-2 Mainline			
Jacks Swamp	296.3 to 297.8	NC	Adjustment to minimize a wetland crossing length
Jacket Swamp	321.3 to 322.0	NC	Adjustment to avoid a conservation easement
Hales Road	373.3 to 374.6	NC	Adjustment to avoid a waterbody crossing and minimize a wetland crossing
Buffalo Creek	376.5 to 376.7	NC	Adjustment to avoid two waterbody crossings
Guin Road	391.5 to 391.9	NC	Adjustment to avoid a waterbody crossing and minimize a wetland crossing
Odom Road	449.4 to 450.2	NC	Adjustment to avoid a wetland crossing and reduce tree clearing
Little Marsh Swamp	454.4 to 457.9	NC	Adjustment to minimize a wetland crossing and parallel an existing utility corridor
AP-3 Lateral			
Buckhorn Crossing	AP 3 12.7 to 13.5	VA	Route adjustment to minimize the length of a wetland crossing
Dutch Road	AP 3 44.2 to 44.6	VA	Route adjustment to reduce the required amount of tree clearing

10.8 ABOVEGROUND FACILITY ALTERNATIVES

Atlantic is in the process of identifying, screening, and evaluating alternative sites for Compressor Stations 1, 2, and 3 for the ACP. A preliminary screen for Compressor Station 1 has identified four potential alternative sites, of which two sites appear to be too steep to be suitable for a compressor station, one site appears to be too close to residences, and one site where the landowner refused to discuss sale of the property. A preliminary screen for Compressor Station 2 has identified one potential alternative site, but this site would add approximately 1.2 miles to the length of the AP-1 mainline. A preliminary screen for Compressor Station 3 has identified one potential alternative site, but this site would increase the length of the AP-3 mainline by approximately 1 mile. A detailed analysis of alternative sites for the proposed compressor stations will be provided in the next draft of Resource Report 10.

Because the additional compression facilities being proposed for the SHP will be constructed adjacent to existing DTI compressor stations, no alternative sites were evaluated for these facilities.

REFERENCES

- Cumberland Times-News. 2014. Spectra Energy puts Proposed Natural Gas Pipeline Project on Hold. Available online at <http://www.naturalgasintel.com/articles/98430-spectra-considering-11-bcfd-pipe-from-marcellus-to-north-carolina>. Accessed October 2014.
- General Electric. 2014. Product and Services, Wind Turbines. Available online at <http://www.ge-energy.com/wind>. Accessed November 2014.
- Ivanpah. 2014. Ivanpah Project Facts. Available online at <http://www.ivanpahsolar.com/about>. Accessed November 2014.
- MarketWatch. 2014. EQT and NextEra Energy Announce Mountain Valley Pipeline Project Joint Venture Formation and Binding Open Season. Available online at <http://www.marketwatch.com/story/eqt-and-nextera-energy-announce-mountain-valley-pipeline-project-joint-venture-formation-and-binding-open-season-2014-09-02>. Accessed October 2014.
- Mountain Valley, LLC. 2104. Letter dated October 27 from Mountain Valley to K. Bose (FERC). Available online through the FERC's eLibrary website at www.ferc.gov. Accessed November 2014.
- National Renewable Energy Laboratory. 2009. *Land-Use Requirements of Modern Wind Power Plans in the United States*. U.S. Department of Energy, Washington, District of Columbia. Available online at <http://www.nrel.gov/docs/fy09osti/45834.pdf>. Accessed November 2014.
- Natural Gas Intelligence Shale Daily. 2014. Spectra Considering 1.1 Bcf/d Pipe from Marcellus to North Carolina. Available online at <http://www.naturalgasintel.com/articles/98430-spectra-considering-11-bcfd-pipe-from-marcellus-to-north-carolina>. Accessed October 2014.
- U.S. Energy Information Administration. 2014a. *Annual Energy Outlook 2014 with Projections to 2040*. U.S. Department of Energy, Washington, District of Columbia.
- U.S. Energy Information Administration. 2014b. *North Carolina State Profile and Energy Estimates*. U.S. Department of Energy, Washington, District of Columbia. Website at <http://www.eia.gov/state/?sid=NC#tabs-5>. Accessed September 2014.
- U.S. Energy Information Administration. 2014c. *Virginia State Profile and Energy Estimates*. U.S. Department of Energy, Washington, District of Columbia. Website at <http://www.eia.gov/state/?sid=VA>. Accessed September 2014.
- U.S. Energy Information Administration. 2014d. How much Coal, Natural Gas, or Petroleum is Used to Generate a Kilowatt hour of Electricity. Available online at <http://www.eia.gov/tools/faqs/faq.cfm?id=667&t=2>. Accessed October 2014.

- U.S. Environmental Protection Agency. 2014. The Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units. Available online at: <https://www.federalregister.gov/articles/2014/06/18/2014-13726/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating>. Accessed October 2014.
- U.S. Fish and Wildlife Service. 2014. Website for the Great Dismal Swamp National Wildlife Refuge. Available online at: http://www.fws.gov/refuge/great_dismal_swamp/. Accessed October 2014.
- U.S. Forest Service. 2011a. Land and Resource Management Plan, Monongahela National Forest. Available online at: http://www.fs.usda.gov/detailfull/mnf/landmanagement/planning/?cid=FSM9_011361&width=full. Accessed October 2014.
- U.S. Forest Service. 2011b. Draft Revised Land and Resource Management Plan, George Washington National Forest. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5297819.pdf. Accessed October 2014.
- U.S. Forest Service. 2014a. Website for the Monongahela National Forest. Available online at: <http://www.fs.usda.gov/mnf>. Accessed October 2014.
- U.S. Forest Service. 2014b. Website for the Jefferson and George Washington national Forests. Available online at: <http://www.fs.usda.gov/gwj/>. Accessed October 2014.
- Virginia National Guard. 2014. Website for Fort Pickett Manuever Training Center. Available online at: <http://vko.va.ngb.army.mil/fortpickett/mtc/garrison/history/history.htm>. Accessed October 2014.
- WDBG7. 2014. Mountain Valley Pipeline would run through Roanoke County, avoid Floyd County. Available online at <http://www.wdbj7.com/news/local/southern-virginia/major-change-announced-for-mountain-valley-pipeline-project/28997640>. Accessed October 2014.
- Williams Partners, LP. 2014a. Project map available online at <http://www.1line.williams.com/Transco/files/Postings/WesternMarcellusPipelineOpenSeasonMap.pdf>. Accessed October 2014.
- Williams Partners, LP. 2014b. Williams Announces Open Season for Transco Western Marcellus Project. Available online at <http://www.williamslp.com/profiles/investor/ResLibraryView.asp?ResLibraryID=72278&BzID=1296&g=345&Nav=0&LangID=1&s=0>. Accessed October 2014.